Appendix G - State MCAs

Alabama

Current status of elevation data for Alabama

The collection of elevation data (lidar) within the State of Alabama began in 2001 with a joint effort between Jefferson County and the state. Up until 2010, collection efforts were sporadic and relied heavily upon individual county and state funding priorities. From 2010 to 2014, the state began developing partnerships with the U.S. Geological Survey (USGS), and the National Resources Conservation Services (NRCS) to collect lidar data. These ad-hoc groups were able to pool resources to collect approximately 15% of the state over that time period. In 2015, with the development of the 3D Elevation Program (3DEP) along with collaboration with the newly created State Geospatial Program Office, funding partners came together to apply to USGS for lidar collection in three counties totaling 3,700 square miles. In 2016, this list grew to 12 counties covering 8,850 square miles, in 2017 the state was able to pool funds to collect lidar data for 25 counties covering 18,850 square miles, and in 2019 an independent group received 3DEP funding for 815 square miles. These 3DEP projects total over 28,500 square miles or 55% of the state since 2015. The state has recently applied to 3DEP for the collection of 17 counties covering 13,000 square miles. If this project is successful, 80% of the state will have lidar collected through 3DEP over the course of five years. The success of these projects is a result of the collaboration and partnerships developed between various state and federal agencies. The existing 3DEP program has organized the users of this data to ease the cost burden of collecting and maintaining elevation data. Future plans will update data in counties with Quality Level 3 (QL3) or older elevation data, and update counties that have data approaching the recommended eight-year replacement cycle.

Importance of elevation data to Alabama

Elevation data have been a critical resource for the state since the early days of the USGS Quadrangle maps. Elevation data provide the means to determine the physical shape and contour of the earth. Over the years, this data was used to guide the development of infrastructure, manage resources, and determine flood boundaries just to name a few. As technology has advanced, lidar data have proven to be a more reliable and robust means of providing amazing detail that increases the utility of this data in ways never thought possible.

- Lidar provides the details needed for mapping and modeling streams, drainage networks, and groundwater recharge which is of great importance in understanding and managing water resources for the state. It provides information for calculating coastal habitat areas and shorelines.
- Improved geological mapping allows us to see structural geology such as folds and faults as well as stratigraphic details that are important for delineating geologic unit (and mineral resource) boundaries in the state. It is also used to identify landslides and sinkholes with detail needed to classify the hazard and risk levels and provide essential information that goes in the FEMA-required state and county hazard mitigation plan.
- Detailed and precise flood maps can be developed that protect property and life and is important in developing criteria for prioritizing flood risk mitigation. It provides more efficient planning and response for emergency services, and preservation of natural functions of floodplains.
- Roadway alignments can be analyzed and efficiently developed to determine the most suitable route based on cost and the effect on the surrounding terrain and environment. Existing transportation routes can be analyzed to determine potential flooding and storm inundation which can be used to develop reliable evacuation routes.
- Details can be discerned revealing archeological features long hidden from view that enable these sites to be studied and protected. Lidar makes it possible to measure and map objects and structures that might otherwise remain hidden.

- Lidar data have proven particularly useful for measuring or estimating a suite of forest structural attributes used to measure forest canopy metrics such as bulk density, height, base and fuel weight which is used in helping understand canopy characteristics across landscapes. This is useful to help model fire behavior and estimate information on tree species. It provides information on the amount of biomass, stand volume, and vegetation cover. This allows the state to monitor forest growth, damage from storms and fire, and determine harvesting schedules along with determining the associated monetary value.

High-level summary of elevation data requirements

The foundation of 3DEP has been the development and maintenance of standards while bringing together key stakeholders together to coordinate priorities and funding. Some of the key aspects of these standards include the following:

- Standard tiling scheme and metadata to ensure collections are organized and easily managed;
- Hydrologic breaklines and hydro enforced Digital Elevation Models (DEMs) to support flood mapping efforts;
- Ability to expand the Area of Interest (AOI) based on individual user needs;
- Consistent QL2 inland topography updated every 4-5 years, QL2B inland bathymetry updated every 6-10 years, QL2B nearshore bathymetry updated every 2-3 years, and Order 1a offshore bathymetry every 4-5 years to meet the majority of user needs;
- Efficient contract selection and management processes;
- Standard file formats and deliverables that meets the needs of all stakeholders; and
- Providing an authoritative point for collaboration between local, state, and federal agencies.

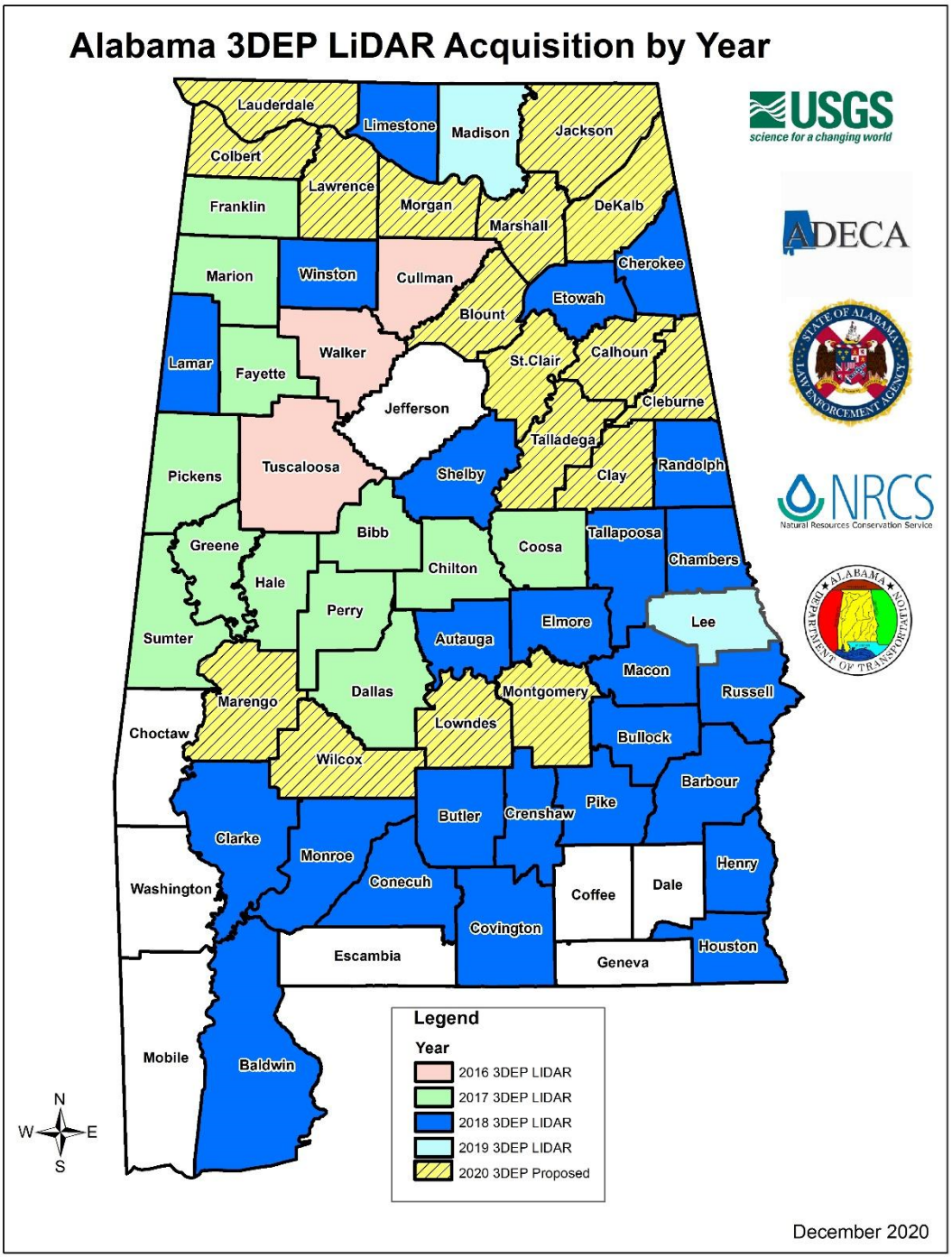


Figure 1. Alabama 3DEP Lidar Acquisition by Year

High-level summary of benefits that would come from higher resolution elevation data

Although existing QL2 data requirements meet a wide variety of needs within the state, higher resolution elevation data would add more robust features to current work programs. Higher point density as required for QL1 data would add more accuracy and potential capability to the state. This density would be useful for extracting building footprints, transportation asset extraction, improved archeological site

identification, improved forest management abilities, improved geologic mapping, flood hazard mapping, and hazard mitigation plans.

The addition of bathymetric data would enhance flood modeling along stream and river systems along with reliable coastal flood maps and storm inundation models. Bathymetric data would also provide critical Marine and Riverine Navigation and Safety along the state's lake and river network and the coastal region providing more reliable transportation of resources.

Additional comments

The continued support and enhancement of 3DEP by the USGS is essential for lidar collection efforts. An organized approach that brings state and federal stakeholders together has been instrumental in coordinating efforts while leveraging funds to ease the cost burden of collecting this data. As this program evolves, it is apparent that regular updates should be included in the program to ensure natural changes to the landscape and hydraulic systems can be temporally monitored and the resulting products updated to reflect existing conditions.

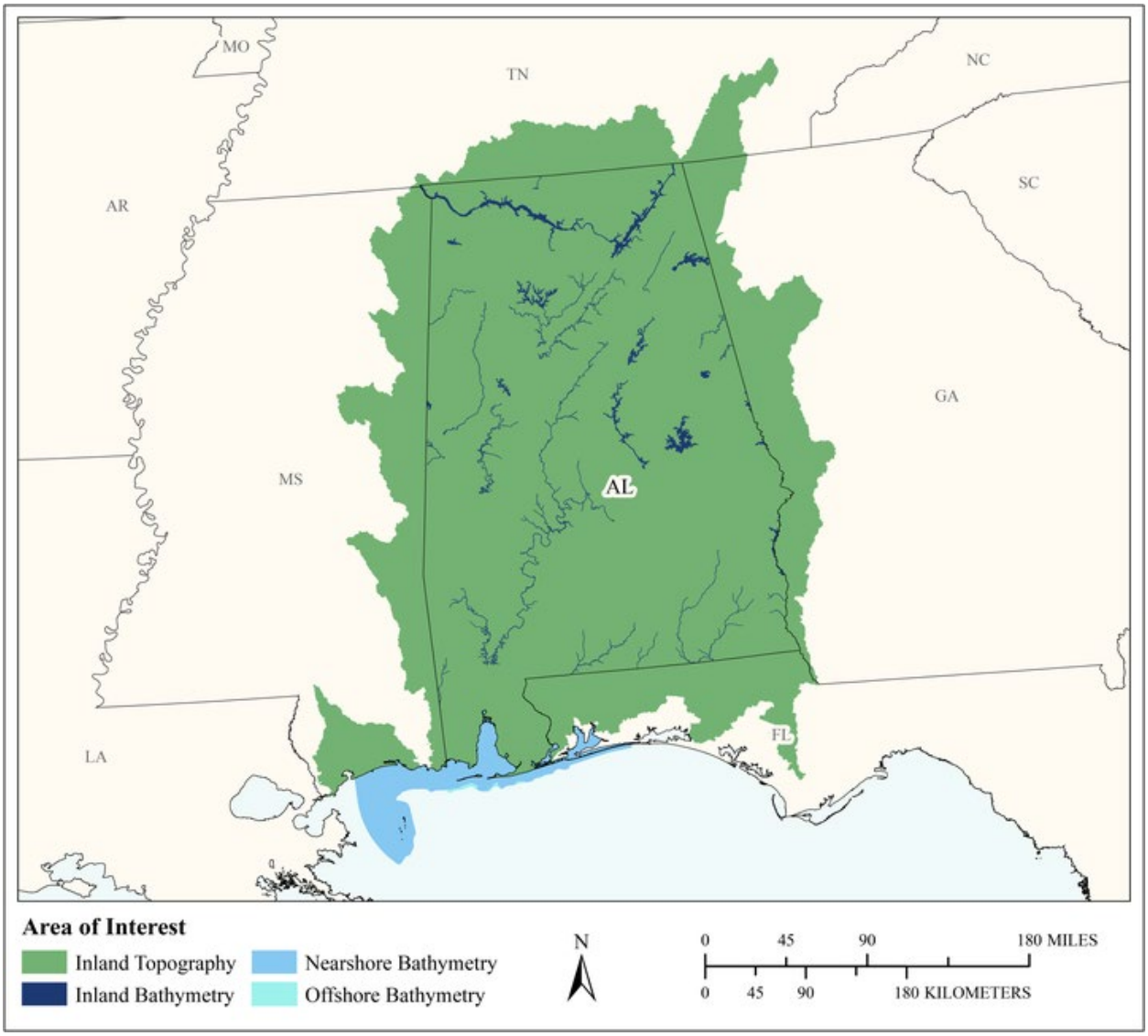
The State of Alabama has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	ADEM	1412	Managing Water Quality in the State of Alabama	Inland Topo	QL2	6-10 years	$286,417	$76,718	Moderate	Major	Major
				Inland Bathy	QL2B	6-10 years	$1,239,067	$129,487	Minor	Minor	I don't know
				Nearshore Bathy	QL2B	6-10 years	$25,499	$42,007	Minor	Moderate	Minor
				Offshore Bathy	Order 1a	4-5 years	$77	$389	Minor	Major	Major
BU 02 – Riverine Ecosystem Management	State of Alabama	60002	Riverine Ecosystem Management	Inland Topo	QL1 HD	6-10 years	$79,067	$7,897	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$42,090	$2,967	Major	Major	Major
				Nearshore Bathy	QL0B	2-3 years	$77,333	$59,095	Moderate	Moderate	Moderate
				Offshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 03 – Coastal Zone Management	Mobile County Commission	33021	Coastal Zone Management	Inland Topo	QL1	4-5 years	$7,236	Unable to quantify	None	Moderate	Minor
BU 04 – Forest Resource Management	Alabama Forestry Commission	1417	Forest Resources Management	Inland Topo	QL2	2-3 years	$204,241	$296,072	Major	Major	Major
BU 07 – Wildlife and Habitat Management	Alabama Department of Conservation and Natural Resources	1136	Conservation of Critical Habitats	Inland Topo	QL2	4-5 years	$12,305	$35,540	I don't know	I don't know	I don't know
				Inland Bathy	QL2B	6-10 years	$98,614	$59,606	I don't know	I don't know	I don't know
				Nearshore Bathy	QL2B	2-3 years	$765	$45	I don't know	I don't know	I don't know
BU 08 – Agriculture	State of Alabama	60003	Agriculture and Precision Farming	Inland Topo	QL2	2-3 years	$59,807	$47,413	Major	Major	Minor
				Inland Bathy	QL4B	4-5 years	$104,783	$47,413	Moderate	Major	Major
				Nearshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Offshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 09 – Fisheries Management and Aquaculture	State of Alabama	60004	Fisheries Management and Aquaculture	Inland Topo	QL2	2-3 years	$52,803	$114,694	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	6-10 years	$103,360	$47,043	Major	Major	Moderate
				Nearshore Bathy	QL0B	6-10 years	$121,460	$8,920	Moderate	Major	Minor
				Offshore Bathy	Special Order	6-10 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Minor

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 10 – Geologic Assessment	Geological Survey of Alabama	1310	Geologic and Ecologic Assessments and Hazards/Disaster Management	Inland Topo	QL2	4-5 years	$73,878	Unable to quantify	Minor	Major	Major
				Nearshore Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	Minor	Minor	I don't know
BU 11 – Geologic Resource Extraction	Alabama Surface Mining Commission	21831	Regulation of Surface Coal Mining in the State of Alabama	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 13 – Oil and Gas Resources	State of Alabama	60005	Oil and Gas Resources	Inland Topo	QL1	Annually	$22,673	Unable to quantify	Minor	Major	Major
				Inland Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	QL2B	2-3 years	$62,729	Unable to quantify	Major	Major	Major
				Offshore Bathy	Order 1a	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 15 – Flood Risk Management	Office of Water Resources	1410	Alabama Flood Risk Management	Inland Topo	QL2	4-5 years	$10,697,236	$1,000,000	None	Major	Major
				Inland Bathy	QL1B	6-10 years	$300,000	Unable to quantify	None	None	None
				Nearshore Bathy	QL2B	6-10 years	$400,000	Unable to quantify	Minor	Minor	Moderate
BU 19 – Land Navigation	Alabama Department of Transportation	1142	Transportation Maintenance and Construction	Inland Topo	QL2	6-10 years	$1,301,598	$55,174	None	Moderate	Moderate
				Inland Bathy	QL2B	Event driven	$28,618	$301	None	None	Moderate

MCA Title: Managing Water Quality in the State of Alabama



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more Hydrologic Units (HUC8s)	One or more states, territories, or counties	Custom description	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements			Alabama and 50 miles to either side	

MCA Description	Response
Mission Critical Activity	Managing water quality in the State of Alabama. We need good elevation data to determine drainage areas. We use it to determine which stream/streams are affected by activities that we regulate. Water modeling to determine velocity, volume, watershed size, land use. Size of watershed, velocity and volume of water. Size of watershed and change in elevation dictates land use. Compare Das of similar characteristics, size, land use, etc. ID causes of quality problems. Inland Bathy for velocity, volume, in models. Nearshore bathy for outflow pipes, coastal change over time, Mobile Bay - bathy in dynamic model Oil spill response may use bathy – boom placement in shallow water, water depth is important in response. Shape and volume of water important. Air quality models use topo as well. Interbasin transfer for water supply. Sample reservoirs in summer. Red tide impacts to fish and wildlife.
MCA Title	Managing Water Quality in the State of Alabama
MCA ID	1412
Organization Type	State or U.S. Territorial government
Organization Name	ADEM
Sub-Agency or Division	
Organization Mission	The mission at ADEM is to assure for all citizens of the State a safe, healthful, and productive environment. This web site is designed to keep you informed and to help you as you live and work in Alabama.
Program Name	Water Quality Program
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	Small drainage areas for streams/ creeks.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B	QL2B	Order 1a
Update Frequency	6-10 years	6-10 years	6-10 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 40 cm	Less than 1 meter
How far onshore needed			10 foot contour line	
How far down the beach profile needed	To MLLW		To MHW	
Tide correction requirement			MSL	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required	Nice to have	Nice to have	Not required	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Nice to have	Required	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Highly desirable	Nice to have	Required
DTM	Not required	Highly desirable	Nice to have	Required
DEM	Highly desirable	Highly desirable	Nice to have	Required
Raw point cloud data	Not required	Nice to have	Nice to have	Nice to have
Classified point cloud	Not required	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Not required	Nice to have
Full waveform	Not required	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Nice to have	Nice to have
Ground control/ground truthing	Highly desirable	Highly desirable	Nice to have	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	Highly desirable
Nautical and/or navigation charts			Nice to have	Required
Acoustic imagery of the seafloor			Highly desirable	Nice to have
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Not required	Required
Underwater videography			Nice to have	Not required
Bottom texture			Nice to have	Highly desirable
Bottom type			Nice to have	Highly desirable
Submerged features			Nice to have	Highly desirable
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Highly desirable	Highly desirable	Nice to have	Nice to have
Water column properties - Physical			Not required	Nice to have
Water column properties - Chemical			Not required	Nice to have
Water column properties - Biological			Not required	Nice to have
Currents			Nice to have	Nice to have
Tide/wave heights			Not required	Nice to have
Sea ice conditions				Not required
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Not required
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Highly desirable
Floating observation/navigation systems			Nice to have	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Nice to have	Highly desirable	Nice to have
Wetlands	Highly desirable	Highly desirable	Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Required
Inland surface water features	Highly desirable	Highly desirable	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	National Elevation Dataset, Stream Stats, NHD	None or sonar data of our own	Use some near shore data collected in 2011, shoreline and dunes	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts		Yes		
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other		Yes	Yes	
Other description		In house	Not sure of the source; in house bathy	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor	Minor	Minor	Moderate
Cost savings/cost reduction	Minor	None	Minor	Moderate
Cost avoidance	Minor	None	Minor	Moderate

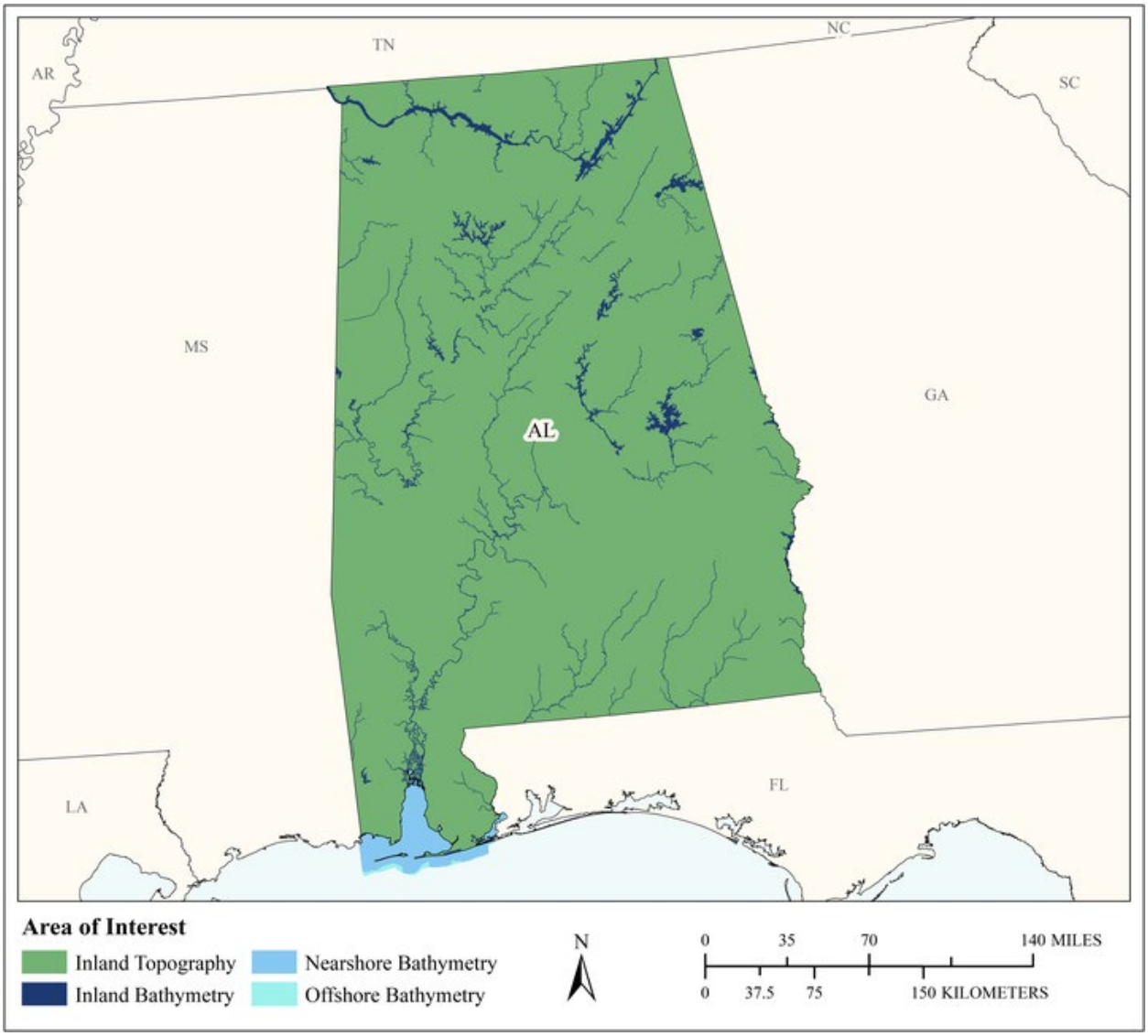
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Increased revenues	None	None	None	Minor
Mission-driven performance improvements	Moderate	None	None	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	None	None	Minor
Improved response or timeliness	Minor	None	None	Moderate
Improved customer experience	Minor	None	None	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	None	None	Minor
Environmental	Moderate	None	None	Minor
Public safety, including life and property	Minor	None	None	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Time savings description	Possible reduction in field work, fewer wasted field visits. Automation of manual processes, including to identify size of watershed for each sampling point.											
Cost savings/cost reduction	None			None			I don't know	Unable to provide		None		
Cost avoidance	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Increased revenues	Moderate	Unable to provide		None			None			None		
Mission-driven performance improvements	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Mission-driven performance improvements description	Automation of manual processes.											
Future annual operational benefits added during validation		Annual dollars saved/ realized	$286,417		Annual dollars saved/ realized	$1,239,067		Annual dollars saved/ realized	$25,499		Annual dollars saved/ realized	$77
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	None			Minor	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$76,718		Annual dollars saved/ realized	$129,487		Annual dollars saved/ realized	$42,007		Annual dollars saved/ realized	$389
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Minor			Minor			Minor		
Environmental	Major			Minor			Moderate			Major		
Public safety, including life and property	Major			I don't know			Minor			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps				
Viewshed maps	Yes	Yes		
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Riverine Ecosystem Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Stream channel analysis and mapping. Stream bank erosion analysis. Aquatic and terrestrial species habitat management. Environmental management.
MCA Title	Riverine Ecosystem Management
MCA ID	60002
Organization Type	State or U.S. Territorial government
Organization Name	State of Alabama
Sub-Agency or Division	Alabama Department of Environmental Management
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B	QL0B	I don't know
Update Frequency	6-10 years	4-5 years	2-3 years	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable	I don't know	Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Required	I don't know	Highly desirable	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	I don't know	Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Required	Required	I don't know	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	I don't know
DTM	Required	Highly desirable	Required	I don't know
DEM	Required	Required	Required	I don't know
Raw point cloud data	Nice to have	Nice to have	Nice to have	I don't know
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Not required	Nice to have	I don't know
Full waveform	Nice to have	Nice to have	Highly desirable	I don't know
Bathymetric Attributed Grid (BAG)		Not required	Nice to have	I don't know
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	I don't know
Tide Predictions			Not required	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			Not required	I don't know
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Nice to have	I don't know
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	I don't know
Nautical and/or navigation charts			Not required	I don't know
Acoustic imagery of the seafloor			Highly desirable	I don't know
Aerial and/or satellite imagery	Required	Highly desirable	Required	I don't know
Underwater videography			Not required	I don't know
Bottom texture			Highly desirable	I don't know
Bottom type			Required	I don't know
Submerged features			Highly desirable	I don't know
Subbottom characteristics			Highly desirable	I don't know
Geologic and seismic data	Nice to have	Nice to have	Not required	I don't know
Water column properties - Physical			Nice to have	I don't know
Water column properties - Chemical			Nice to have	I don't know
Water column properties - Biological			Nice to have	I don't know
Currents			Nice to have	I don't know
Tide/wave heights			Not required	I don't know
Sea ice conditions			Not required	I don't know
Habitat distribution and classification			Nice to have	I don't know
Boundaries			Not required	I don't know
Routes			Not required	I don't know
Offshore cadastral			Not required	I don't know
Lease areas			Not required	I don't know
Fixed obstructions			Not required	I don't know
Floating observation/navigation systems			Not required	I don't know
Shorelines – current, historic, change rates	Nice to have	Nice to have	Highly desirable	
Land use/land cover	Highly desirable	Nice to have	Required	I don't know
Wetlands	Highly desirable	Highly desirable	Required	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	I don't know
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have	Not required	
Cultural resources	Nice to have	Nice to have	Not required	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	I don't know
Cost savings/cost reduction	Moderate	Minor	Moderate	I don't know
Cost avoidance	Moderate	None	None	I don't know
Increased revenues	None	None	None	I don't know
Mission-driven performance improvements	Major	None	Minor	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Minor	I don't know

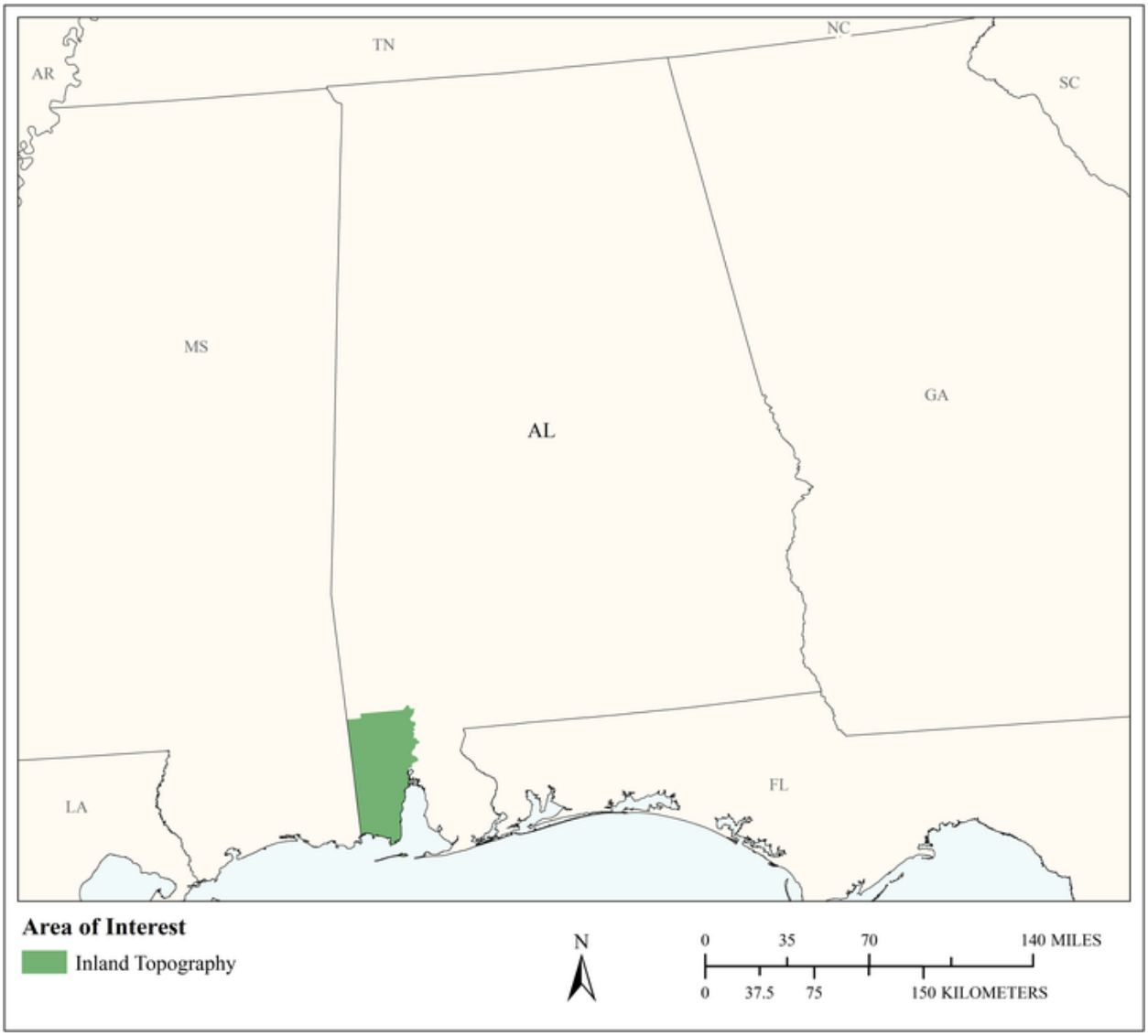
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	Moderate	Minor	I don't know
Improved customer experience	Major	Minor	Minor	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Minor	I don't know
Environmental	Major	Major	Moderate	I don't know
Public safety, including life and property	Major	Moderate	Moderate	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$79,067		Annual dollars saved/ realized	$42,090		Annual dollars saved/ realized	$77,333			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$7,897		Annual dollars saved/ realized	$2,967		Annual dollars saved/ realized	$59,095			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate			I don't know		
Environmental	Major			Major			Moderate			I don't know		
Public safety, including life and property	Major			Major			Moderate			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps			Yes	
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints			Yes	
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Coastal Zone Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements	Mobile County, AL			

MCA Description	Response
Mission Critical Activity	BU 03 - Coastal Zone Management. Coastal hazard mitigation; coastal zones, flood plain management, building inspections, MS4.
MCA Title	Coastal Zone Management
MCA ID	33021
Organization Type	Regional, County, City, or other local government
Organization Name	Mobile County Commission
Sub-Agency or Division	
Organization Mission	Govern the unincorporated areas of Mobile County, AL.
Program Name	Geographic Information Systems
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 22 - Infrastructure and Construction Management
Tertiary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Shoreline, building rooftop elevations

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI	Coastline			
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need			
Acceptable Vertical Error	Up to 10 cm			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed				
How far down the beach profile needed	Below MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Highly desirable			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Nice to have			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Locally acquired Lidar ground-class point cloud and generated contours. 2014 County-wide Lidar survey (RMSE = 0.3 ft.), with DEM and 1-foot contours			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes			
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Moderate			

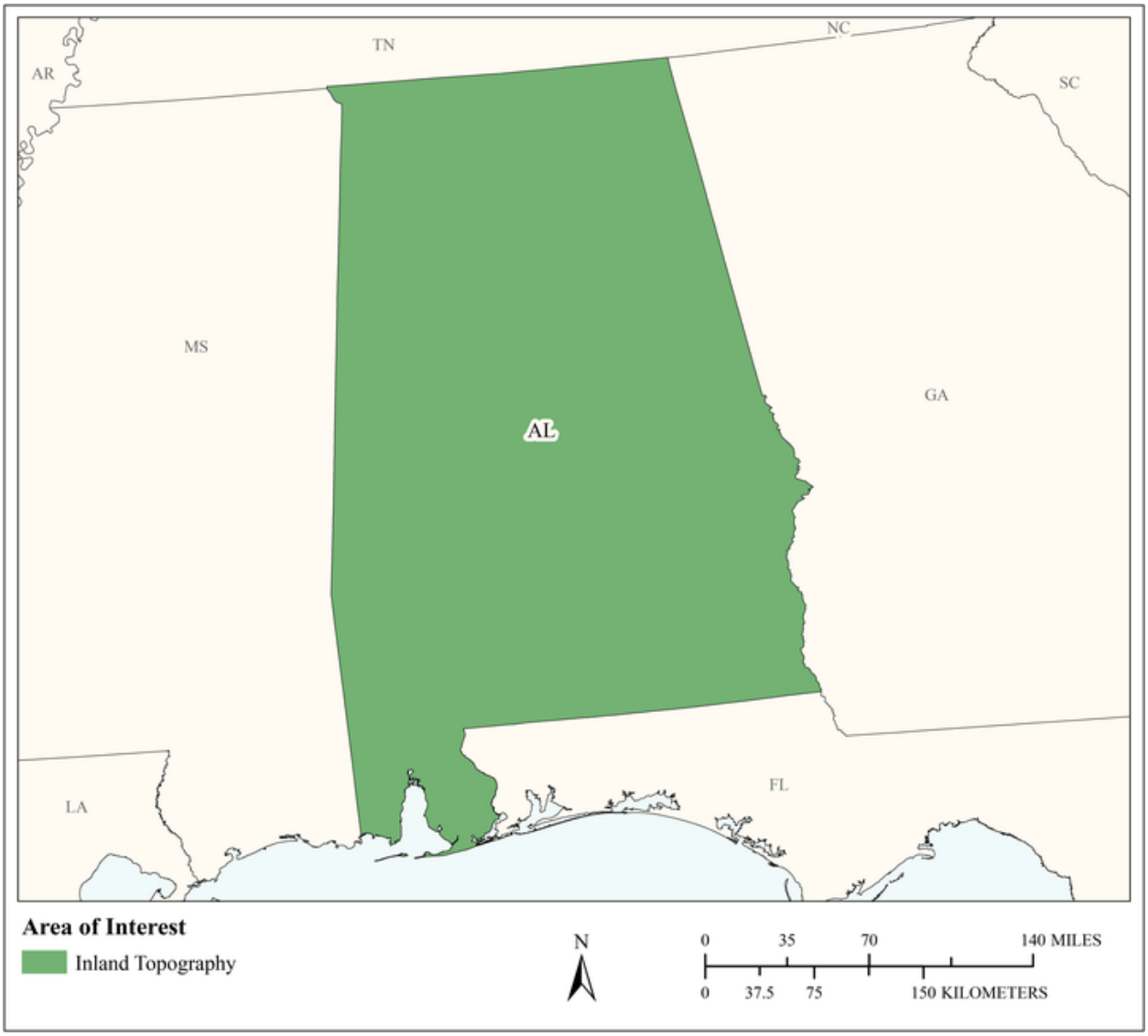
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None			
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Minor	Annual dollars saved/realized	$7,236									
Time savings description	We just use the data we have available, good or bad.											
Cost savings/cost reduction	None											
Cost avoidance	None											
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	Moderate	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	None											
Improved response or timeliness	None											
Improved customer experience	None											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None											
Education or outreach description	Not part of what we do											
Environmental	Moderate											
Environmental description	Better shoreline modeling											
Public safety, including life and property	Minor											
Public safety, including life and property description	Some help for Public Works											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Forest Resources Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Forest area mapping, forest health assessment, forest inventory analysis, prescribed burn, silvicultural planning, canopy analysis, determination of forest fuel and fire susceptibility, fire behavior modeling to support wildfire suppression activities, urban wildland interface, wildfire response. Elevation data are needed for urban forestry planning to include canopy analysis, understand drainage patterns to manage forest resources, calculating forest biomass, and identifying prescribed burning areas. Elevation data are also needed as input into wildfire models to include calculating slope, estimating fuel loads, and predicting fire risk and fire spread. Any tornado debris residue contributes to fire hazards. There is a small amount of timber harvesting on state lands, mostly harvesting is done on privately owned lands.
MCA Title	Forest Resources Management
MCA ID	1417
Organization Type	State or U.S. Territorial government
Organization Name	Alabama Forestry Commission
Sub-Agency or Division	
Organization Mission	The Alabama Forestry Commission is committed to protecting and sustaining our forest resources using professionally applied stewardship principles and education. We will ensure Alabama's forests contribute to abundant timber and wildlife, clean air and water, and a healthy economy.
Program Name	Forest Management and Protection
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	BU 17 - Wildfire Management, Planning, and Response
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Groups of trees/vegetation or generalized landcover (larger area)

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	2-3 years			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts				
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Not using any. However, with the pressing environmental and economic pressures the need for elevation dataset will certainly arise for better forest resources management			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None			
Cost savings/cost reduction	None			
Cost avoidance	None			
Increased revenues	None			
Mission-driven performance improvements	None			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None			
Improved response or timeliness	None			
Improved customer experience	None			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	None			
Public safety, including life and property	None			

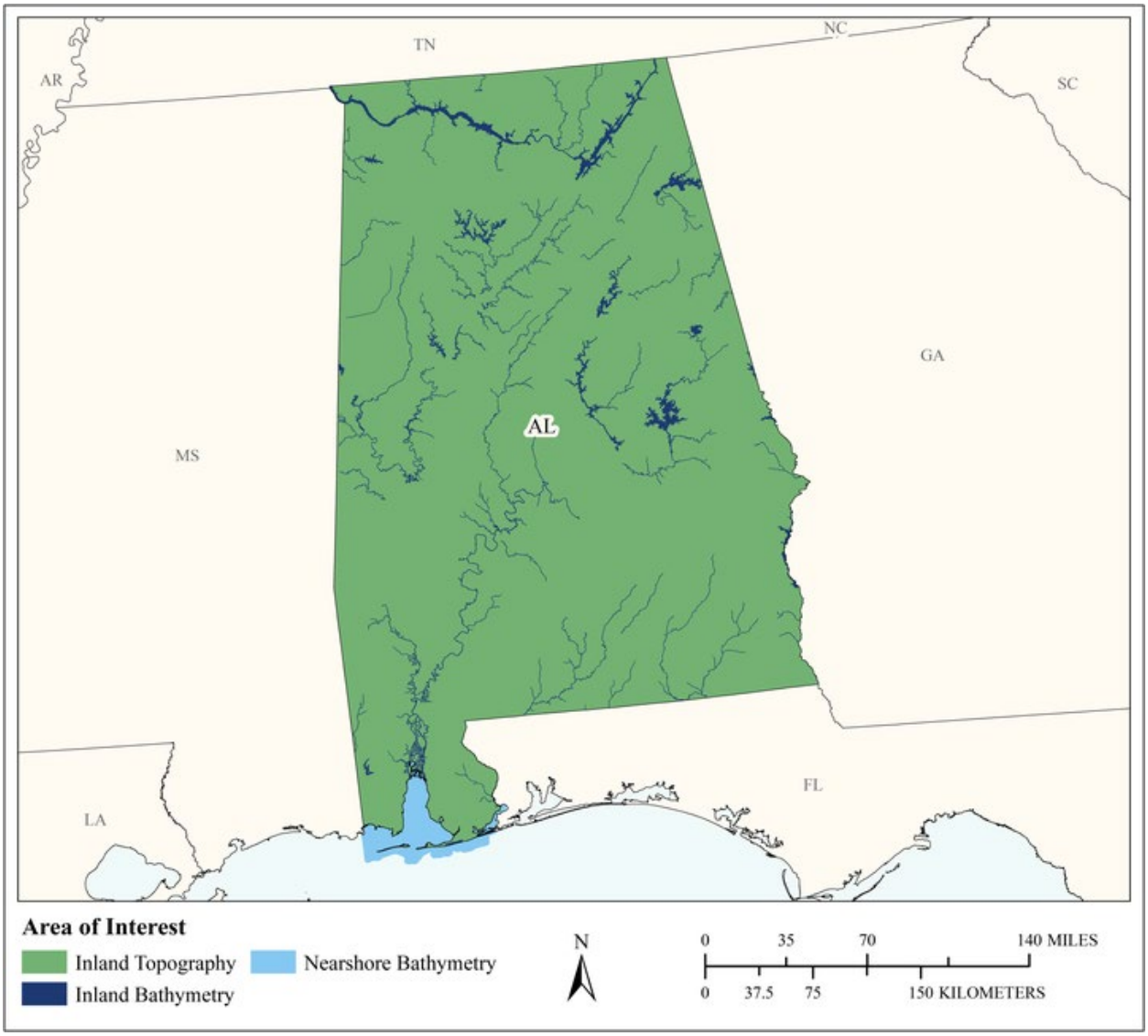
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Time savings description	Availability of 3D inland data alongside other logical/relevant datasets will save the agency time in data manipulation. The availability of 3D inland data will help the agency managers and program managers more effectively conduct field planning and monitoring. A standard data product from the source will have a direct impact on time saved in avoiding data errors. For forest inventory, canopy analysis, forest health, vegetation density, forest fuel susceptibility, etc. The data will certainly enhance the agency's ability to make decisions in critical/vulnerable areas. General forestry mapping, landcover mapping, reporting, etc.											
Cost savings/cost reduction	Major	Unable to provide										
Cost savings/cost reduction description	The 3D inland data information will help the agency in protecting water quality in the state. The availability of 3D inland data will help the agency by saving data acquisition cost. The fund saved can be used in alleviating other forest resources management issues.											
Cost avoidance	Major	Unable to provide										
Cost avoidance description	Furnished with 3D inland data information the forestry agency can make decisions on forest resource management such as prescribed burn, wildland fuel susceptibility, community wildfire protection plans, etc. and avoid property loss. Data processing can be avoided while providing the organization with additional data information. Standardized data products will save data processing errors. 3D inland data information can help the organization avoid all different kinds of adverse impacts from forest fires and forest health.											
Increased revenues	Major	Unable to provide										
Increased revenues description	Additionally, the 3D inland data information will enable the organization to make new mapping services to support agency managers, landowners and other stakeholders. The availability of 3D inland data will have a positive impact on silvicultural as well as timber harvest operations.											
Mission-driven performance improvements	Major	Unable to provide										
Mission-driven performance improvements description	The agency program managers will have additional information/tools to better manage forest resources. Additional tool for more effective program management. It will positively impact mission critical activities.											
Future annual operational benefits added during validation		Annual dollars saved/ realized	$204,241									

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved response or timeliness description	A more accurate mapping system will improve resources management, navigation and therefore response time. The data will certainly enhance the agency's ability to make decisions in critical/vulnerable areas. Improved projection analysis will improve preparedness. Disaster response and recovery from wildfire, tornado and other natural disasters will be greatly improved. More up-to-date and accurate. This will improve the agency's ability to provide stakeholders and customers with more accurate and timely information regarding the ground truth.											
Improved customer experience	Major	Unable to provide										
Improved customer experience description	This will greatly help in all aspects of mapping and analysis. Improved customer confidence is invaluable. New mapping services and tools can be provided for enhanced forest resources management.											
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$296,072									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Education or outreach description	More accurate map apps and data information will lead to improved education and outreach											
Environmental	Major											
Environmental description	Environmental benefits will be invaluable because the information will help support, protect and conserve Alabama's forest resources											
Public safety, including life and property	Major											
Public safety, including life and property description	Improved data information will greatly enhance the ability to fight forest fires and manage forest resources by ensuring the safety of people, community and property											
Other												
Other benefits	Major											
Other description	The 3D inland information will improve and support forest management and protection effort											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Conservation of Critical Habitats



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation of critical habitats. The department is responsible for the conservation of all flora and fauna both terrestrial and in state waters. Elevation data are needed to identify watersheds, assess water quality, and manage upstream uses re: habitats. The data are also needed for species conservation. The marine resources group may also want offshore bathymetry, although they often collect their own as needed. Bathymetry for lease areas would useful. Inland bathymetry is needed for public lakes.
MCA Title	Conservation of Critical Habitats
MCA ID	1136
Organization Type	State or U.S. Territorial government
Organization Name	Alabama Department of Conservation and Natural Resources
Sub-Agency or Division	
Organization Mission	To conserve and manage Alabama's natural resources for future generations.
Program Name	Conservation and management of habitats and species.
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Ridgelines and small creeks/streams.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have

Inland Bathy Feature Size Requirements	Response
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B	QL2B	
Update Frequency	4-5 years	6-10 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 40 cm	
How far onshore needed			To cover the beach slope	
How far down the beach profile needed	To MLLW		To MHW	
Tide correction requirement			MSL	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required	Nice to have		Not required	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Nice to have		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Nice to have	
DTM	Highly desirable	Highly desirable	Nice to have	
DEM	Highly desirable	Highly desirable	Nice to have	
Raw point cloud data	Nice to have	Nice to have	Nice to have	
Classified point cloud	Highly desirable	Nice to have	Nice to have	
Edited/cube XYZ		Not required	Not required	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Nice to have	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Not required	
Geologic and seismic data	Highly desirable	Highly desirable	Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Nice to have	Nice to have	
Wetlands	Highly desirable	Highly desirable	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Highly desirable	Highly desirable	Nice to have	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	NED or LiDAR	None or sonar data of our own	Sonar data of our own	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor	Minor	Minor	
Cost savings/cost reduction	Minor	None	Minor	
Cost avoidance	Moderate	None	Moderate	
Increased revenues	None	Minor	Minor	
Mission-driven performance improvements	Minor	None	Minor	

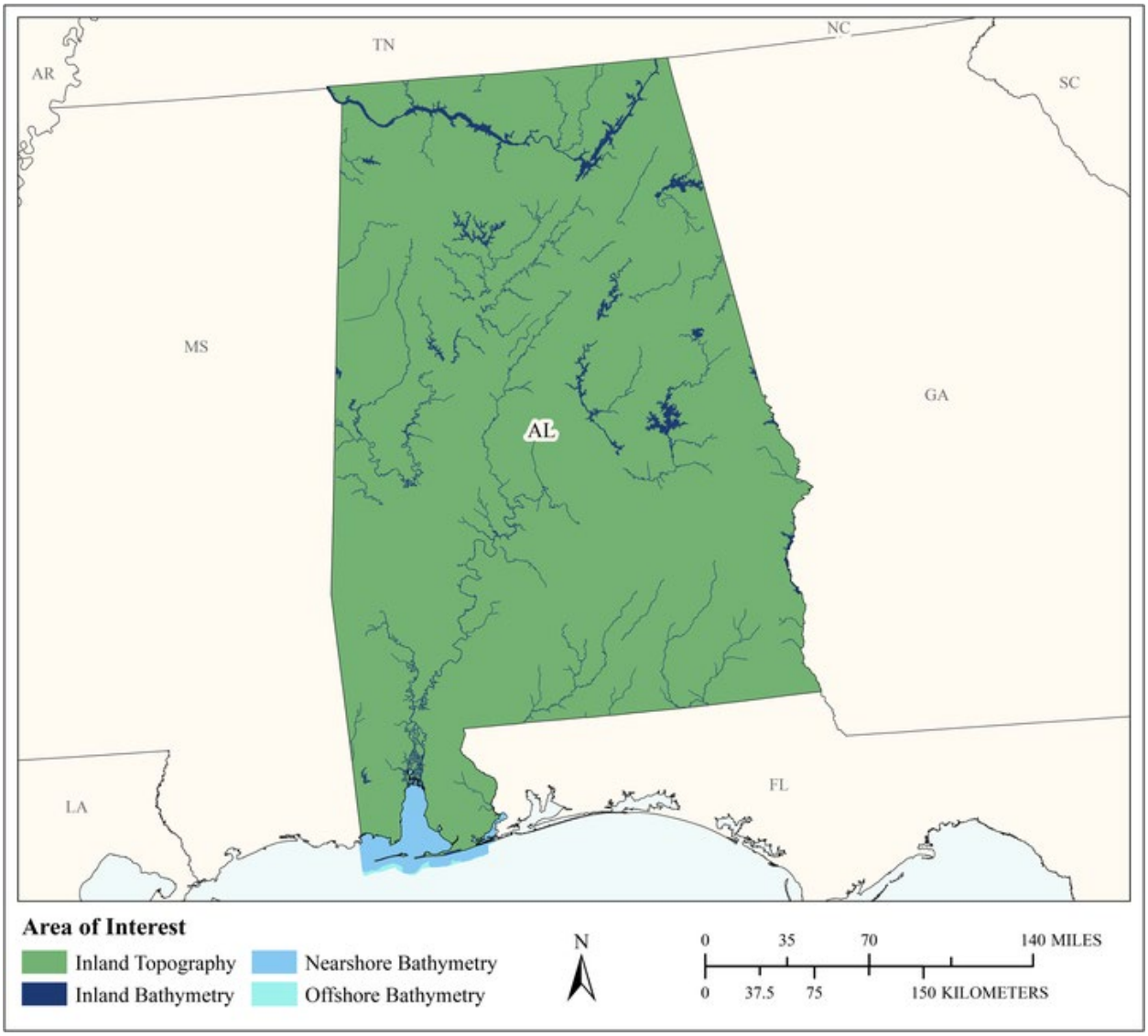
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	Minor	Moderate	
Improved response or timeliness	Minor	None	Minor	
Improved customer experience	Minor	Moderate	Moderate	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	Minor	
Environmental	Minor	Minor	Moderate	
Public safety, including life and property	Minor	Minor	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$12,305		Annual dollars saved/ realized	$98,614		Annual dollars saved/ realized	$765			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$35,540		Annual dollars saved/ realized	$59,606		Annual dollars saved/ realized	$45			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know			I don't know					
Environmental	I don't know			I don't know			I don't know					
Public safety, including life and property	I don't know			I don't know			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Agriculture and Precision Farming



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Farm pond design. Irrigation system design. Detailed site analysis to support precision farming. Analysis of farm sedimentation and runoff. Calibration of fertilizer application, fertilizer management, and irrigation planning. Optimized terraforming.
MCA Title	Agriculture and Precision Farming
MCA ID	60003
Organization Type	State or U.S. Territorial government
Organization Name	State of Alabama
Sub-Agency or Division	Alabama Cooperative Extension Service
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 08 - Agriculture and Precision Farming
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Nice to have
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL4B	I don't know	I don't know
Update Frequency	2-3 years	4-5 years	I don't know	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 10 meters	I don't know	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 50 cm	I don't know	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required	I don't know	I don't know	Not required	I don't know
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	I don't know	I don't know	Nice to have	I don't know
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	I don't know	I don't know	Not required	I don't know
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	I don't know	I don't know	Not required	I don't know
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	I don't know	I don't know	Up to double the required TVU at the 95% confidence level	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	I don't know	I don't know
DTM	Required	Required	I don't know	I don't know
DEM	Required	Required	I don't know	I don't know
Raw point cloud data	Nice to have	Nice to have	I don't know	I don't know
Classified point cloud	Nice to have	Nice to have	I don't know	
Edited/cube XYZ		Highly desirable	I don't know	I don't know
Full waveform	Nice to have	Highly desirable	I don't know	I don't know
Bathymetric Attributed Grid (BAG)		Highly desirable	I don't know	I don't know
Breaklines required for standard hydro-flattening	Required	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			I don't know	I don't know
Tide Predictions			I don't know	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			I don't know	I don't know
Intensity imagery/sidescan imagery	Nice to have	Nice to have	I don't know	I don't know
Ground control/ground truthing	Highly desirable	Highly desirable	I don't know	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			I don't know	I don't know
Nautical and/or navigation charts			I don't know	I don't know
Acoustic imagery of the seafloor			I don't know	I don't know
Aerial and/or satellite imagery	Required	Required	I don't know	I don't know
Underwater videography			I don't know	I don't know
Bottom texture			I don't know	I don't know
Bottom type			I don't know	I don't know
Submerged features			I don't know	I don't know
Subbottom characteristics			I don't know	I don't know
Geologic and seismic data	Nice to have	Highly desirable	I don't know	I don't know
Water column properties - Physical			I don't know	I don't know
Water column properties - Chemical			I don't know	I don't know
Water column properties - Biological			I don't know	I don't know
Currents			I don't know	I don't know
Tide/wave heights			I don't know	I don't know
Sea ice conditions			I don't know	I don't know
Habitat distribution and classification			I don't know	I don't know
Boundaries			I don't know	I don't know
Routes			I don't know	I don't know
Offshore cadastral			I don't know	I don't know
Lease areas			I don't know	I don't know
Fixed obstructions			I don't know	I don't know
Floating observation/navigation systems			I don't know	I don't know
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	I don't know	
Land use/land cover	Highly desirable	Required	I don't know	I don't know
Wetlands	Required	Required	I don't know	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			I don't know	I don't know
Inland surface water features	Required	Required	I don't know	
Bridges/culverts	Required	Required		
Landmark features	Nice to have	Required	I don't know	
Cultural resources	Nice to have	Highly desirable	I don't know	
Coastal and riverine structures	Highly desirable	Required	I don't know	
Overhead structures			I don't know	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	None	I don't know	I don't know
Cost savings/cost reduction	Major	I don't know	I don't know	I don't know
Cost avoidance	Major	Moderate	I don't know	I don't know
Increased revenues	None	I don't know	I don't know	I don't know
Mission-driven performance improvements	Moderate	None	I don't know	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None	I don't know	I don't know

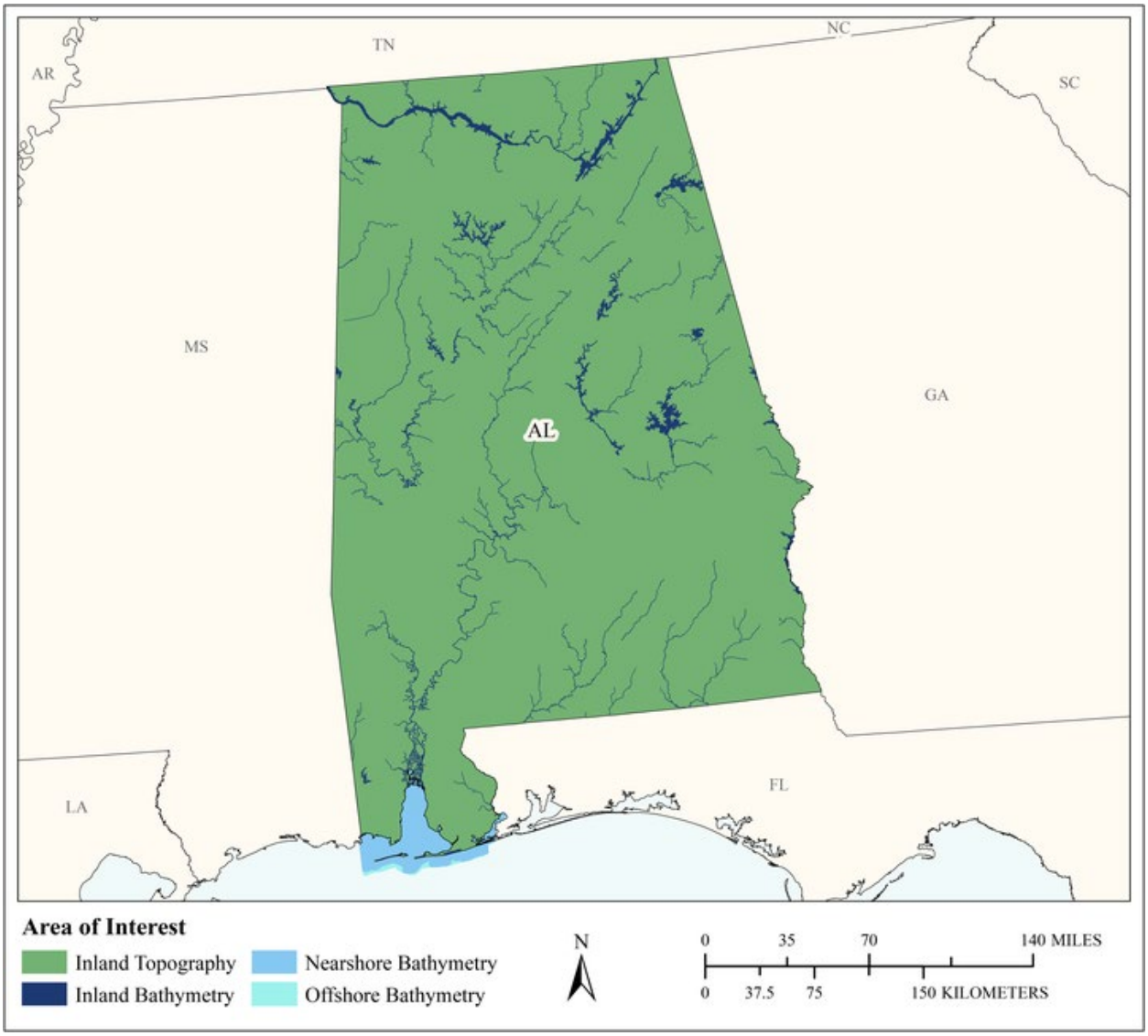
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	None	I don't know	I don't know
Improved customer experience	Moderate	None	I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	None	I don't know	I don't know
Environmental	Major	I don't know	I don't know	I don't know
Public safety, including life and property	Moderate	I don't know	I don't know	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues	Minor	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$59,807		Annual dollars saved/ realized	$104,783						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$47,413		Annual dollars saved/ realized	$47,413						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate			I don't know			I don't know		
Environmental	Major			Major			I don't know			I don't know		
Public safety, including life and property	Minor			Major			I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps				
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps		Yes		
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Fisheries Management and Aquaculture



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Management of fisheries. Sustainable aquaculture.
MCA Title	Fisheries Management and Aquaculture
MCA ID	60004
Organization Type	State or U.S. Territorial government
Organization Name	State of Alabama
Sub-Agency or Division	Alabama Department of Conservation and Natural Resources
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B	QL0B	Special Order
Update Frequency	2-3 years	6-10 years	6-10 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Nice to have	Nice to have	Required	Nice to have
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Required	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Required
DTM	Required	Highly desirable	Highly desirable	Nice to have
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Nice to have	Highly desirable	Nice to have
Classified point cloud	Highly desirable	Nice to have	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Nice to have
Tide Predictions			Not required	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Highly desirable	Required
Ground control/ground truthing	Required	Highly desirable	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Nice to have	Required
Acoustic imagery of the seafloor			Highly desirable	Required
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Required
Underwater videography			Nice to have	Highly desirable
Bottom texture			Nice to have	Required
Bottom type			Highly desirable	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Highly desirable	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Required
Floating observation/navigation systems			Nice to have	Required
Shorelines – current, historic, change rates	Required	Highly desirable	Highly desirable	
Land use/land cover	Required	Highly desirable	Nice to have	Nice to have
Wetlands	Required	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Highly desirable
Inland surface water features	Required	Required	Nice to have	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Not required	
Coastal and riverine structures	Required	Highly desirable	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	Moderate
Cost savings/cost reduction	Major	Moderate	Major	Minor
Cost avoidance	Moderate	Moderate	Minor	Minor
Increased revenues	Moderate	Moderate	Minor	None
Mission-driven performance improvements	Major	Major	Moderate	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Minor	Moderate

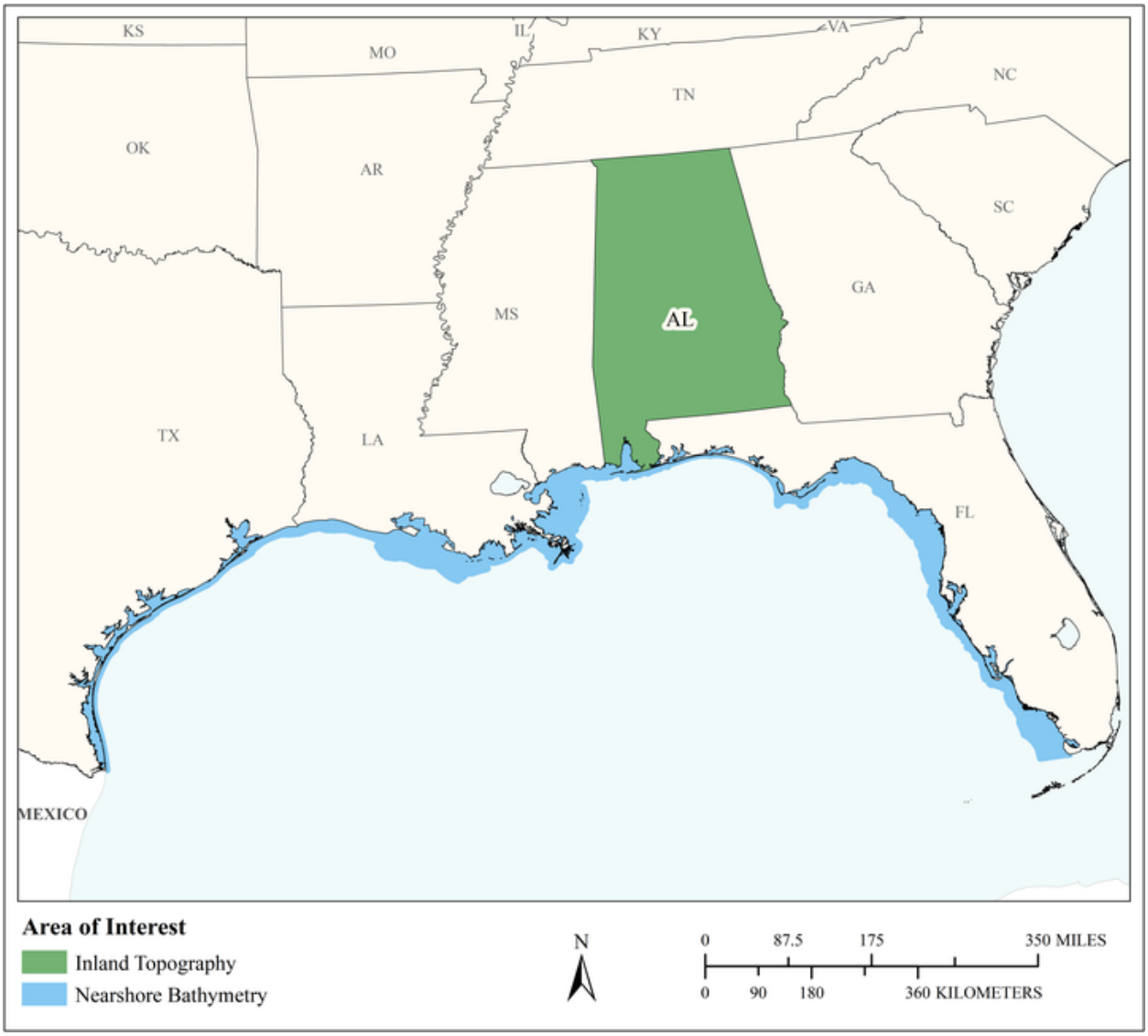
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major	Moderate	Minor
Improved customer experience	Moderate	Major	Minor	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Moderate	Moderate
Environmental	Major	Moderate	Moderate	Minor
Public safety, including life and property	Moderate	Minor	Minor	None

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		None		
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		None		
Increased revenues	Minor	Unable to provide		None			Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$52,803		Annual dollars saved/ realized	$103,360		Annual dollars saved/ realized	$121,460			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$114,694		Annual dollars saved/ realized	$47,043		Annual dollars saved/ realized	$8,920			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Moderate			Moderate		
Environmental	Moderate			Major			Major			Moderate		
Public safety, including life and property	Moderate			Moderate			Minor			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes		Yes	Yes
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic and Ecologic Assessments and Hazards/Disaster Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	One or more states, territories, or counties		Custom description	
Sub Area Requirements			Gulf of Mexico Coast	

MCA Description	Response
Mission Critical Activity	Geologic Assessment and Hazard Mitigation. Geologic resources mapping and studies. Groundwater resources studies. Coastal geomorphology and resources mapping and studies. Wetlands mapping and characterization. Modeling of biological and ecological systems. Rainfall penetration studies, impervious surfaces. Elevation data are needed for surface water modeling as well as modeling of natural resources and ecosystems. The focus is on natural resources related to mineral resources and geologic hazards. The Geologic Survey includes many divisions that focus on separate activities. The Oil and Gas Board is responsible for regulatory requirements of oil and gas extraction. The Geologic Survey does research and mapping for oil and gas. The Geologic Survey is also responsible for the sand inventory for beach re-nourishment and post dredging placement. Additional relevant Business Uses are BU 02 – Riverine Ecosystem Management, BU 06 – Natural Resources Conservation, and BU 11 – Geologic Resource Mining and Extraction.
MCA Title	Geologic and Ecologic Assessments and Hazards/Disaster Management
MCA ID	1310
Organization Type	State or U.S. Territorial government
Organization Name	Geological Survey of Alabama
Sub-Agency or Division	
Organization Mission	GSA explores and evaluates the mineral, water, energy, biological, and other natural resources and geologic hazards of the State of Alabama and conducts basic and applied research in these fields, and other natural resources of the State of Alabama and conducts basic and applied research in these fields.
Program Name	Geologic Investigations Program
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 01 - Water Supply and Quality
Tertiary Business Use	BU 03 - Coastal Zone Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Highly desirable
Other	Required
Other description	Subsurface - depth to water or oil from individual wells

General Geographic Area and Size	
Average geographic extent of day-to-day area	Project specific. Each day we work with projects covering the southeastern region, to state, to county, to site-specific.
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.

General Geographic Area and Size	
Description of smallest 3D features	A rock (especially in areas where outcrops are few). Lineaments, even small ones where structure is important. Water line for coastal areas. Small habitat features for ecology projects. Nearshore geomorphology.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2		QL2B	
Update Frequency	4-5 years		2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI	Some areas require higher frequency - such as higher developed areas, hazardous areas (like karst), areas of mining/quarrying, coastal, or project-driven needs, etc. Multiple years of lidar would be helpful for looking at variations of the land surface in general, e.g. change detection in areas of geologic hazards. Coastal areas need pre- and post-storm data, 5 year cycle as baseline. On land, 5 – 10 years as baseline. 5 years for urban areas. 10 years OK for geologic hazards.			
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need		The best horizontal accuracy achievable for the vertical accuracy I need	
Acceptable Vertical Error	Up to 20 cm		Up to 1 meter	
How far onshore needed			1 kilometer inland	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MHW	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable		Required			Required
Entire AOI under same environmental conditions	Required		Required			Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Required			Required
DEM for entire AOI needs to be seamless	Required		Highly desirable			Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level		Up to double the required TVU at the 95% confidence level			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable		Required	
DTM	Required		Required	
DEM	Highly desirable		Required	
Raw point cloud data	Required		Required	
Classified point cloud	Required		Required	
Edited/cube XYZ			Required	
Full waveform	Not required		Highly desirable	
Bathymetric Attributed Grid (BAG)			Required	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Required	
Intensity imagery/sidescan imagery	Nice to have		Highly desirable	
Ground control/ground truthing	Required		Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required		Nice to have	
Underwater videography			Not required	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Required	
Geologic and seismic data	Required		Required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Highly desirable	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Required	
Routes			Highly desirable	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable		Required	
Land use/land cover	Highly desirable		Highly desirable	
Wetlands	Highly desirable		Required	
Estuaries			Required	
Inland surface water features	Required		Required	
Bridges/culverts	Highly desirable			
Landmark features	Nice to have		Highly desirable	
Cultural resources	Nice to have		Highly desirable	
Coastal and riverine structures	Required		Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	LiDAR QL2 and QL3; SRTM;		NOAA published; bathymetric interpretations from offshore surveys	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast			Yes	
NCEI	Yes		Yes	
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts			Yes	
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Different sources			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Minor	
Cost savings/cost reduction	I don't know		I don't know	

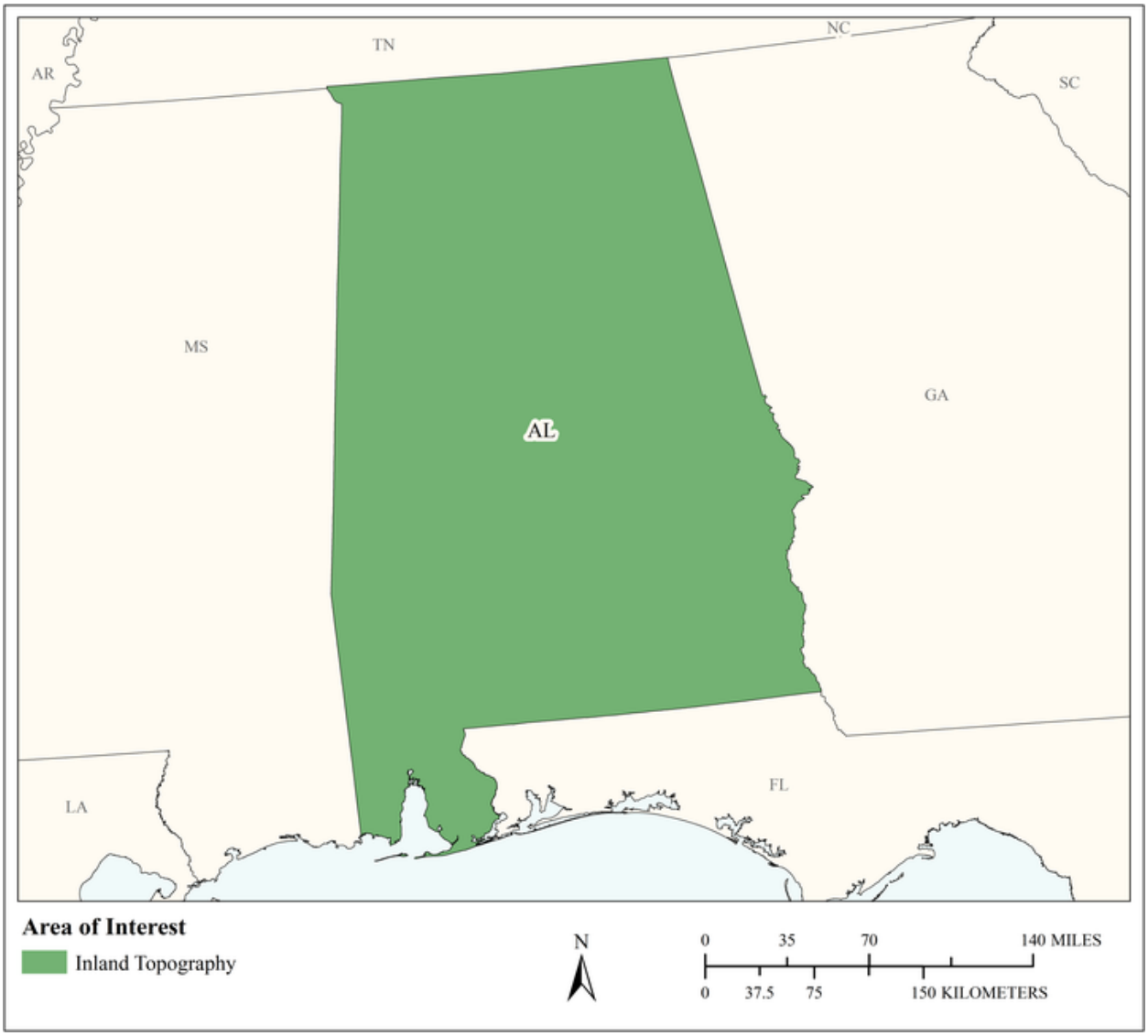
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost avoidance	Major		I don't know	
Increased revenues	Minor		None	
Mission-driven performance improvements	Major		Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		Minor	
Improved response or timeliness	Major		I don't know	
Improved customer experience	Major		I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate		Minor	
Environmental	Major		Minor	
Public safety, including life and property	Major		I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$23,879				Minor	Unable to provide				
Time savings description	Reduces field time, because elevations can be checked from office rather than GPS'ing locations on site. Also, topographic details and patterns can be realized from the computer rather than hiking for days and not seeing the patterns... Topographic models are more detailed and can show very small details not visible with other data and in the field. Processing takes a long time if we start with just the points, but if we have the DTM itself, that saves a lot of time. Depending on the project, this can save a lot of pre-project field assessments.											
Cost savings/cost reduction	I don't know	Unable to provide					None					
Cost savings/cost reduction description	GSA does not secure vendors for LiDAR, so we do not have costs recorded. We depend upon the LiDAR that has already been flown and provided from others.											
Cost avoidance	Major	Annual dollars saved/realized	$50,000				Minor	Unable to provide				
Cost avoidance description	We use LiDAR to examine property for builders examining/planning building. Karst risk mapping via lidar can help save them money. However, GSA has no money at risk...											
Increased revenues	None						None					
Mission-driven performance improvements	Major	Unable to provide					Moderate	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide					Minor	Unable to provide				
Value added to products or services description	Value is increased in products and services from a technical, accuracy, and precision perspective - and not financially. Value is increased in products and services from a technical, accuracy, and precision perspective - and not financially. Value is increased in products and services from a technical, and precision perspective - and not financially.											
Improved response or timeliness	Major	Unable to provide					Moderate	Unable to provide				
Improved response or timeliness description	Not inclusive for all agency mission, but critically important to disaster response.											
Improved customer experience	Major	Unable to provide					Moderate	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor						Minor					
Environmental	Major						Minor					
Public safety, including life and property	Major						I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes		Yes	
Hillshades	Yes		Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes		Yes	
Curvature maps	Yes			
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes		Yes	
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes		Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Regulation of Surface Coal Mining in the State of Alabama



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Open mine volume computations, stockpile analysis, environmental impact assessment, and site restoration
MCA Title	Regulation of Surface Coal Mining in the State of Alabama
MCA ID	21831
Organization Type	State or U.S. Territorial government
Organization Name	Alabama Surface Mining Commission
Sub-Agency or Division	
Organization Mission	To regulate surface coal mining in Alabama and ensure reclamation of surface mined land
Program Name	Permitting, inspection and enforcement
Total Annual Program Budget	
Primary Business Use	BU 11 - Geologic Resource Mining and Extraction
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Small features 1 square meter

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years and certain events.			
Event type(s)	Permitting action, mine operator's activities, changes in ownership of the land, etc.			
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required					
Entire AOI under same environmental conditions	Not required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Not required					
DEM for entire AOI needs to be seamless	Not required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Not applicable					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Not required			
Wetlands	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Not required			
Cultural resources	Nice to have			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	3DEP lidar			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know			
Cost savings/cost reduction	I don't know			
Cost avoidance	I don't know			
Increased revenues	I don't know			
Mission-driven performance improvements	I don't know			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know			

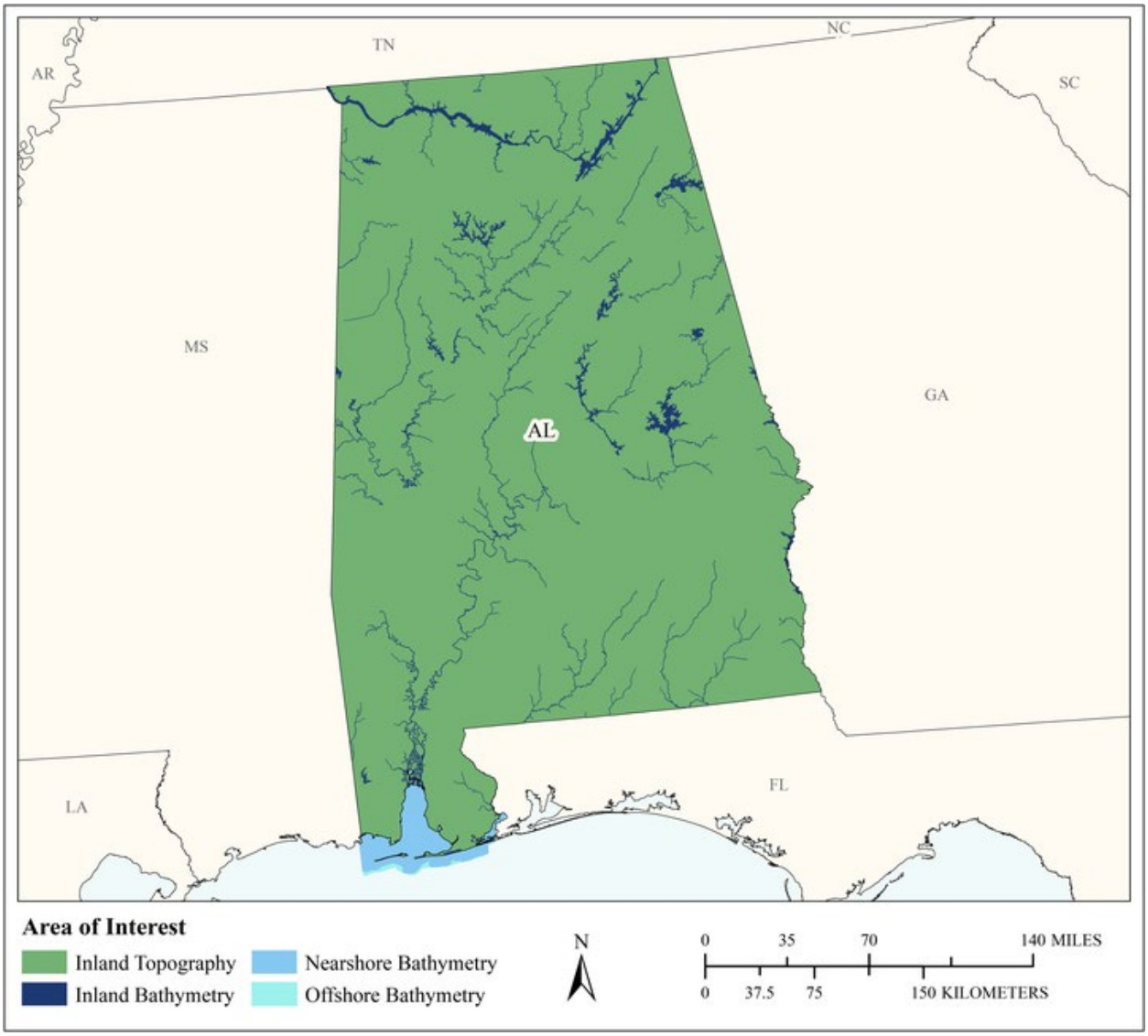
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	I don't know			
Improved customer experience	I don't know			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know			
Environmental	I don't know			
Public safety, including life and property	I don't know			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide										
Cost savings/cost reduction	I don't know	Unable to provide										
Cost avoidance	I don't know	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	I don't know	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide										
Improved response or timeliness	I don't know	Unable to provide										
Improved customer experience	I don't know	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Oil and Gas Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Oil and gas exploration and production. Pipeline and route selection. Facility siting to mitigate geologic hazards. Construction planning. Environmental impact assessment and mitigation. Regulatory compliance.
MCA Title	Oil and Gas Resources
MCA ID	60005
Organization Type	State or U.S. Territorial government
Organization Name	State of Alabama
Sub-Agency or Division	Geological Survey of Alabama
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 13 - Oil and Gas Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B	QL2B	Order 1a
Update Frequency	Annually	2-3 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 5 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 40 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Required	Required	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Required	Required	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required	Nice to have	Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Required	Required	Required	Nice to have	Highly desirable	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Highly desirable	Required	Highly desirable
DEM	Required	Highly desirable	Required	Highly desirable
Raw point cloud data	Highly desirable	Nice to have	Required	Nice to have
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Not required	Nice to have	Nice to have
Full waveform	Nice to have	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Not required	Not required	Nice to have
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Nice to have
Ground control/ground truthing	Highly desirable	Nice to have	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	Highly desirable
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Underwater videography			Not required	Nice to have
Bottom texture			Nice to have	Nice to have
Bottom type			Nice to have	Nice to have
Submerged features			Required	Highly desirable
Subbottom characteristics			Not required	Nice to have
Geologic and seismic data	Highly desirable	Highly desirable	Nice to have	Highly desirable
Water column properties - Physical			Not required	Nice to have
Water column properties - Chemical			Not required	Nice to have
Water column properties - Biological			Not required	Nice to have
Currents			Not required	Nice to have
Tide/wave heights			Not required	Nice to have
Sea ice conditions			Nice to have	Highly desirable
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Highly desirable	Nice to have
Routes			Highly desirable	Highly desirable
Offshore cadastral			Nice to have	Highly desirable
Lease areas			Nice to have	Highly desirable
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Required	
Land use/land cover	Nice to have	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Highly desirable	Highly desirable	Highly desirable	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Nice to have	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	I don't know	I don't know	I don't know
Cost savings/cost reduction	Minor	I don't know	I don't know	I don't know
Cost avoidance	Minor	I don't know	I don't know	I don't know
Increased revenues	None	I don't know	I don't know	I don't know
Mission-driven performance improvements	Minor	I don't know	I don't know	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	I don't know	I don't know	I don't know

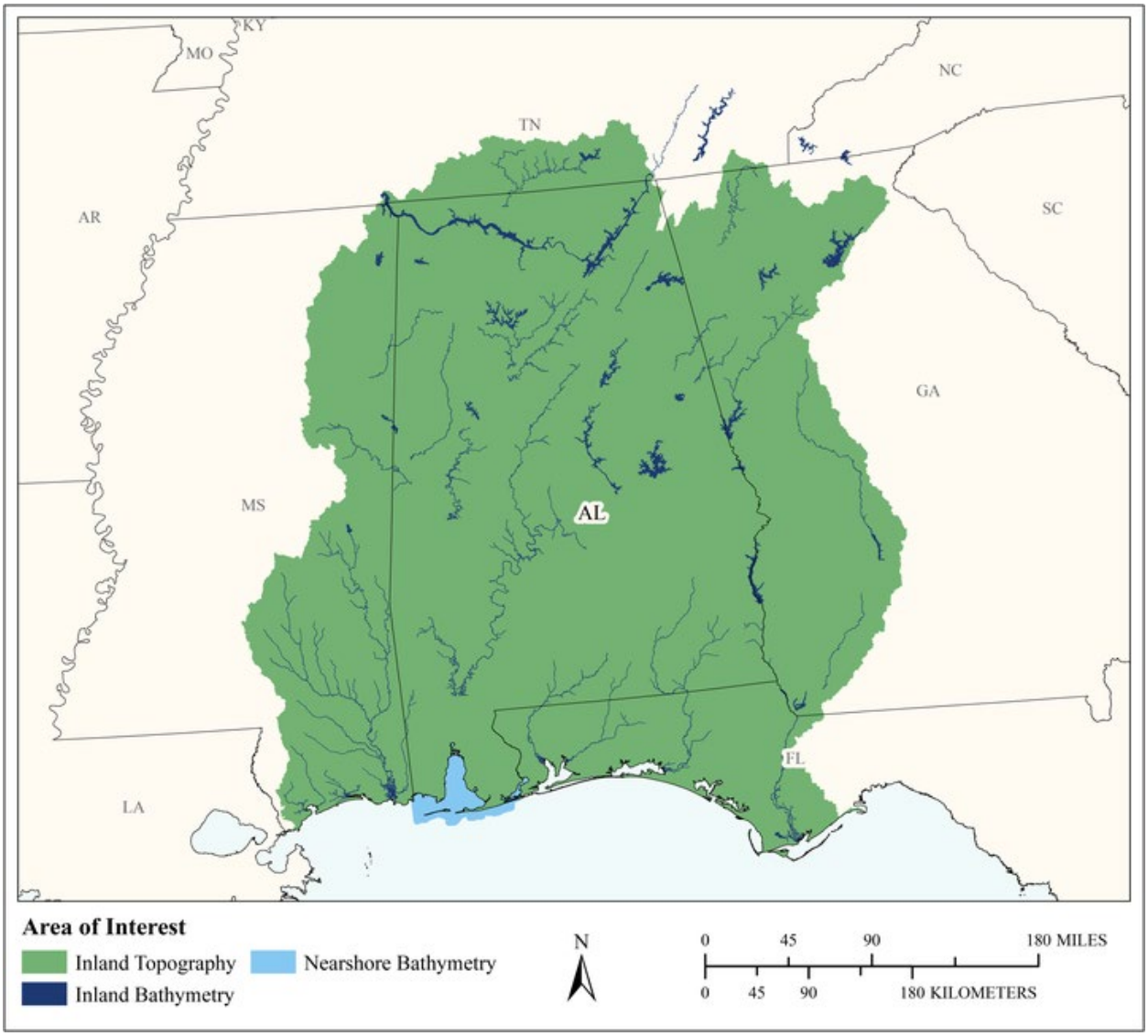
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	I don't know	I don't know	I don't know
Improved customer experience	Moderate	I don't know	I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	I don't know	I don't know	I don't know
Environmental	Minor	I don't know	I don't know	I don't know
Public safety, including life and property	Minor	I don't know	I don't know	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Moderate	Unable to provide		I don't know	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Increased revenues	None			I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$22,673					Annual dollars saved/ realized	$62,729			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			I don't know			Major			I don't know		
Environmental	Major			I don't know			Major			I don't know		
Public safety, including life and property	Major			I don't know			Major			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes		Yes	Yes
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids		Yes	Yes	
Hydrologic Flow Accumulation Grids		Yes	Yes	
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Alabama Flood Risk Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)	One or more Hydrologic Units (HUC4s)	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Flood risk management, modeling, mitigation, and mapping. Elevation data are needed for FEMA floodplain management activities and H&H modeling. Water use planning could also use the data. Utilities likely gather their own data.
MCA Title	Alabama Flood Risk Management
MCA ID	1410
Organization Type	State or U.S. Territorial government
Organization Name	Office of Water Resources
Sub-Agency or Division	
Organization Mission	The Division plans, coordinates, develops and manages Alabama's water resources, both ground and surface water, in a manner that is in the best interest of the state. This includes recommending policies and legislation, conducting technical studies, implementing and participating in programs and projects and actively representing Alabama's intra and interstate water resource interests.
Program Name	Floodplain Management Program
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 03 - Coastal Zone Management
Tertiary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Need to distinguish between rivers/lakes/streams and land

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Nice to have

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Required
Other	Highly desirable
Other description	Large Hydroelectric Reservoirs

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL2B	
Update Frequency	4-5 years	6-10 years	6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	Up to 2 meters	Less than 50 cm	
Acceptable Vertical Error	Up to 20 cm	Up to 20 cm	Up to 40 cm	
How far onshore needed			To cover the beach slope	
How far down the beach profile needed	To MHW		To MHW	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable		Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Required		Required	Required
DEM for entire AOI needs to be seamless	Required	Highly desirable	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Highly desirable	Required	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Required	Required	Required	
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Highly desirable	Required	
Full waveform	Not required	Highly desirable	Highly desirable	
Bathymetric Attributed Grid (BAG)		Highly desirable	Required	
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Nice to have	Not required	Highly desirable	
Ground control/ground truthing	Nice to have	Nice to have	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Not required	Nice to have	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Highly desirable	
Offshore cadastral			Highly desirable	
Lease areas			Highly desirable	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Nice to have	Highly desirable	Nice to have	
Wetlands	Highly desirable	Highly desirable	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Nice to have	
Inland surface water features	Highly desirable	Highly desirable	Required	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Not required	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Highly desirable	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Data derived from 3DEP and individual community partnerships for Risk MAP purposes. QL2 or QL3 has been used in the past. Dated from early 2011 to 2015.	Use what little is available.	Use what little is available.	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes		Yes	
Other description	Office Server		Utility companies	
Data that meet my needs are not available		Yes		

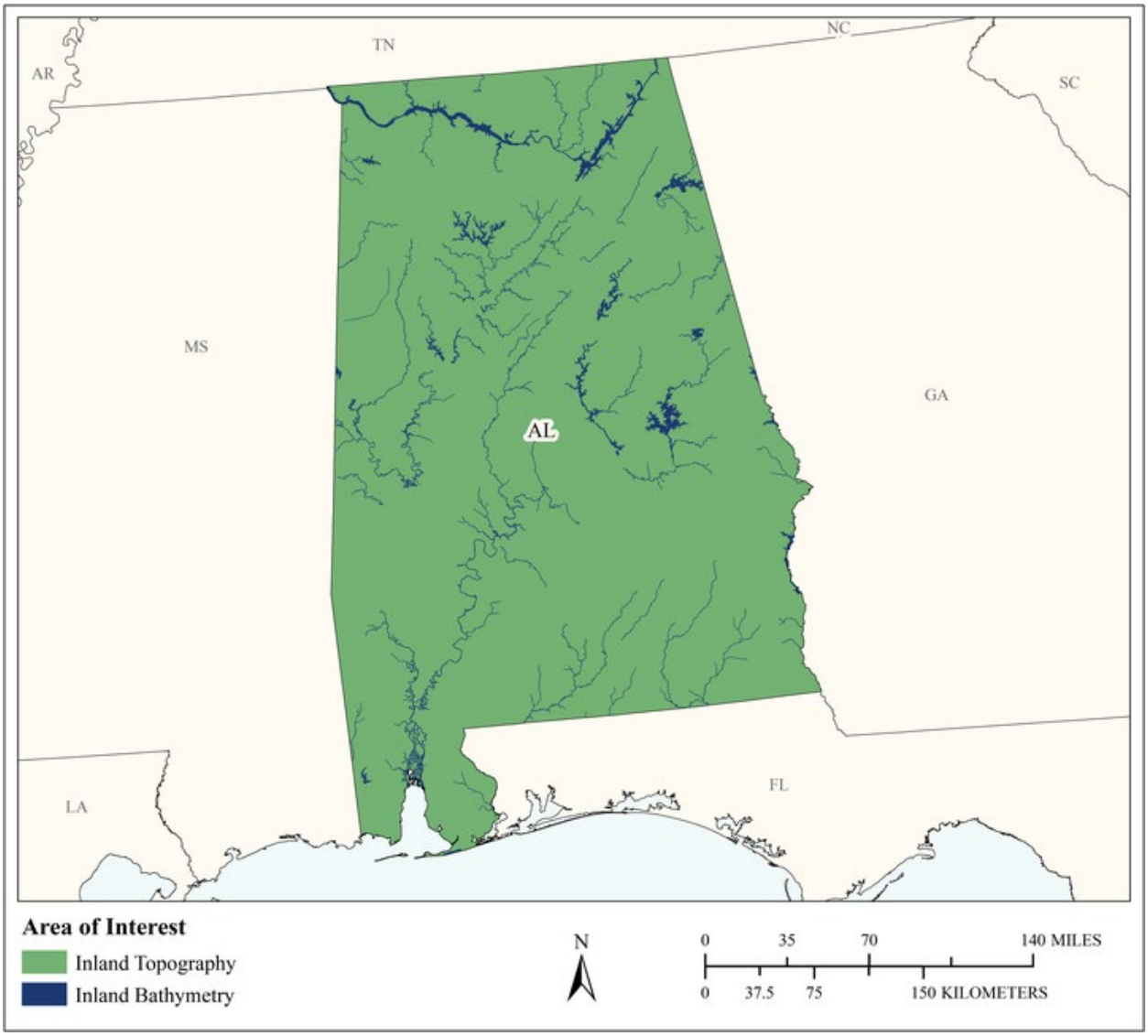
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None	Inland bathy data not available	None	
Cost savings/cost reduction	Moderate	Inland bathy data not available	None	
Cost avoidance	Moderate	Inland bathy data not available	None	
Increased revenues	None	Inland bathy data not available	None	
Mission-driven performance improvements	Minor	Inland bathy data not available	None	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available	None	
Improved response or timeliness	Minor	Inland bathy data not available	None	
Improved customer experience	Minor	Inland bathy data not available	None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Inland bathy data not available	None	
Environmental	Major	Inland bathy data not available	None	
Public safety, including life and property	Major	Inland bathy data not available	None	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$7,236	I don't know	Unable to provide		I don't know	Unable to provide				
Cost savings/cost reduction	Major	Annual dollars saved/realized	$150,000	Minor	Annual dollars saved/realized	$200,000	Moderate	Annual dollars saved/realized	$200,000			
Cost savings/cost reduction description	FEMA funded lidar acquisition at $750,000, divided by 5 year update frequency = $150,000 annually.											
Cost avoidance	Moderate	Annual dollars saved/realized	$540,000	Moderate	Annual dollars saved/realized	$100,000	Moderate	Annual dollars saved/realized	$200,000			
Cost avoidance description	$200,000 per acquisition divided by 5 year update = $40,000 annually.											
Increased revenues	None			Minor	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Other operational benefits	Major	Annual dollars saved/realized	$10,000,000	Moderate	Unable to provide		Minor	Unable to provide				
Other operational benefits description	Better contructed neighborhoods using accurate flood risk info.			More effective modeling around are flood impacted large reservoirs.			Better coastal flood risk modeling process.					
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$1,000,000	Moderate	Unable to provide		Minor	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Other customer service benefits				Minor	Unable to provide							
Other customer service benefits description				Better bathymetry data for our individual utility contractors Southern Co & TVA.								
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			None			Minor					
Environmental	Major			None			Minor					
Environmental description	More accurate flood risk analysis can lead to better environmental mitigation options.											
Public safety, including life and property	Major			None			Moderate					
Public safety, including life and property description	Flood risk mapping using high resolution LiDAR better identifies low areas of flooding risk to life and property.											
Other	Cost savings to our communities will benefit future society.											
Other benefits	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Transportation Maintenance and Construction



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Preliminary and Final Design of Construction Projects. Maintenance and monitoring of existing roadways. Lidar can be used for preliminary design, may be able to be used in rural areas for actual design augmented with field surveys. Bathymetry is needed for bridge and culvert planning and design.
MCA Title	Transportation Maintenance and Construction
MCA ID	1142
Organization Type	State or U.S. Territorial government
Organization Name	Alabama Department of Transportation
Sub-Agency or Division	
Organization Mission	To provide a safe, efficient, environmentally sound intermodal transportation system for all users, especially the taxpayers of Alabama. To also facilitate economic and social development and prosperity through the efficient movement of people and goods and to facilitate intermodal connections within Alabama. ALDOT must also demand excellence in transportation and be involved in promoting adequate funding to promote and maintain Alabama's transportation infrastructure.
Program Name	Design, Construction, and Maintenance of roadways and bridges
Total Annual Program Budget	
Primary Business Use	BU 19 - Land Navigation and Safety
Secondary Business Use	BU 22 - Infrastructure and Construction Management
Tertiary Business Use	BU 15 - Flood Risk Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required
Other	Highly desirable
Other description	Increased points per square meter for road corridors and developed areas.

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Would like to be able to extract signs, guardrails, and other roadside features if feasible

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Not required

Inland Bathy Feature Size Requirements	Response
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B		
Update Frequency	6-10 years and certain events.	Event driven only – Data need to coincide with a specific event.		
Event type(s)	The rule of thumb for updates is typically about 6 years on average. New construction/development and changes in the landscape can dictate update needs. New technology can also dictate updates - for example, if a new technology can provide a dramatic increase in accuracy, point spacing, etc, then this could affect decision to update areas.	A new project that spans a water body or an event such as flooding that results in scour or sand deposits.		
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	The best horizontal accuracy achievable for the vertical accuracy I need		
Acceptable Vertical Error	Up to 10 cm	Up to 50 cm		
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed	To MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Not required	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Nice to have	Nice to have			Nice to have	
Other	Required					

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Other description	When you say AOI, are you speaking about the AOI collected under that contract? Are you talking about feathering the edges of a dataset from one year to another year to give it a smooth appearance? We do not need someone in the office giving us their artistic rendition of an appealing surface. If there are differences between the data sets, then the field personnel should be the ones making the decision about the quality of the data - in my opinion.					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	None. Would rather perform manipulation in house.	None - prefer to manipulate manually			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Nice to have		
DTM	Required	Highly desirable		
DEM	Nice to have	Nice to have		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Raw point cloud data	Not required	Not required		
Classified point cloud	Required	Required		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Not required		
Ground control/ground truthing	Required	Required		
Other	Nice to have			
Other description	Contours			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Required		
Land use/land cover	Highly desirable	Nice to have		
Wetlands	Required	Highly desirable		
Estuaries				
Inland surface water features	Required	Highly desirable		
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have		
Cultural resources	Required	Nice to have		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			
Other	Required			
Other description	As long as the data is collected and tied to NSRS, there should not be problems integrating with data from other sources			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current dataset used	Currently using LIDAR data collected thru 3DEP program as well as products from older county and project collections. The newer 3DEP data is QL2 while the older data sets typically meet QL3 vertical accuracy.	Currently using data from USACE and joint collection efforts with USGS on a project by project basis. No accuracy information has been provided - we have assumed +/- 2.0 feet.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes	Yes		
Other description	We receive copies of final projects from the source - USGS, Counties, Etc	Mobile AL USACE office, Currently contract with Montgomery AL USGS office to collect new data.		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	Major	Minor		
Increased revenues	None	None		
Mission-driven performance improvements	Major	Minor		

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None		
Improved response or timeliness	Major	Minor		
Improved customer experience	Major	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	None		
Environmental	Moderate	None		
Public safety, including life and property	Minor	None		
Other Current Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other		Minor		
Other description		Rarely need this type data		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$401,598	Minor	Annual dollars saved/realized	$1,809						
Time savings description	Estimated man-hours for field crew to collect data if it did not exist. Time savings from delivering data, developing models. This has always been a tricky one to estimate. Let us know if you come up with a good method. Project coordination and planning.			Rarely need this type data.								
Cost savings/cost reduction	Major	Annual dollars saved/realized	$900,000	Minor	Annual dollars saved/realized	$25,000						
Cost savings/cost reduction description	Data collection costs - either field (see above) or contract.			Rarely use this type data.								
Cost avoidance	Moderate	Unable to provide		Minor	Unable to provide							
Cost avoidance description	These costs would be included in the acquisition (see above). Future roadway safety enhancements.											
Increased revenues	None			None								
Mission-driven performance improvements	Moderate	Annual percent improvement	10%	Minor	Annual percent improvement	2%						
Mission-driven performance improvements description	Use of products developed by other agencies. Overall benefit from consistent, reliable data meeting various needs.			Rarely use this type data.								
Other operational benefits				Minor	Annual dollars saved/realized	$1,809						
Other operational benefits description												
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		None								
Value added to products or services description	Improved 3-d roadway characteristics.											
Improved response or timeliness	Major	Annual dollars saved/realized	$40,702	None								
Improved response or timeliness description	Improved flood maps and other products developed by other agencies. Permits, EIS time savings. Improved evacuation plans.											
Improved customer experience	Major	Annual dollars saved/realized	$14,472	Minor	Annual dollars saved/realized	$302						
Improved customer experience description	Potential future apps. Reduced field data validation. Improved data management/access/distribution.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			None								
Environmental	Moderate			None								
Environmental description	Wetlands, mitigation banks											
Public safety, including life and property	Moderate			Moderate								
Public safety, including life and property description	Improved analysis of roadways for safety purposes			Main benefit would be from improved products developed by other agencies - flood maps.								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

Alaska

Importance of elevation data to Alaska

Alaska is the largest and most unexplored state in the union with 570,641 square miles of land and over 60,000 miles of coastline, often called "the last frontier". It is the third least populous state in the nation with the majority of Alaskans spread across 300 plus small communities and a few large cities. The State of Alaska is approximately one-fifth the size of the lower 48 states. Because of the size, difficulty in access, and complex terrain the cost of statewide data acquisitions is tremendous. However, for these same reasons, the importance of high-resolution elevation data is of even greater significance.

The structure of Alaska's economy has changed overtime with regard to the relative statistics of the various sectors. Currently, industries that provide revenue include oil and gas, mining, fisheries, timber, tourism, international cargo handling (aviation and marine), and offshore natural resource extraction. Alaska is subject to a broad range of geologic hazards including active volcanoes, earthquakes, tsunamis, landslides, storm surge, flooding and erosion (terrestrial and coastal). Alaskans are also being significantly impacted from effects of climate change such as permafrost thaw, glacial retreat, and loss of sea ice. Cumulative impacts from both natural hazards and climate change are severely impacting infrastructure across the state, with vulnerabilities most extreme in small interior and coastal communities. Our ability to accurately plan for development and resource extraction, respond to disasters, mitigate future impacts, and plan for an uncertain future is dependent on high-quality geospatial information, including topographic and bathymetric elevation data.

Departments within the State of Alaska government use elevation data for resource management; coastal and geologic hazard modeling and assessments (including storm surge and erosion); habitat assessment and management of marine and terrestrial animals; monitoring and mitigating pollution (solid waste, mining, drinking water contamination, and marine spills); and natural disaster preparedness, response, mitigation, and management. Bathymetric data are used for safe navigation by the marine transportation (natural resources, fuel, goods, and personnel) and tourism/recreation industry sectors; and are critical to the accurate assessment of tsunami hazards. The first statewide elevation acquisition was completed in 2020. IFSAR is the first ever seamless raster elevation dataset with consistent standards for the State of Alaska. These data are a vast improvement over the 60-meter National Elevation Dataset (NED) distributed by the U.S. Geological Survey (USGS) that were previously available, however, do not meet specifications needed for infrastructure development, sanitation design, civil engineering applications, impact assessments, change modeling, and community planning purposes. High resolution and quality topography and bathymetry data are required for planning that will support the economy, life and safety of Alaskans into the future.

For simplicity, *elevation* as defined within this document is referred to as both topographic and bathymetric data sources.

Current status of elevation data for Alaska

The National Enhanced Elevation Assessment (NEEA) determined that Quality Level (QL) 5 IFSAR was the most appropriate statewide elevation source for Alaska, with annual benefits of $19 million per year and a complete return on investment within three and half years. Lidar was not recommended due to the high cost of acquisition in remote locations with complex terrain which is frequently covered with clouds, fog or haze. In 2010, Dewberry, with subcontractors Intermap Technologies, Fugro EarthData and JOA Surveys, executed the first of 31 task orders to acquire aerial IFSAR and produce 5-meter hydro-enforced Digital Surface Models (DSMs), 5-meter hydro-enforced Digital Terrain Models (DTMs), and Ortho-rectified Radar Images (ORIs) with resolution down to 62.5-cm. In 2020, the Dewberry team completed

QL5 IFSAR data acquisition for 100% of Alaska. During this process, significant investments were made to acquire data efficiently between a broad group of stakeholders, including the USGS (54.2%), State of Alaska (21.44%), Natural Resources Conservation Service (5.95%), Bureau of Land Management (5.25%), National Park Service (4.90%), Department of Defense (3.86%), U.S. Forest Service (2.87%), and U.S. Fish and Wildlife Service (1.53%).

Higher resolution topographic data sets, typically QL1 or QL2 are periodically, but not regularly acquired by federal, state, regional, and local entities on a project specific basis. The most common data types are lidar and Structure-from-Motion photogrammetrically derived elevation datasets. Use of such data is limited as these datasets are discontinuous across the state and generally encompass small communities, roadway or pipeline corridors, or are collected to support specific projects.

Modern bathymetric data is sparse in Alaskan waters. The National Oceanic and Atmospheric Administration's (NOAA) Office of Coast Survey conducts bathymetric surveys in Alaska every year, yet 72% remains unmapped to modern standards. For northern and western Alaska, much of the data are either historic (1890s–1930s) or were collected as part of defense efforts during World War II (1930s–1950s). Inland bathymetry is unavailable for most of Alaska. Bathymetric data collected by the Office of Coast Survey is limiting because it does not generally overlap with topographic data; and the current extents include 2-meter (6.5-foot), 4-meter (13-foot), or 8-meter (26-foot) depth contours, which leaves a significant data gap in the surf zone. A small number of topobathymetric lidar surveys have been completed by NOAA in southeast Alaska and on the southern side of the Alaska Peninsula (2004-2009) and by JALBTCX in 2019 over 13 community regions across western, south central and southeast Alaska in efforts to fill these gaps. For the coastal regions bathymetric and coastal elevation data would have major benefits to industrial and community project planning, bolster the shipping and fishing economy through safer maritime navigation, enable more resilient coastal economies through flood and wave impact modeling, data driven coastal infrastructure development, improved emergency planning, and effective community management plans.

The Alaska Division of Geological and Geophysical Surveys is currently hosting elevation data (excluding NOAA bathymetry) on the elevation.alaska.gov webpage and encourages all public data to be available on this page.

High-level summary of elevation data requirements

Quality level requirements vary depending on the Mission Critical Activity. Inland topography generally needs a higher quality level ranging from QL0 to QL2 with an average response of QL1. Inland bathymetric quality level requirements range from QL0B to QL4B with an average response of QL1B. Nearshore bathymetric quality level requirements range from QL0B to QL4B with an average response of QL2B. IHO Order 1a is sufficient for most offshore bathymetric requirements, unless a Special Order is needed. Higher quality levels have been identified for select Areas of Interest (AOIs), including developed areas or areas prone to high rates of erosion. If elevation projects are initiated more detailed AOIs should be developed at that time. All data types require an update frequency of 4-5 years.

High-level summary of benefits that would come from higher resolution elevation data

All stakeholders in Alaska would benefit from high-resolution topographic and bathymetry data. Specifically these data would improve work-flow efficiencies, such as remote planning and project implementation. Major operational benefits would be realized and would result in more accurate assessments and less time acquiring and processing elevation data to support project needs. Elevation data could also provide significant cost savings from disaster mitigation. Accurate and accessible data would provide a data-driven platform form for decision making. However, due to the broad range of stakeholders and application of such data, additional work is needed to fully quantify cost savings and

return on investment of improved topographic and bathymetry data. Additionally, due to the limited availability of high-quality elevation data in Alaska, such data has not yet been integrated into work-flow processes and systems, which would imply benefits are likely larger than expected. Until then all sectors will continue to suffer from poor management and investment decisions based on insufficient data, and the loss of potential projects due to high risks associated with incomplete information. The table below highlights some applications of high-resolution elevation data by user groups.

User Group	Purpose
Alaska Aviation	International Civil Aviation Organization standards for terrain mapping for simulation and embedded navigation aids.
State of Alaska Department of Commerce, Community, and Economic Development	Rural Alaska Community Maps, suitable for road and sanitation design, airport, and other civil engineering. Maps also display flood of record.
State of Alaska Division of Geological and Geophysical Surveys	Interpretation for geologic mapping; generate orthophotos using digital aerial photographs; 3-D landscape drapes for visual analysis and display; slope/aspect analysis; neotectonics/active faulting studies; bedrock structural analysis; generate topographic base maps (contour lines); generate topographic cross-section lines; lahar modeling; tsunami modeling; volumetric analysis; geophysical overlays for analysis.
State of Alaska Department of Natural Resources	State land ownership; land use; status plat maps; project permitting; state land lease sales; easement.
State of Alaska Department of Transportation	Roadway corridors and villages; general planning of road development; remote design purposes; DOT also supports hundreds of airfields statewide that need accurate data for flight paths.
State of Alaska Department of Military and Veteran Affairs	Emergency response, management and preparedness; disaster mitigation.
State of Alaska Department of Public Safety	Emergency response and preparedness.
State of Alaska Department of Environment Conservation	Monitoring and mitigating pollution (solid waste, mining, drinking water contamination, and marine spills).
University of Alaska	Orthorectification of digital images; arctic research; atmospheric sciences and weather forecasting; forestry and vegetation analyses; hydrology analyses; geology analyses; and diverse studies such as coastal erosion, rates of erosion, subsidence, and sea level change.

The State of Alaska has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	Alaska Department of Environmental Conservation	1090	Pollution Risk	Inland Topo	QL2	6-10 years	$16,281	Unable to quantify	Minor	Moderate	Moderate
				Inland Bathy	Cross sections and/or transects meet needs	6-10 years	Unable to quantify	Unable to quantify	Minor	Moderate	Moderate
				Nearshore Bathy	QL4B	6-10 years	Unable to quantify	Unable to quantify	Minor	Moderate	Moderate
BU 02 – Riverine Ecosystem Management	State of Alaska	60006	Riverine Ecosystem Management	Inland Topo	QL1 HD	6-10 years	$894,104	$89,307	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$475,960	$33,561	Major	Major	Major
				Nearshore Bathy	QL0B	2-3 years	$4,034,591	$3,083,065	Moderate	Moderate	Moderate
BU 03 – Coastal Zone Management	Alaska Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGS), Coastal Hazards Program	1187	Coastal Hazards	Inland Topo	QL2	6-10 years	$1,267,135	$67,837	Major	Major	Major
				Inland Bathy	QL3B	6-10 years	$64,366	$34,199	Major	Major	Major
				Nearshore Bathy	Cross sections and/or transects meet needs	6-10 years	$240,500	$1,002,412	Major	Major	Major
BU 03 – Coastal Zone Management	University of Alaska Fairbanks	32630	Tsunami Inundation Mapping and Modeling for Coastal Communities	Inland Topo	QL4	4-5 years	$224,672	$38,771	I don't know	I don't know	I don't know
				Inland Bathy	QL4B	>10 years	$95,170	$55,793	I don't know	I don't know	I don't know
				Nearshore Bathy	QL4B	>10 years	$1,929,288	$3,261,581	I don't know	I don't know	I don't know
				Offshore Bathy	Order 3	>10 years	$275,045	$54,913	I don't know	I don't know	I don't know

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 03 – Coastal Zone Management	Alaska Department of Natural Resources, Alaska Ocean Observing Systems	32721	Coastal Zone Management	Inland Topo	QL2	(a) 2-3 years (b) 4-5 years	$1,495,953	$261,523	Moderate	Major	Major
				Nearshore Bathy	QL1B	Dependent on location's rate of change. Rapidly changing areas should be refreshed every 2-3 years, many other places can do 4-5 years. Many areas the rate of change is unknown.	$6,912,191	$11,692,799	Moderate	Major	Major
				Offshore Bathy	Order 1	Dependent on location's rate of change. Rapidly changing areas should be refreshed every 2-3 years, many other places can do 4-5 years. Many areas the rate of change is unknown.	$2,416,364	$482,429	Moderate	Major	Major
BU 04 – Forest Resource Management	State of Alaska	60007	Forest Resources Management	Inland Topo	QL1	2-3 years	$2,309,579	$3,348,010	Major	Major	Major
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL2B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	I don't know

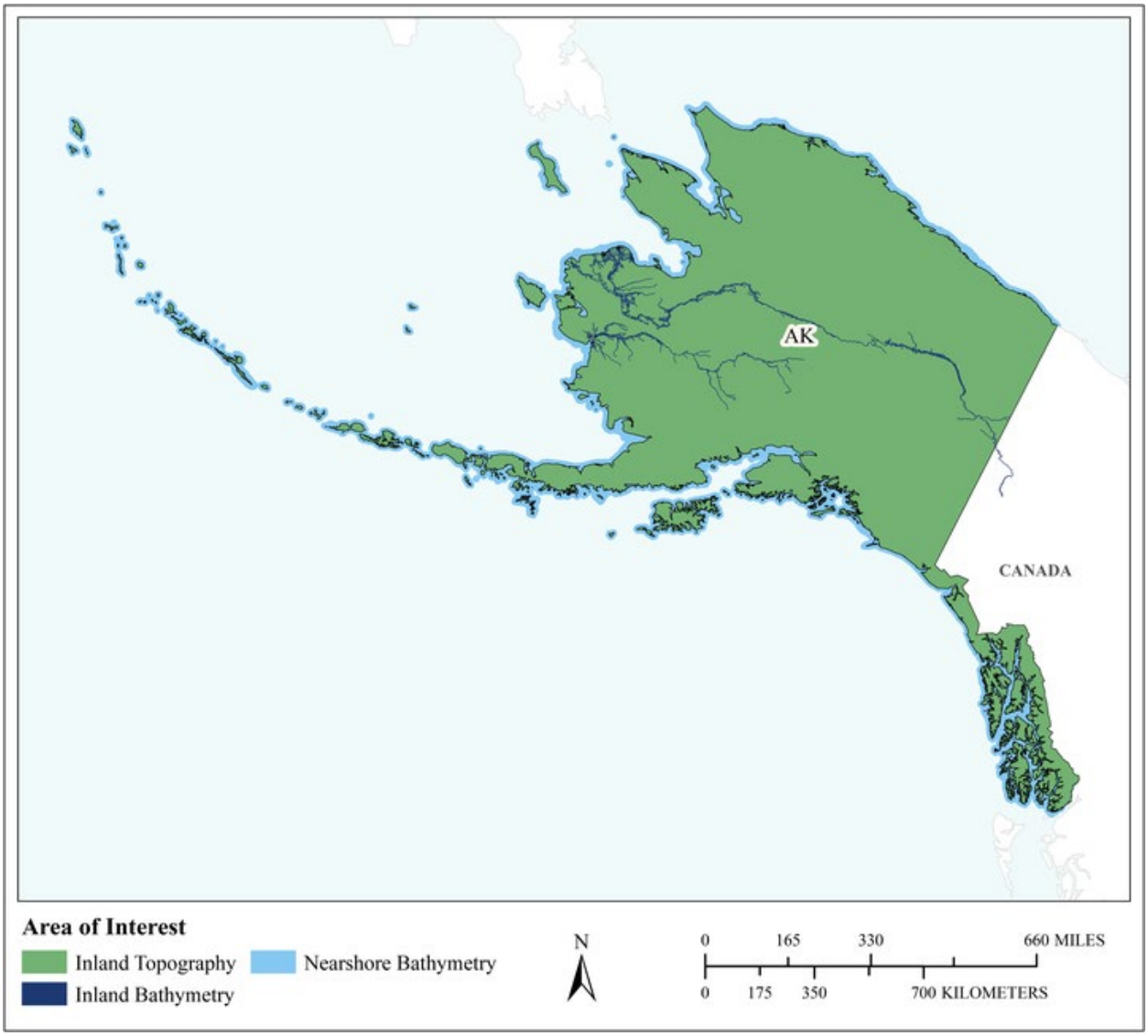
MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 05 – Rangeland Management	State of Alaska	60008	Rangeland Management	Inland Topo	QL2	Annually	Unable to quantify	Unable to quantify	Minor	Major	I don't know
BU 06 – Natural Resource Management	The Nature Conservancy	32660	Natural Resources Conservation	Inland Topo	QL1 HD	6-10 years	$22,911,703	$84,138,763	Major	Major	Major
				Inland Bathy	QL2B	6-10 years	$3,105,423	$139,798	I don't know	I don't know	I don't know
BU 07 – Wildlife and Habitat Management	Alaska Department of Fish & Game	21489	Habitat Management	Inland Topo	QL1 HD	4-5 years	$241	$4,522	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	4-5 years	$4,221	$5,427	Moderate	Minor	Minor
				Nearshore Bathy	QL0B	4-5 years	$25,024	$2,412	Moderate	Moderate	Moderate
				Offshore Bathy	Special Order	4-5 years	$20,803	$2,412	Minor	Minor	Moderate
BU 08 – Agriculture	State of Alaska	60009	Agriculture and Precision Farming	Inland Topo	QL2	2-3 years	$676,309	$536,154	Major	Major	Minor
				Inland Bathy	QL4B	4-5 years	$1,184,901	$536,154	Moderate	Major	Major
BU 09 – Fisheries Management and Aquaculture	State of Alaska	60010	Fisheries Management and Aquaculture	Inland Topo	QL2	2-3 years	$597,110	$1,296,971	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	6-10 years	$1,168,810	$531,972	Major	Major	Moderate
				Nearshore Bathy	QL0B	6-10 years	$6,336,771	$465,386	Moderate	Major	Minor
				Offshore Bathy	Special Order	6-10 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Minor
BU 10 – Geologic Assessment	Alaska Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGS)	1092	Mapping of Geologic Resources and Geologic Hazards	Inland Topo	QL2	6-10 years	$123,306,248	$2,164,641	I don't know	I don't know	I don't know
				Inland Bathy	Cross sections and/or transects meet needs	6-10 years	$12,019	$13,207	I don't know	I don't know	I don't know
				Nearshore Bathy	QL2B	6-10 years	$658,786	$1,059,961	I don't know	I don't know	I don't know
BU 11 – Geologic Resource Extraction	Alaska Department of Natural Resources, Division of Mining, Land, and Water	21756	Natural Resource Management of State Lands and Water	Inland Topo	QL1	4-5 years	$142,689	$94,652	Moderate	Moderate	I don't know
				Inland Bathy	QL1B	4-5 years	Unable to quantify	$9,759	I don't know	I don't know	I don't know
				Nearshore Bathy	QL3B	Event driven	Unable to quantify	Unable to quantify	I don't know	Moderate	I don't know
				Offshore Bathy	Order 1b	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 12 – Renewable Energy Resources	State of Alaska	60011	Renewable Energy Resources	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	None

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 13 – Oil and Gas Resources	Alaska Department of Natural Resources	1209	Land Records	Inland Topo	QL0 HD	Annually	$256,391	Unable to quantify	I don't know	I don't know	I don't know
				Inland Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	QL2B	2-3 years	$3,272,663	Unable to quantify	I don't know	I don't know	I don't know
				Offshore Bathy	Order 1a	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 14 – Cultural Resource Management	State of Alaska	60012	Cultural Resources Preservation and Management	Inland Topo	QL1	4-5 years	$107,068	$93,611	Minor	Minor	Minor
				Inland Bathy	QL0B	6-10 years	$256,755	Unable to quantify	Moderate	Minor	Minor
				Nearshore Bathy	QL0B	4-5 years	$115,445	Unable to quantify	Minor	Moderate	Minor
				Offshore Bathy	Order 1a	6-10 years	$83,461	Unable to quantify	Minor	Moderate	Minor
BU 15 – Flood Risk Management	Alaska Department of Commerce, Community, and Economic Development (DCCED), Division of Community and Regional Affairs (DCRA)	21550	Community Resilience and Climate Adaptation and Imminently-Threatened Alaska Native Villages	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	Minor	Minor	Minor
				Nearshore Bathy	QL3B	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 15 – Flood Risk Management	State of Alaska	60013	Flood Risk Management	Inland Topo	QL2	4-5 years	$82,016,806	$14,350,373	Major	Moderate	Major
				Inland Bathy	QL1B	4-5 years	$5,697,455	$6,396,781	Moderate	Moderate	Major
				Nearshore Bathy	QL2B	4-5 years	$7,637,097	$5,660,175	Major	Moderate	Major
				Offshore Bathy	Special Order	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 16 – Sea Level Rise and Subsidence	State of Alaska	60014	Sea Level Rise and Subsidence	Inland Topo	QL1 HD	4-5 years	$30,753,521	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Minor
				Offshore Bathy	Order 2	6-10 years	Unable to quantify	Unable to quantify	Major	Major	Moderate
BU 17 – Wildfire Management	State of Alaska	60015	Wildfire Management, Planning, and Response	Inland Topo	QL1	4-5 years	$3,138,503	Unable to quantify	Major	Major	Major
				Inland Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Major

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 18 – Homeland Security	Alaska Department of Military and Veterans Affairs, Division of Homeland Security and Emergency Management (AKDHS&EM)	1365	Natural Disaster Response	Inland Topo	QL1	4-5 years	$683,253	$14,509	Major	Minor	Major
				Inland Bathy	QL1B	4-5 years	$683,253	$13,906	Major	Minor	Major
				Nearshore Bathy	Cross sections and/or transects meet needs	6-10 years	$683,253	$10,891	Major	Minor	Major
BU 19 – Land Navigation	State of Alaska	60016	Land Navigation and Safety	Inland Topo	QL0	2-3 years	$7,567,181	$611,087	Minor	Major	Major
				Inland Bathy	QL0B	2-3 years	$322,773	$3,339	Minor	Moderate	Moderate
				Nearshore Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	None	Moderate	Moderate
BU 20 – Marine and Riverine Navigation	State of Alaska	60017	Marine and Riverine Navigation and Safety	Inland Topo	QL0 HD	2-3 years	$22,377,442	Unable to quantify	None	None	Minor
				Inland Bathy	QL0B	2-3 years	$10,655,214	$1,402,349	Moderate	Moderate	Moderate
				Nearshore Bathy	QL0B	2-3 years	$30,920,455	$1,046,877	Minor	Major	Major
BU 21 – Aviation Navigation	State of Alaska	60018	Aviation Navigation and Safety	Inland Topo	QL1 HD	Annually	$1,974,715	$2,459,441	Minor	Moderate	Moderate
				Inland Bathy	QL0B	Annually	$393,226	Unable to quantify	Moderate	Major	Major
				Nearshore Bathy	I don't know	Annually	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 22 – Infrastructure Management	Alaska Department of Transportation & Public Facilities	1369	Transportation Infrastructure Management	Inland Topo	(a) QL2 (b) QL5	(a) 4-5 years (b) 6-10 years	$43,657	$128,476	Major	Moderate	Moderate
				Inland Bathy	I don't know	Event driven	$14,709	$1,527	Moderate	Minor	I don't know
				Nearshore Bathy	I don't know	Event driven	$1,013	$139	Moderate	Moderate	I don't know
BU 23 – Urban and Regional Planning	Kodiak Island Borough	22348	Kodiak Island Borough Government Services	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	Major
				Inland Bathy	I don't know	Event driven	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	QL1B	I don't know	Unable to quantify	Unable to quantify	Moderate	I don't know	Moderate

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 23 – Urban and Regional Planning	State of Alaska	60019	Urban and Regional Planning	Inland Topo	QL1	4-5 years	$157,169,570	$18,145,298	Moderate	Major	Major
				Inland Bathy	QL1B	6-10 years	$6,401,242	$8,098,125	Moderate	Moderate	Major
				Nearshore Bathy	QL2B	4-5 years	$7,382,568	$7,788,320	Moderate	Moderate	Moderate
				Offshore Bathy	Cross sections and/or transects meet needs	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 24 – Health and Human Services	State of Alaska	60020	Health and Human Services	Inland Topo	QL1	6-10 years	$208,429	$26	Moderate	Moderate	Major
BU 25 – Real Estate, Banking, and Insurance	State of Alaska	60021	Real Estate, Banking, Mortgage, and Insurance	Inland Topo	QL1 HD	4-5 years	$20,296,209	Unable to quantify	Minor	Minor	Major
				Nearshore Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	Major	Moderate	Major
BU 26 – Education and Basic Research	State of Alaska	60022	Education K12 and Beyond, Basic Research	Inland Topo	QL1 HD	2-3 years	$3,069,728	$7,337,545	Major	Major	Major
				Inland Bathy	QL1B	4-5 years	$802,769	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL2B	4-5 years	$264,552	$10,440	Major	Major	Minor
				Offshore Bathy	Order 1a	6-10 years	$66,659	Unable to quantify	Major	Minor	Minor
BU 27 – Recreation	State of Alaska	60023	Recreation	Inland Topo	QL1	4-5 years	$134,037	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	4-5 years	$80,720	Unable to quantify	Major	Major	Moderate
				Nearshore Bathy	QL0B	4-5 years	$5,220,226	Unable to quantify	Major	Major	Moderate
BU 28 – Telecom-munications	State of Alaska	60024	Telecommunications	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Inland Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	Major
				Nearshore Bathy	QL2B	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Offshore Bathy	Cross sections and/or transects meet needs	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 30 – Maritime and Land Boundary Management	State of Alaska	60025	Maritime and Land Boundary Management	Inland Topo	QL1	6-10 years	$657,314	$2,520,175	Moderate	Minor	None
				Inland Bathy	QL2B	6-10 years	$493,291	Unable to quantify	Major	Major	Moderate
				Nearshore Bathy	QL0B	2-3 years	$9,265,541	Unable to quantify	Moderate	Major	Moderate
				Offshore Bathy	I don't know	2-3 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate

MCA Title: Pollution Risk



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	Custom description	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements		Navigable waterways such as Yukon and Kuskokwim rivers		

MCA Description	Response
Mission Critical Activity	Fate and transport of contaminants. Pollution risk mitigation. DEC needs elevation data to monitor pollution including contaminant spills, solid waste sites in flood risk areas, drinking water contamination, and groundwater contamination and modeling. Elevation data are also needed to address mining concerns in rural areas – tailings, tailings pond breaches, and contaminant flow. Bathymetry is also needed to address marine spills and potential groundings.
MCA Title	Pollution Risk
MCA ID	1090
Organization Type	State or U.S. Territorial government
Organization Name	Alaska Department of Environmental Conservation
Sub-Agency or Division	
Organization Mission	To conserve, improve, and protect Alaska's natural resources and environment and control water, land, and air pollution, in order to enhance the health, safety, and welfare of the people of the state and their overall economic and social well being.
Program Name	Spill Prevention and Response
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 24 - Health and Human Services
Tertiary Business Use	BU 02 - Riverine Ecosystem Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Culverts, ditches, small docks and shore features, underwater hazards.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Not required
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	Cross sections and/or transects meet needs	QL4B	
Update Frequency	6-10 years	6-10 years	6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI			Anadromous waters, places of refuge, protected marine areas are of most interest	
Acceptable Horizontal Error	Up to 1 meter	I don't know	Up to 5 meters	
Acceptable Vertical Error	Up to 1 meter	I don't know	Up to 50 cm	
How far onshore needed			To Mean Higher High Water (MHHW)	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MLLW	
Cross sections and/or transects meet needs		Yes		
Cross section/transect requirement		I don't know. The data are needed for modeling of stream flow.		

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Nice to have		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Nice to have	Nice to have		Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Nice to have	Nice to have		Nice to have	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Nice to have	
DTM	Highly desirable	Highly desirable	Nice to have	
DEM	Required	Required	Required	
Raw point cloud data	Not required	Nice to have	Not required	
Classified point cloud	Not required	Nice to have	Not required	
Edited/cube XYZ		Nice to have	Not required	
Full waveform	Not required	Nice to have	Not required	
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Not required	Highly desirable	Nice to have	
Ground control/ground truthing	Highly desirable	Highly desirable	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Highly desirable	Nice to have	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Not required	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Nice to have	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Nice to have	
Boundaries			Highly desirable	
Routes			Highly desirable	
Offshore cadastral			Nice to have	
Lease areas			Highly desirable	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	
Estuaries			Highly desirable	
Inland surface water features	Required	Highly desirable	Highly desirable	
Bridges/culverts	Highly desirable	Nice to have		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	IfSAR 5m elevation data	Very limited LIDAR data available in Yukon and Kuskokwim delta areas.	NOAA RNC	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts		Yes	Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Minor	Minor	
Cost savings/cost reduction	Moderate	Minor	Minor	

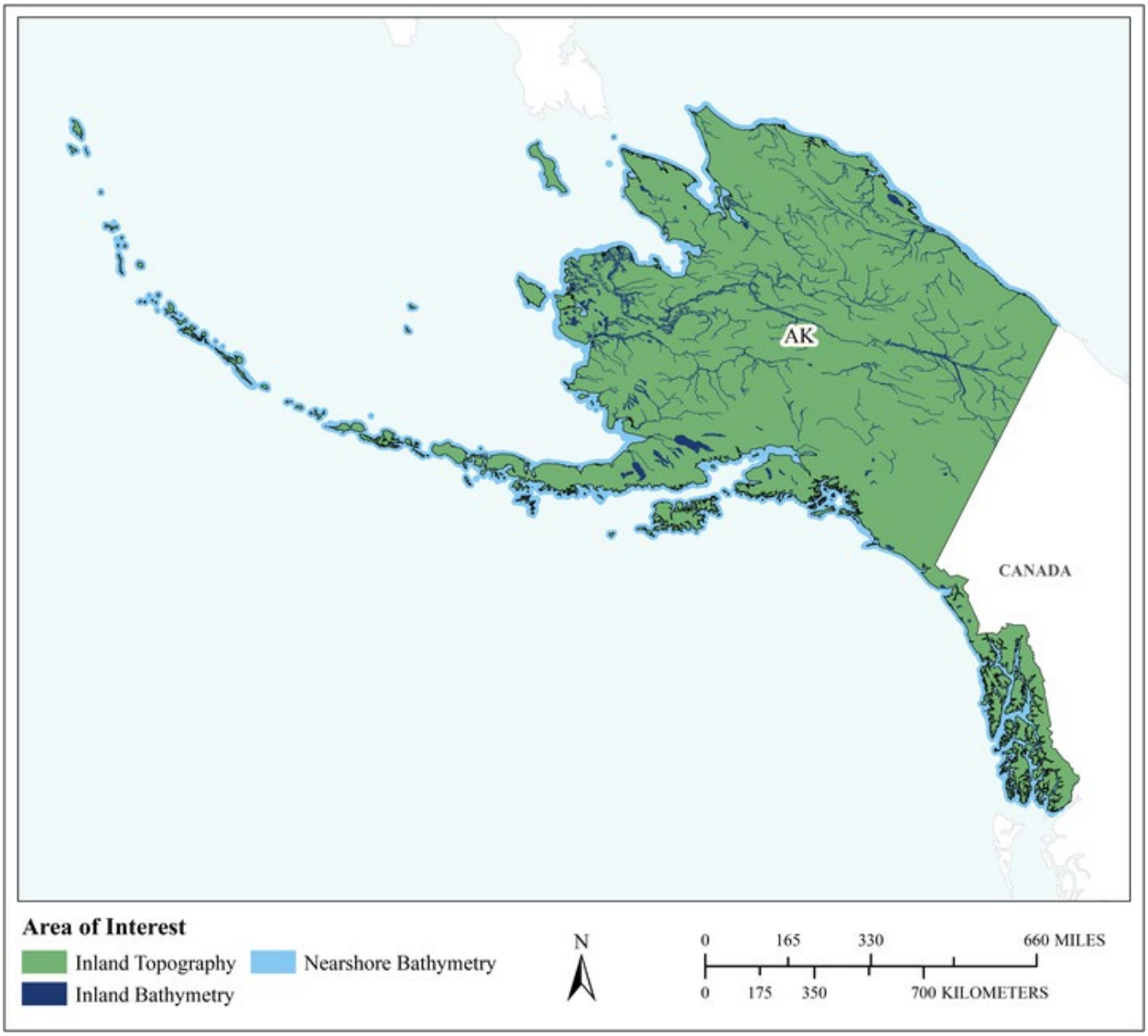
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Cost avoidance	Minor	Minor	Minor	
Increased revenues	Minor	Minor	Minor	
Mission-driven performance improvements	Minor	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor	Moderate	
Improved response or timeliness	Moderate	Minor	Moderate	
Improved customer experience	Minor	Minor	Moderate	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	Moderate	
Environmental	Moderate	Minor	Minor	
Public safety, including life and property	Moderate	Moderate	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$16,281	Moderate	Unable to provide		Moderate	Unable to provide				
Time savings description	More accurate assessment of impaired waters due to better hydro layers (derived elevation product). Sifting through various elevation sources such as LIDAR and IfSAR is time consuming and error-ridden. Remote assessment of conditions surrounding HazMat spills can save field inspection time.											
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Increased revenues	I don't know	Unable to provide		None			None					
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Value added to products or services description	Timely and accurate response.											
Improved response or timeliness	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			Minor					
Environmental	Moderate			Moderate			Moderate					
Public safety, including life and property	Moderate			Moderate			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes	Yes	Yes	
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes	Yes	
Hydrologic Flow Accumulation Grids	Yes	Yes	Yes	
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Riverine Ecosystem Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Stream channel analysis and mapping. Stream bank erosion analysis. Aquatic and terrestrial species habitat management. Environmental management.
MCA Title	Riverine Ecosystem Management
MCA ID	60006
Organization Type	State or U.S. Territorial government
Organization Name	State of Alaska
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B	QL0B	
Update Frequency	6-10 years	4-5 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable		Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Required		Highly desirable	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Required	Required		Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	
DTM	Required	Highly desirable	Required	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Nice to have	Nice to have	
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Not required	Nice to have	
Full waveform	Nice to have	Nice to have	Highly desirable	
Bathymetric Attributed Grid (BAG)		Not required	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Nice to have	
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Highly desirable	Required	
Underwater videography			Not required	
Bottom texture			Highly desirable	
Bottom type			Required	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Nice to have	Nice to have	Not required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates	Nice to have	Nice to have	Highly desirable	
Land use/land cover	Highly desirable	Nice to have	Required	
Wetlands	Highly desirable	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have	Not required	
Cultural resources	Nice to have	Nice to have	Not required	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	
Cost savings/cost reduction	Moderate	Minor	Moderate	
Cost avoidance	Moderate	None	None	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	None	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Minor	

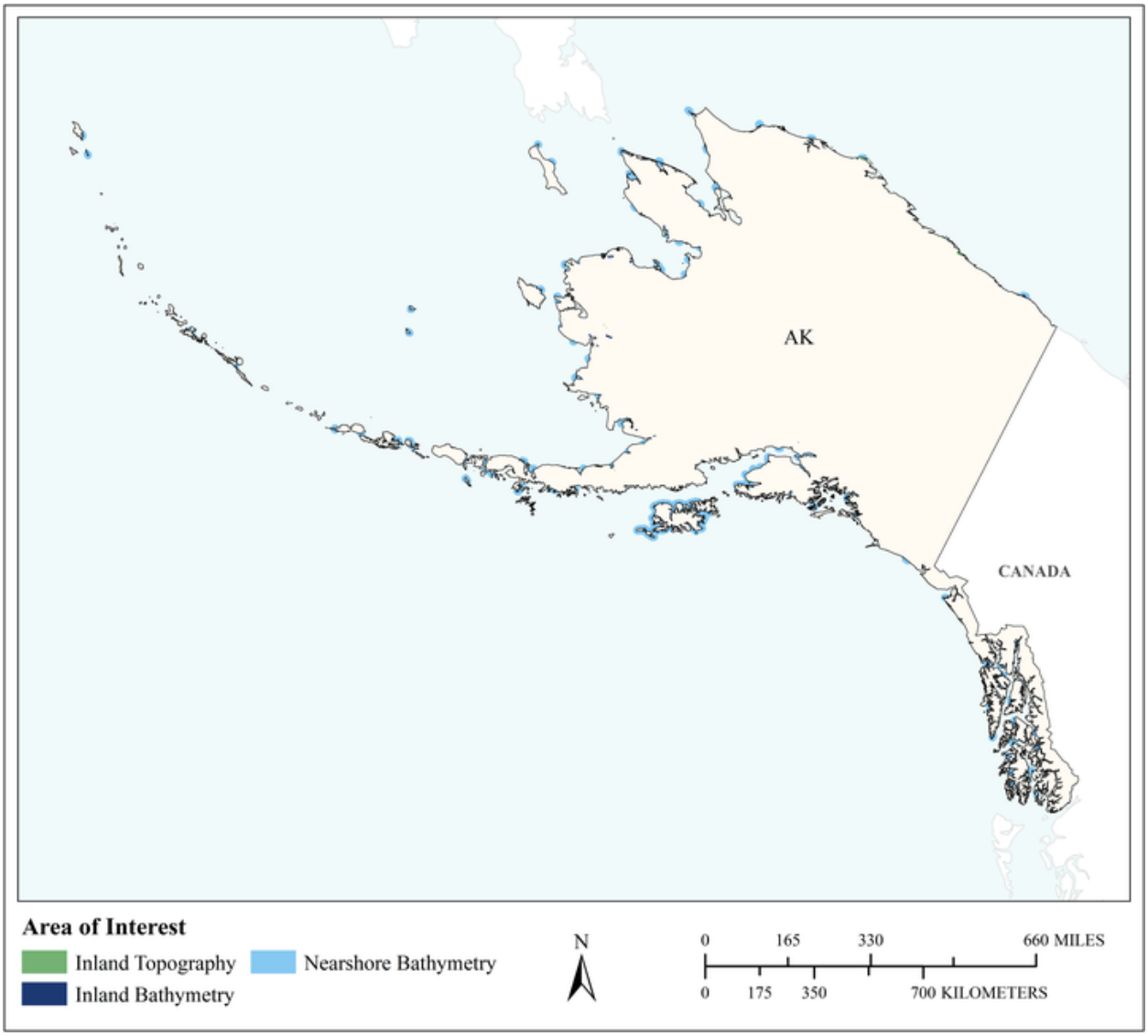
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Moderate	Minor	
Improved customer experience	Major	Minor	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Minor	
Environmental	Major	Major	Moderate	
Public safety, including life and property	Major	Moderate	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$894,104		Annual dollars saved/ realized	$475,960		Annual dollars saved/ realized	$4,034,591			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$89,307		Annual dollars saved/ realized	$33,561		Annual dollars saved/ realized	$3,083,065			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate					
Environmental	Major			Major			Moderate					
Public safety, including life and property	Major			Major			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps			Yes	
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints			Yes	
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Coastal Hazards



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Highly desirable	Required	
Geographic Area Requirements	Respondent provided own shapefile, KML, or geodatabase	Respondent provided own shapefile, KML, or geodatabase	Respondent provided own shapefile, KML, or geodatabase	
Sub Area Requirements	DGGS Coastal Hazards Program AOI	Within Alaska's tidally influenced rivers.	Tidally influenced community locations around Alaska	

MCA Description	Response
Mission Critical Activity	Analysis of coastal erosion and inundation. Extra-tropical storm surge modeling and assessment. Coastal hazard modeling and mapping. Coastal resiliency. Flood risk modeling and mapping of coastal areas. Flood forecasts. Modeling and mapping the effects of sea level rise or subsidence. Coastal inundation and infrastructure assessment.
MCA Title	Coastal Hazards
MCA ID	1187
Organization Type	State or U.S. Territorial government
Organization Name	Alaska Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGS), Coastal Hazards Program
Sub-Agency or Division	
Organization Mission	Our mission: Determine the potential of Alaskan land for production of metals, minerals, fuels, and geothermal resources, the locations and supplies of groundwater and construction material, and the potential geologic hazards to buildings, roads, bridges, and other installations and structures (AS 41.08.020).
Program Name	Coastal Hazards Program
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 16 - Sea Level Rise and Subsidence

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Culverts/drainage ditches, bridges, flood access points, mean high water shoreline, underwater surface and slope.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Required
501 - 2,500 ft	Required

Inland Bathy Feature Size Requirements	Response
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Not required
5.1 – 10 acres	Not required
Greater than 10 acres	Not required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL3B	Cross sections and/or transects meet needs	
Update Frequency	6-10 years	6-10 years	6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter	Up to 1 meter	
Acceptable Vertical Error	Up to 30 cm	Up to 40 cm	Up to 50 cm	
How far onshore needed			1 kilometer inland	
How far down the beach profile needed	Below MLLW		10 m depth contour	
Tide correction requirement			MHW	
Cross sections and/or transects meet needs			Yes	
Cross section/transect requirement			0.5 km transects fronting tidally influenced community locations, Alaska. Up to 1 m horizontal error, up to 50 cm vertical error.	

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Required	Required		Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable		Required	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Not required	Not required	
DTM	Required	Required	Required	
DEM	Required	Highly desirable	Highly desirable	
Raw point cloud data	Highly desirable	Highly desirable	Nice to have	
Classified point cloud	Highly desirable	Required	Nice to have	
Edited/cube XYZ		Highly desirable	Highly desirable	
Full waveform	Not required	Highly desirable	Nice to have	
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	
Breaklines required for standard hydro-flattening	Highly desirable	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Nice to have	Nice to have	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Not required	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Not required	Not required	Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Highly desirable	
Habitat distribution and classification			Not required	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Nice to have	Not required	Not required	
Wetlands	Not required	Not required	Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Not required	
Inland surface water features	Not required	Highly desirable	Not required	
Bridges/culverts	Nice to have	Required		
Landmark features	Nice to have	Not required	Not required	
Cultural resources	Nice to have	Not required	Not required	
Coastal and riverine structures	Nice to have	Not required	Not required	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Elevation data are not currently available over entire AOI, some areas have no elevation datasets usable for my Mission Critical Activities. The primary dataset available over the majority of the AOI: THU 95% Confidence <1m TVU 95% Confidence <50 cm Data have been ground controlled and truthed. Data are not treated (i.e. hydro-flattened), any treatment must be conducted by end user. Data represent a digital surface model, rather than the required bare earth model.	Inland bathymetric data is not readily available for rural northern and western Alaska.	No substantial bathymetric data available for northern and western Alaska collected after 1910.	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	The Alaska Division of Geological & Geophysical Surveys Elevation Data Portal. https://elevation.alaska.gov/			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None	Inland bathy data not available	None	
Cost savings/cost reduction	None	Inland bathy data not available	None	
Cost avoidance	None	Inland bathy data not available	None	
Increased revenues	None	Inland bathy data not available	None	
Mission-driven performance improvements	Major	Inland bathy data not available	None	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available	None	
Improved response or timeliness	Major	Inland bathy data not available	None	
Improved customer experience	Major	Inland bathy data not available	None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Inland bathy data not available	None	

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Environmental	Major	Inland bathy data not available	None	
Public safety, including life and property	Major	Inland bathy data not available	None	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$27,135	Major	Annual dollars saved/realized	$6,030	Major	Annual dollars saved/realized	$6,332			
Time savings description	When data are collected by DGGS or contracted, they are not always in the final format necessary for creating end products. By conducting hydro-corrections, that would save DGGS at least 1 month of hours spent on data processing. Either contract planning/oversight or field planning take tremendous time away from other critical CHP activities. Datum corrections are very difficult to conduct on Alaska data. We do not have VDATUM, so any transformations are time consuming. If CHP could utilize pre-existing data, each project would benefit from approximately 2 months of preparation for and completion of surveying in remote Alaska locations, which is logistically challenging to complete.			Making datasets seamless for flood/inundation mapping and modeling can be very time consuming. CHP does not have any experts on staff to make seamless topo/bathy surfaces, and would benefit greatly from having that done in advance of receiving data, which would likely reduce any errors caused by having a non-expert complete the work. Inland bathymetry would contribute to better modeling of storm surge up coastal river systems, which would save time when making storm forecasts and modeling long-term storm impact potential.			Expected errors from non-expert collecting bathymetric data. Either planning field bathymetry survey or contracting bathymetry survey. More efficient coastal flood modeling. Expected hours manipulating bathymetric data for specific projects. Expected hours collecting bathymetric data for specific projects.					
Cost savings/cost reduction	Major	Annual dollars saved/realized	$200,000	None			Major	Annual dollars saved/realized	$25,000			
Cost savings/cost reduction description	Annual amounts spent on data acquisition vary. But on average are approximately 200k, because of the lack of data currently available over Alaska communities, and the increased expense in collecting data in Alaska.						Expected cost of bathymetric survey conducted by CHP or contractor.					
Cost avoidance	Major	Annual dollars saved/realized	$1,040,000	None			Major	Annual dollars saved/realized	$15,000			
Cost avoidance description	Currently CHP conducts data processing such as hydro-processing (different levels), DSM cleaning. Flooding and erosion result in approximately 1 million $ damage per year. These damages might be avoided by making data available for community planning and relocation, more advanced forecasting, and developing timelines for critical infrastructure impacts such as sewage lagoons/dumps/residential homes. CHP must revisit sites, if not enough QC surveying has been completed, which costs approximately 10k/year.						Errors in processing the data ourselves. Storm forecasts informed by bathymetry updated from the 1900s would vastly improve our ability to forecast coastal storms, which is expected to avoid property lost during events. Processing any bathymetric data in house.					
Increased revenues	I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues description	CHP does not sell services.			Able to provide storm forecast to rivers upstream of main coastal areas which CHP is not currently able to provide services to.			Provide more accurate storm forecasts to broader range of communities. Communities that have not previously had forecasts.					
Mission-driven performance improvements	Major	Annual percent improvement	42%	Major	Unable to provide		Major	Annual percent improvement	50%			
Mission-driven performance improvements description	Current ground models are DSM so data under vegetation are lost, which reduces CHP ability to model flooding in Alaska. Because there is such limited baseline data available in Alaska. CHP spends approximately 50% of time annually on collecting/contracting/processing data. Time not spent on data collection would go directly to increased number of flood/erosion vulnerability assessments.			Able to provide storm forecast to rivers upstream of main coastal areas which CHP is not currently able to provide services to.			Able to make better decisions about evacuations, relocation, and mitigation of flooding and erosion. Able to provide more accurate flood/erosion predictions. Able to conduct numerical modeling studies of erosion and flooding as compared to simpler modeling methods that are less accurate.					

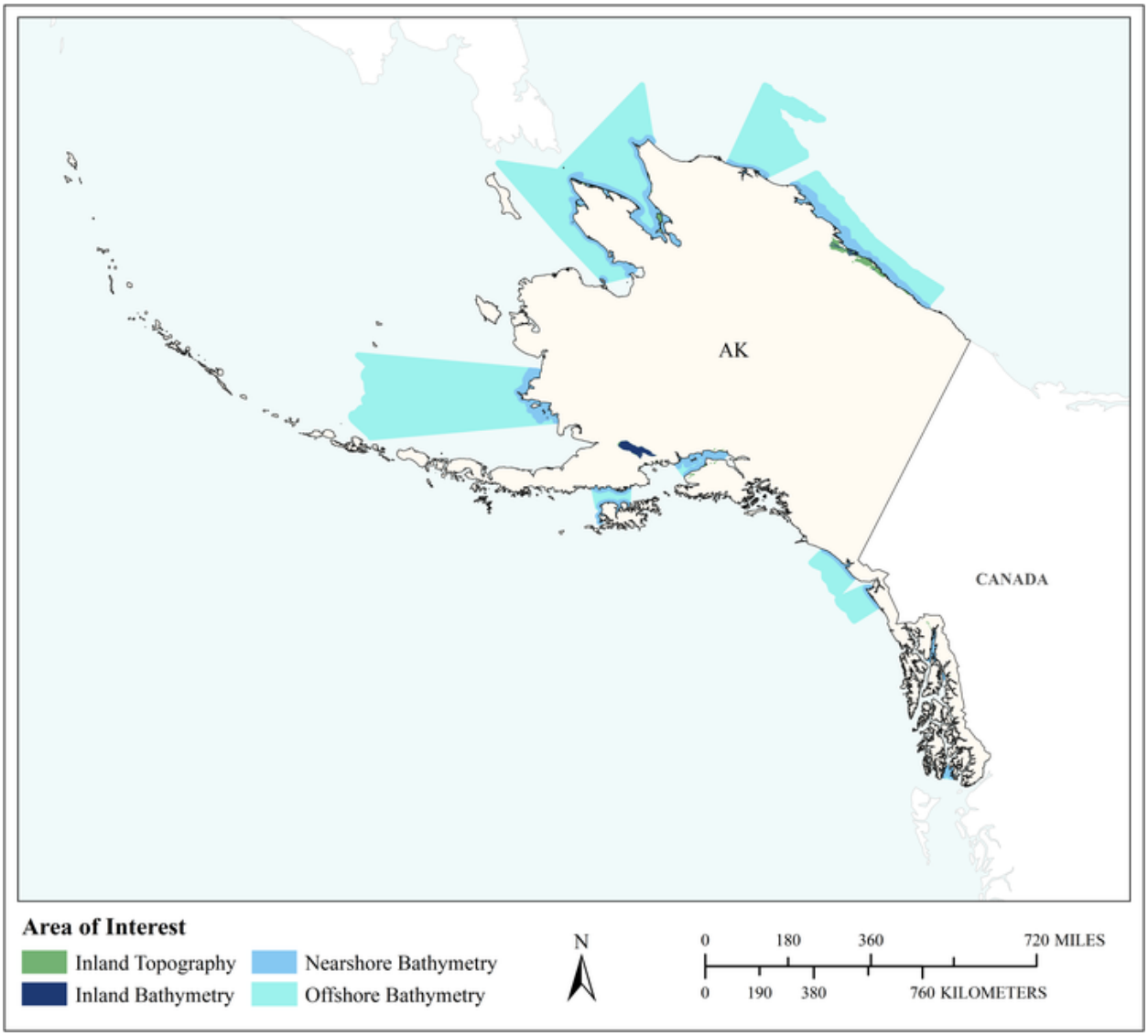
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future annual operational benefits added during validation					Annual dollars saved/ realized	$58,336		Annual dollars saved/ realized	$194,169			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$27,135	Major	Unable to provide		Major	Unable to provide				
Value added to products or services description	Baseline datasets would allow Alaska to delineate shorelines, create flood hazard maps, and flood warnings for the first time at most rural communities. Since data have not previously existed, these services have not been provided. Hours saved on data collection/processing would allow CHP to create online tools for visualizing coastal flooding and erosion as well as paper maps and publications made freely available to the public.			Able to provide storm forecast to rivers upstream of main coastal areas which CHP is not currently able to provide services to.			Better coastal flood modeling. Coastal flood products at communities that have not previously had coverage.					
Improved response or timeliness	Major	Annual dollars saved/realized	$13,568	Major	Unable to provide		Major	Annual dollars saved/realized	$1,002,412			
Improved response or timeliness description	Disaster recovery in Alaska is a very slow process, which is often stymied by the lack of baseline information before a storm. Oftentimes, communities cannot prove that the disaster even occurred, because there is no baseline. Products and services would be available for the first time in many communities. CHP receives 2-3 requests for information in regard to flood/erosion hazards per week. Answering these requests takes additional time, due to the lack of baseline elevation data. CHP spends approximately 100 hours each coastal storm season providing the most up-to-date information connecting topography to predicted storm elevations, which has not been streamlined, because so much time is spent collecting/processing elevation data.			Able to provide storm forecast to rivers upstream of main coastal areas which CHP is not currently able to provide services to.			Hours saved before making a better forecast, because models are more accurate farther in advance of a storm event. More up to date than 1900s. Expected amount of losses from moderate to major storm event at any community, which might be avoided by better flood modeling.					
Improved customer experience	Major	Annual dollars saved/realized	$27,135	Major	Unable to provide		Major	Unable to provide				
Improved customer experience description	Data are currently accessible in one location for Alaska, which is convenient and easy to use. If CHP is not collecting/processing data, additional time is spent creating end products with added value such as flood/erosion vulnerability mapping. Coastal engineers/scientists/managers rely on CHP collected data, since it is often the only elevation data available for a community. These data however, are not always ideal for the end user, they would benefit from having access to bare earth models.			Able to provide storm forecast to rivers upstream of main coastal areas which CHP is not currently able to provide services to.			Better hydrologic models using accurate bathymetric data would vastly improve coastal flood forecasting and modeling that could then contribute to for the first time, climate adaptation plans, hazard mitigation plans, FEMA flood maps, NWS storm forecasts, engineering projects in the coastal zone.					
Future annual customer service benefits added during validation					Annual dollars saved/ realized	$34,199						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major					

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Education or outreach description	If less time is spent on collecting elevation data, our program would provide additional education and outreach activities during field travel, such as meeting with tribe/city/corporation governments, in class presentations for schools, community based monitoring of erosion and flooding, outreach to state/federal partners on using data and end products.	Better hydrologic models of riverine communities provide realistic scenarios and photos/figures that could be used for community outreach.	Better hydrologic models made from accurate bathymetry would allow CHP to create visualizations of risk for education and outreach experience.	
Environmental	Major	Major	Major	
Environmental description	Erosion of Alaska coastlines results in contaminants reaching Alaska's oceans, rivers, and lakes. Additional elevation data would allow state/fed/local government to understand the timelines for erosion to take place and plan for removing contaminants before an erosion event occurs.	Capabilities to model hydrologic processes at community locations experiencing flooding, which could lead to better environmental management of community resources.	Better hydrologic models made from accurate bathymetry would allow CHP to model potential storm surge events, which highlight at risk locations, and may help to make decisions about mitigating those hazards to reduce threat of environmental contamination.	
Public safety, including life and property	Major	Major	Major	
Public safety, including life and property description	Elevation data contribute directly to flood/erosion forecasting in the 3-5 day window before a storm occurs. By providing potential impact locations to community leadership, the public are better able to move valued property out of the flooded zone, evacuate to higher ground within the community, or evacuate the community entirely (which can only be done through air travel).	Hydrologic models using inland bathymetry could be used to forecast/model long term potential for flooding, which would inform community planning, response, and mitigation of flooding.	Better hydrologic models made from accurate bathymetry would allow CHP to prove NWS with better forecast information to inform public about coastal storm flooding in advance of storm event.	

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours				
Hillshades	Yes	Yes	Yes	
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Tsunami Inundation Mapping and Modeling for Coastal Communities



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Custom description	Custom description	Custom description	Custom description
Sub Area Requirements	Populated coastal areas	Populated coastal areas	Populated coastal areas	Populated coastal areas out to the 1 km depth

MCA Description	Response
Mission Critical Activity	Tsunami inundation mapping and modeling for coastal communities, development of the tsunami inundation maps
MCA Title	Tsunami Inundation Mapping and Modeling for Coastal Communities
MCA ID	32630
Organization Type	Academic or Not-for-Profit
Organization Name	University of Alaska Fairbanks
Sub-Agency or Division	
Organization Mission	Tsunami inundation mapping and modeling for coastal communities, development of the tsunami inundation maps
Program Name	Alaska Tsunami Hazard Mitigation Program and Inundation Mapping
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Breakwaters and other harbor structures.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL4	QL4B	QL4B	Order 3
Update Frequency	4-5 years	>10 years	>10 years	>10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 5 meters	Up to 10 meters	Greater than 20 meters	Greater than 20 meters
Acceptable Vertical Error	Up to 50 cm	Greater than 1 meter	Greater than 1 meter	Up to 5 meters
How far onshore needed			Up to 25 miles	
How far down the beach profile needed	Below MLLW		Up to 200 meter depth	
Tide correction requirement			Any tide correction is acceptable, as long as it is defined	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required	Not required	Not required	Not required	Not required
Entire AOI under same environmental conditions	Not required	Required	Required	Required	Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Not required	Not required	Not required	Not required	Not required
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Not required	Not required	Not required
DTM	Required	Required	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Not required	Not required	Not required	Not required
Classified point cloud	Not required	Not required	Not required	
Edited/cube XYZ		Not required	Not required	Not required
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Required	Required	Required

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Not required	Not required		
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)			Required	Required
Tide Predictions			Required	Required
Tidal Constituent And Residual Interpolation (TCARI)			Required	Required
Intensity imagery/sidescan imagery	Not required	Not required	Not required	Not required
Ground control/ground truthing	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Not required	Not required
Acoustic imagery of the seafloor			Not required	Not required
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Not required	Not required
Bottom texture			Not required	Not required
Bottom type			Not required	Not required
Submerged features			Not required	Not required
Subbottom characteristics			Not required	Not required
Geologic and seismic data	Highly desirable	Required	Required	Required
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Required	Required
Tide/wave heights			Required	Required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Not required	Not required
Boundaries			Not required	Not required
Routes			Not required	Not required
Offshore cadastral			Not required	Not required
Lease areas			Not required	Not required
Fixed obstructions			Required	Required
Floating observation/navigation systems			Not required	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Highly desirable	Not required	Required	Required
Wetlands	Highly desirable	Not required	Not required	Not required
Estuaries			Not required	Not required
Inland surface water features	Highly desirable	Not required	Not required	
Bridges/culverts	Nice to have	Not required		
Landmark features	Nice to have	Not required	Not required	
Cultural resources	Not required	Not required	Not required	
Coastal and riverine structures	Required	Not required	Required	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Tsunami DEMs produced by NCEI	Tsunami DEMs produced by NCEI	Tsunami DEMs produced by NCEI	Tsunami DEMs produced by NCEI
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI	Yes	Yes	Yes	Yes
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Major	Major
Cost savings/cost reduction	Major	Major	Major	Major
Cost avoidance	Major	Major	Major	Major

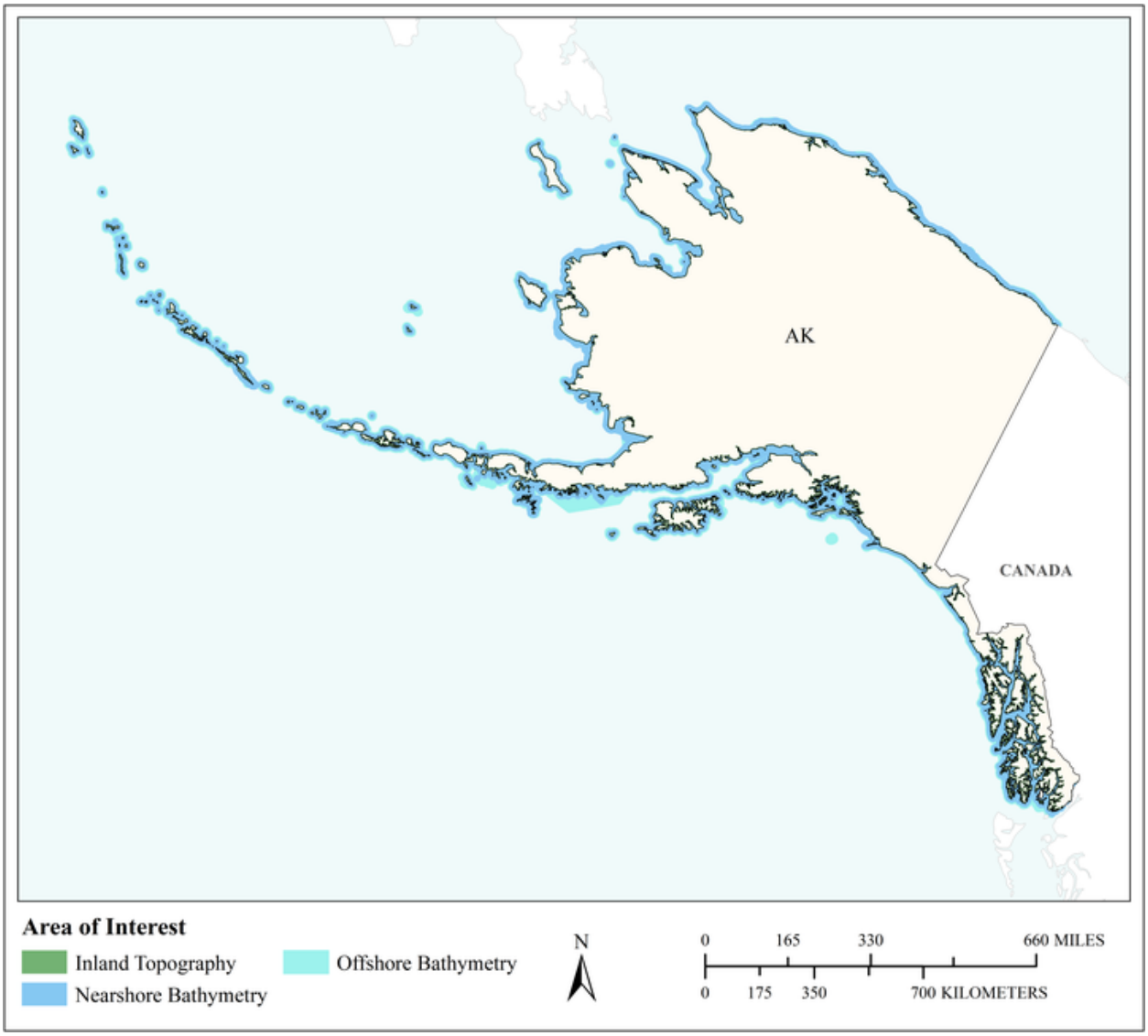
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	None	None	None	None
Mission-driven performance improvements	None	None	None	None
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None	None	None	None
Improved response or timeliness	None	None	None	None
Improved customer experience	None	None	None	None
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	None	None	None
Environmental	None	None	None	None
Public safety, including life and property	Major	Major	Major	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$2,894	Major	Unable to provide		Major	Annual dollars saved/realized	$1,206	Moderate	Unable to provide	
Time savings description	If the data collection is not seamless (ie. between the bathymetry surveys or between the multibeam and topography), it takes about up to a few days to smooth the DEM. We either have a DEM for the given region or not. Usually NCEI develops DEMs for us using the best available data. We cannot go and collect data ourselves. In some very limited cases, we do inspection of the DEM. It is easily 1 week of travel time just to check the topo. We cannot inspect bathymetry at all.											
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$221,778		Annual dollars saved/ realized	$95,170		Annual dollars saved/ realized	$1,928,082		Annual dollars saved/ realized	$275,045
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$38,771		Annual dollars saved/ realized	$55,793		Annual dollars saved/ realized	$3,261,581		Annual dollars saved/ realized	$54,913
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know			I don't know			I don't know		
Environmental	I don't know			I don't know			I don't know			I don't know		
Public safety, including life and property	I don't know			I don't know			I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	1
Update frequency	3

MCA Title: Coastal Zone Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	Required
Geographic Area Requirements	Area split by varying quality level or update frequency		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Custom description
Sub Area Requirements	2 km onshore of Alaska			Alaska out to 30m depth

MCA Description	Response
Mission Critical Activity	Resource management, coastal zone management, flooding, ecosystems, and land management. The Geospatial Council's concern is to identify data needs and get the data to the end users – including state, Federal, and local entities. As a part of addressing this concern, the Council identifies state mapping strategies.
MCA Title	Coastal Zone Management
MCA ID	32721
Organization Type	State or U.S. Territorial government
Organization Name	Alaska Department of Natural Resources, Alaska Ocean Observing Systems
Sub-Agency or Division	
Organization Mission	Alaska Geospatial Council's Mission Statement: Create a spatial infrastructure that will be supported by a participatory environment to facilitate collaboration and communication between all public and private stakeholders based on a philosophy of shared responsibilities, shared costs, shared benefits, and shared control. The Alaska DNR mission statement is to "Develop, conserve and maximize the use of Alaska's natural resources consistent with the public interest."
Program Name	Alaska Geospatial Council
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 06 - Natural Resources Conservation
Tertiary Business Use	BU 15 - Flood Risk Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required
Other	Required
Other description	Tidal datums

General Geographic Area and Size	
Average geographic extent of day-to-day area	200,000 sq mi - 2 million sq mi (e.g. large state, large multi-state region such as the Great Basin, standard Federal region, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Houses, buildings, archaeological sites, roads, pipelines, and other infrastructure.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2		QL1B	Order 1

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Update Frequency	(a) 2-3 years (b) 4-5 years		Dependent on location's rate of change. Rapidly changing areas should be refreshed every 2-3 years, many other places can do 4-5 years. Many areas the rate of change is unknown.	Dependent on location's rate of change. Rapidly changing areas should be refreshed every 2-3 years, many other places can do 4-5 years. Many areas the rate of change is unknown.
Event type(s)				
Quality Level and/or update frequency variability across AOI	Baseline 4-5 years, High erosion areas need more frequent data collection (2-3 years). High erosion occurs in northern, western, and south-central Alaska.		Dependent on locations, typically areas near populations/infrastructure/resources/special habitat/rapid change need more frequent mapping.	Dependent on locations, typically areas near populations/infrastructure/resources/special habitat/rapid change need more frequent mapping.
Acceptable Horizontal Error	Up to 1 meter		Up to 1 meter	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm		Up to 50 cm	Less than 1 meter
How far onshore needed			Any area that could be prone to flooding. In some areas it will be less than 500 meters inland, in others it will be > 1 km inland.	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			Tide correction using MHW, MSL or MLLW depending on data type and application.	Tide correction using MHW, MSL or MLLW depending on data type and application.
Cross sections and/or transects meet needs			Partial	Partial

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross section/transect requirement			Requirements are highly variable, depending on the local area. Areas with complicated bathymetry need full coverage. Areas on wide shallow sloped mud flats can be adequately characterized by widely spaced transects.	Requirements are highly variable, depending on the local area. Areas with complicated bathymetry need full coverage. Areas on wide shallow sloped mud flats can be adequately characterized by widely spaced transects.

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have		Nice to have	Nice to have		Nice to have
Entire AOI under same environmental conditions	Highly desirable		Highly desirable	Highly desirable		Highly desirable
Other	Nice to have		Nice to have	Nice to have		
Other description	It is impracticable to get the entire State of Alaska in one season, but areas of collection would be nice to have in the same season for multiple datasets for data collections.		It is impracticable to get the entire State of Alaska in one season, but areas of collection would be nice to have in the same season for multiple datasets for data collections.	It is impracticable to get the entire State of Alaska in one season, but areas of collection would be nice to have in the same season for multiple datasets for data collections.		
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have		Nice to have	Nice to have		Nice to have
DEM for entire AOI needs to be seamless	Highly desirable		Highly desirable	Highly desirable		Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required		Required	Required
DTM	Highly desirable		Highly desirable	Highly desirable
DEM	Required		Required	Required
Raw point cloud data	Nice to have		Nice to have	Nice to have
Classified point cloud	Highly desirable		Highly desirable	
Edited/cube XYZ			Nice to have	Nice to have
Full waveform	Not required		Not required	Not required
Bathymetric Attributed Grid (BAG)			Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Required	Required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Nice to have		Nice to have	Nice to have
Ground control/ground truthing	Highly desirable		Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required		Required	Required
Underwater videography			Highly desirable	Highly desirable
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Required	Required
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Highly desirable		Highly desirable	Highly desirable
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Nice to have	Nice to have
Tide/wave heights			Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Sea ice conditions			Required	Required
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Required	Required
Routes			Required	Required
Offshore cadastral			Highly desirable	Highly desirable
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Required	Required
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates	Highly desirable		Highly desirable	
Land use/land cover	Highly desirable		Highly desirable	Highly desirable
Wetlands	Highly desirable		Highly desirable	Highly desirable
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Highly desirable		Nice to have	
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable		Highly desirable	
Cultural resources	Required		Required	
Coastal and riverine structures	Required		Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	IfSAR and lidar where available, best available		Nearshore bathymetry in use varies from modern surveys to pre-1867. Continuous elevation data form the nearshore through the tidal zone is basically non-existent for most of the state.	Nearshore bathymetry in use varies from modern surveys to pre-1867. Continuous elevation data form the nearshore through the tidal zone is basically non-existent for most of the state.
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes		Yes	Yes
NCEI				

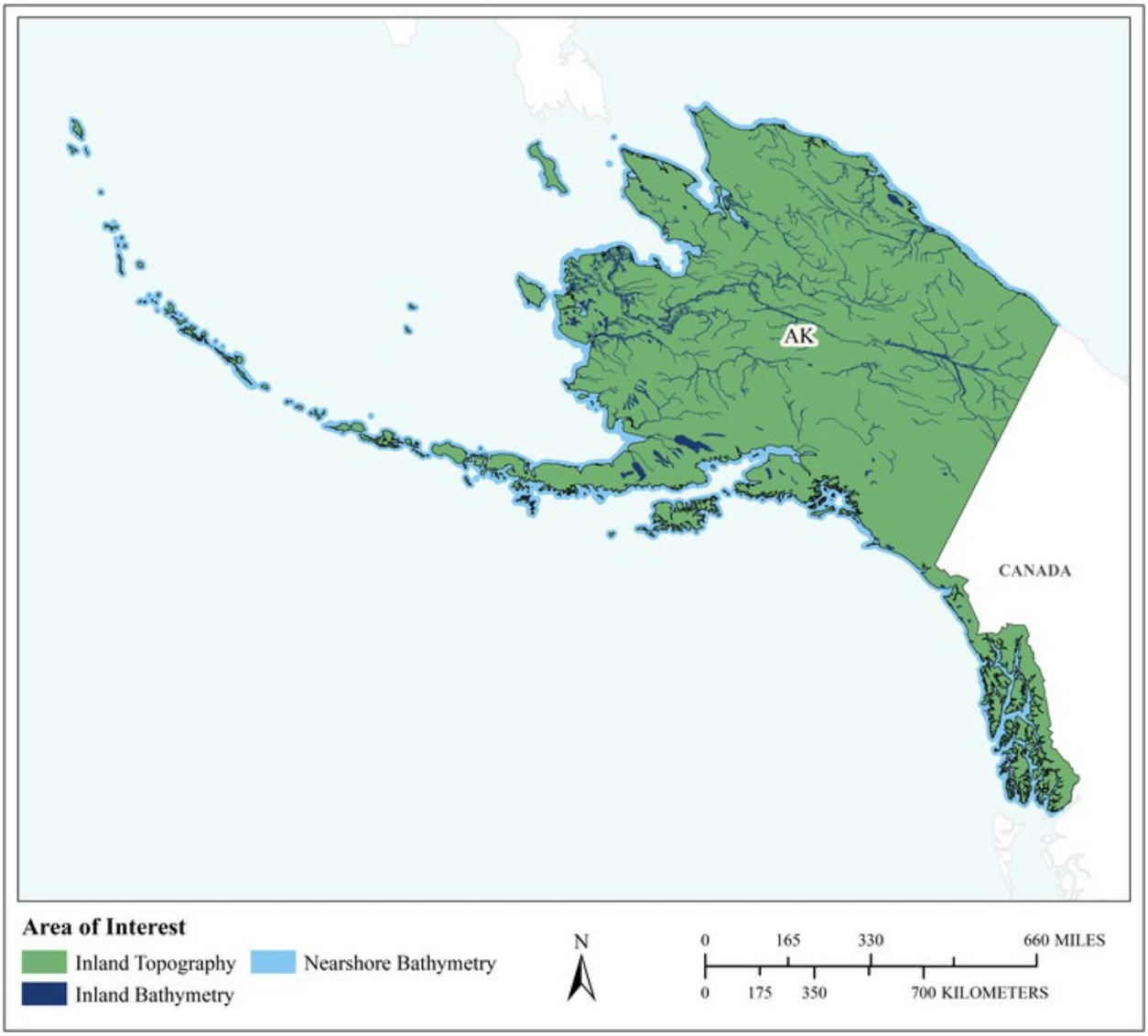
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	DGGS data portal			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know		I don't know	I don't know
Cost savings/cost reduction	I don't know		I don't know	I don't know
Cost avoidance	I don't know		I don't know	I don't know
Increased revenues	I don't know		I don't know	I don't know
Mission-driven performance improvements	I don't know		I don't know	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know		I don't know	I don't know
Improved response or timeliness	I don't know		I don't know	I don't know
Improved customer experience	I don't know		I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know		I don't know	I don't know
Environmental	I don't know		I don't know	I don't know
Public safety, including life and property	I don't know		I don't know	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Time savings description	Including non-actions made due to lack of data.						Including non-actions made due to lack of data. Few data sets are currently available.			Few data sets are currently available. Including non-actions made due to lack of data.		
Cost savings/cost reduction	I don't know	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction description							Most areas will continue to go unsurveyed without outside funding.			Most areas will continue to go unsurveyed without outside funding.		
Cost avoidance	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Cost avoidance description	Including errors made due to lack of data.						Most areas will continue to go unsurveyed without outside funding. Including errors made due to lack of data.			Most areas will continue to go unsurveyed without outside funding. Including errors made due to lack of data.		
Increased revenues	Moderate	Unable to provide					Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues description	Shipping related to natural resource extraction and shipping of goods statewide. Likely natural resource extraction and tourism.						Shipping related to natural resource extraction and shipping of goods statewide. Likely natural resource extraction and tourism.			Shipping related to natural resource extraction and shipping of goods statewide. Likely natural resource extraction and tourism.		
Mission-driven performance improvements	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,495,953					Annual dollars saved/ realized	$6,912,191		Annual dollars saved/ realized	$2,416,364
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness description	Currently very little customer assistance.						Currently very little customer assistance.			Currently very little customer assistance.		
Improved customer experience	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Improved customer experience description							Much of this data does not exist, thus is unavailable.			Much of this data does not exist, thus is unavailable.		
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$261,523					Annual dollars saved/ realized	$11,692,799		Annual dollars saved/ realized	$482,429
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate						Moderate			Moderate		
Education or outreach description	Information and data available to communities						Information and data available to communities			Information and data available to communities		
Environmental	Major						Major			Major		
Environmental description	Key data available for analysis in environmental decisions						Key data available for analysis in environmental decisions			Key data available for analysis in environmental decisions		
Public safety, including life and property	Major						Major			Major		
Public safety, including life and property description	Key data available for good coastal management						Key data available for good coastal management			Key data available for good coastal management		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	Yes
Contours			Yes	Yes
Hillshades	Yes		Yes	
Slope maps				
Aspect maps				
Curvature maps				
Cross sections	Yes		Yes	
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Forest Resources Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Forest health assessment. Determination of standing inventory of forest resources. Prescribed burn planning. Analysis of carbon stocks for trade. Harvest systems planning.
MCA Title	Forest Resources Management
MCA ID	60007
Organization Type	State or U.S. Territorial government
Organization Name	State of Alaska
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL2B	
Update Frequency	2-3 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Not required		Highly desirable	Nice to have
Entire AOI under same environmental conditions	Required	Required	Highly desirable		Required	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Not required	Not required	
DTM	Required	Not required	Not required	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Highly desirable	Required	
Classified point cloud	Required	Highly desirable	Required	
Edited/cube XYZ		Not required	Not required	
Full waveform	Nice to have	Nice to have	Not required	
Bathymetric Attributed Grid (BAG)		Nice to have	Not required	
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Not required	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Not required	
Ground control/ground truthing	Highly desirable	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Not required	
Subbottom characteristics			Not required	
Geologic and seismic data	Nice to have	Not required	Not required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Not required	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Required	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates	Nice to have	Required	Required	
Land use/land cover	Required	Required	Required	
Wetlands	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Highly desirable	Required		
Landmark features	Nice to have	Nice to have	Not required	
Cultural resources	Highly desirable	Nice to have	Not required	
Coastal and riverine structures	Nice to have	Required	Not required	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	I don't know	
Cost savings/cost reduction	Major	Major	I don't know	
Cost avoidance	Major	Major	I don't know	
Increased revenues	Minor	Moderate	I don't know	
Mission-driven performance improvements	Major	Major	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	I don't know	

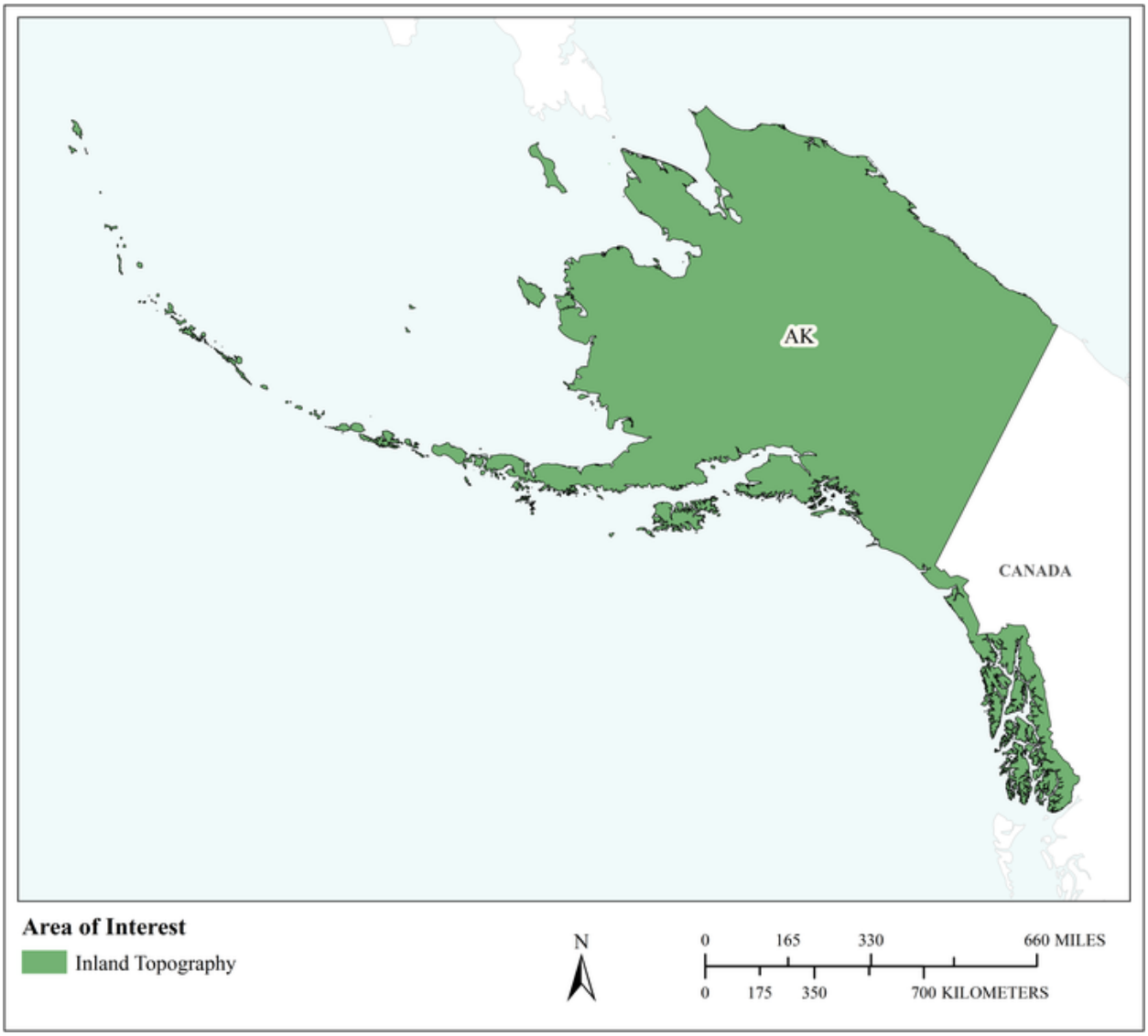
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	Major	I don't know	
Improved customer experience	Moderate	Major	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Major	Major	
Environmental	Major	Major	Major	
Public safety, including life and property	Moderate	Major	I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,309,579									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$3,348,010									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major					
Environmental	Major			Major			Major					
Public safety, including life and property	Major			Major			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes	Yes	
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes		Yes	
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Rangeland Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Assessment of rangeland health. Mapping for soil erosion potential due to grazing.
MCA Title	Rangeland Management
MCA ID	60008
Organization Type	State or U.S. Territorial government
Organization Name	State of Alaska
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 05 - Rangeland Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Highly desirable			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Not required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None			
Cost savings/cost reduction	None			
Cost avoidance	None			
Increased revenues	None			
Mission-driven performance improvements	None			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None			

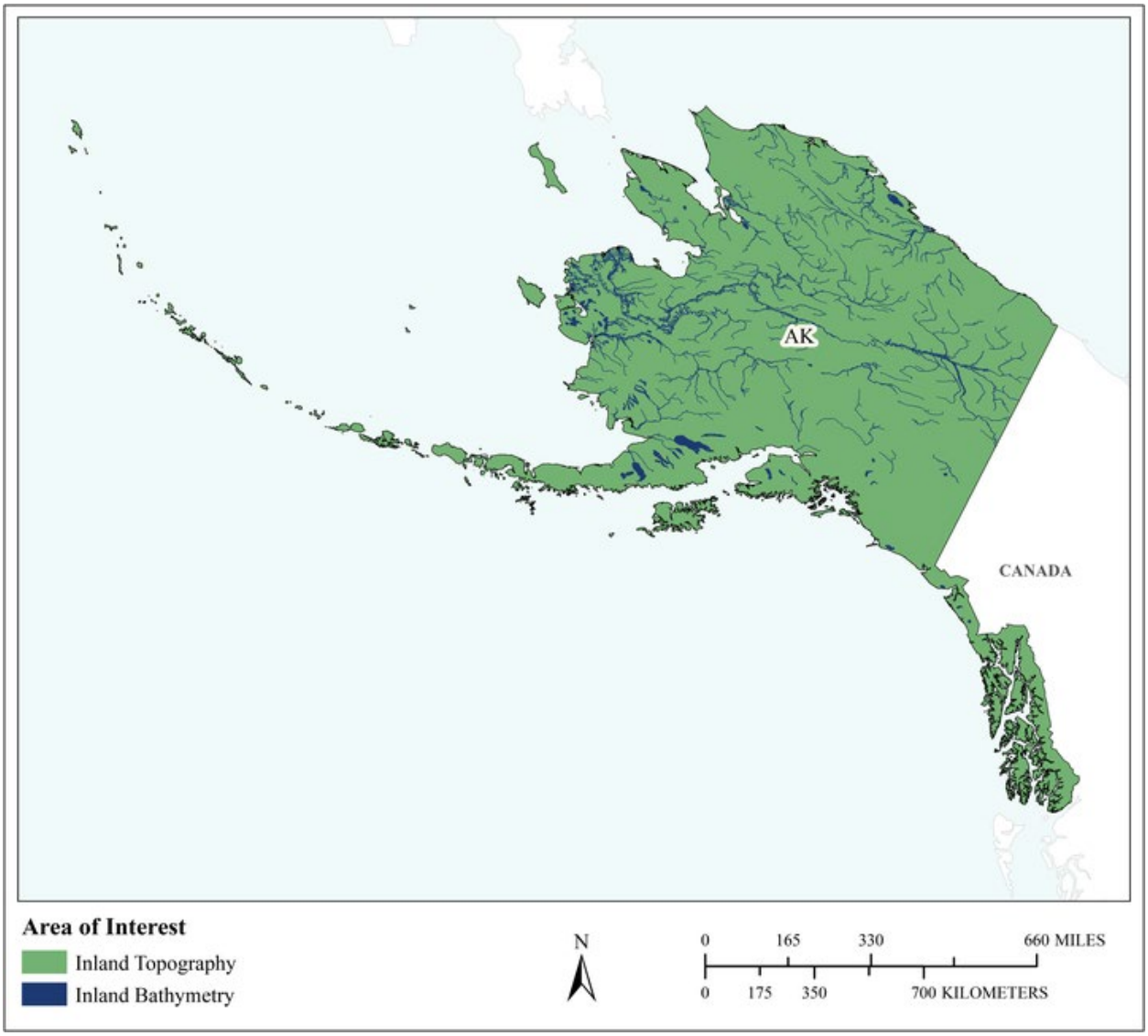
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	None			
Improved customer experience	None			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	None			
Public safety, including life and property	None			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	None											
Cost avoidance	Minor	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Natural Resources Conservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Forest management, fisheries management, hydrographic mapping (stream channel analysis and mapping), conservation engineering, flooding/inundation analyses
MCA Title	Natural Resources Conservation
MCA ID	32660
Organization Type	Private or Commercial
Organization Name	The Nature Conservancy
Sub-Agency or Division	
Organization Mission	Conservation Science
Program Name	Integrated Hydrography, Forest Management
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	BU 04 - Forest Resources Management
Tertiary Business Use	BU 09 - Fisheries Management and Aquaculture

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Any feature resolved by 0.5 meter resolution DEM

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL2B		
Update Frequency	6-10 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Up to 1 meter		
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed	To MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs		Partial		
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Nice to have	Nice to have			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have			Nice to have	
DEM for entire AOI needs to be seamless	Required	Nice to have			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Nice to have		
DTM	Nice to have	Nice to have		
DEM	Required	Highly desirable		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Required	Nice to have		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required	Highly desirable		
Ground control/ground truthing	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Nice to have	Nice to have		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Highly desirable		
Land use/land cover	Highly desirable	Nice to have		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Nice to have		
Landmark features	Highly desirable	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL1 lever LiDAR and associated derived products (DEM, DSM, Breaklines, contours, building footprints)	None available		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor	Inland bathy data not available		
Cost savings/cost reduction	Minor	Inland bathy data not available		

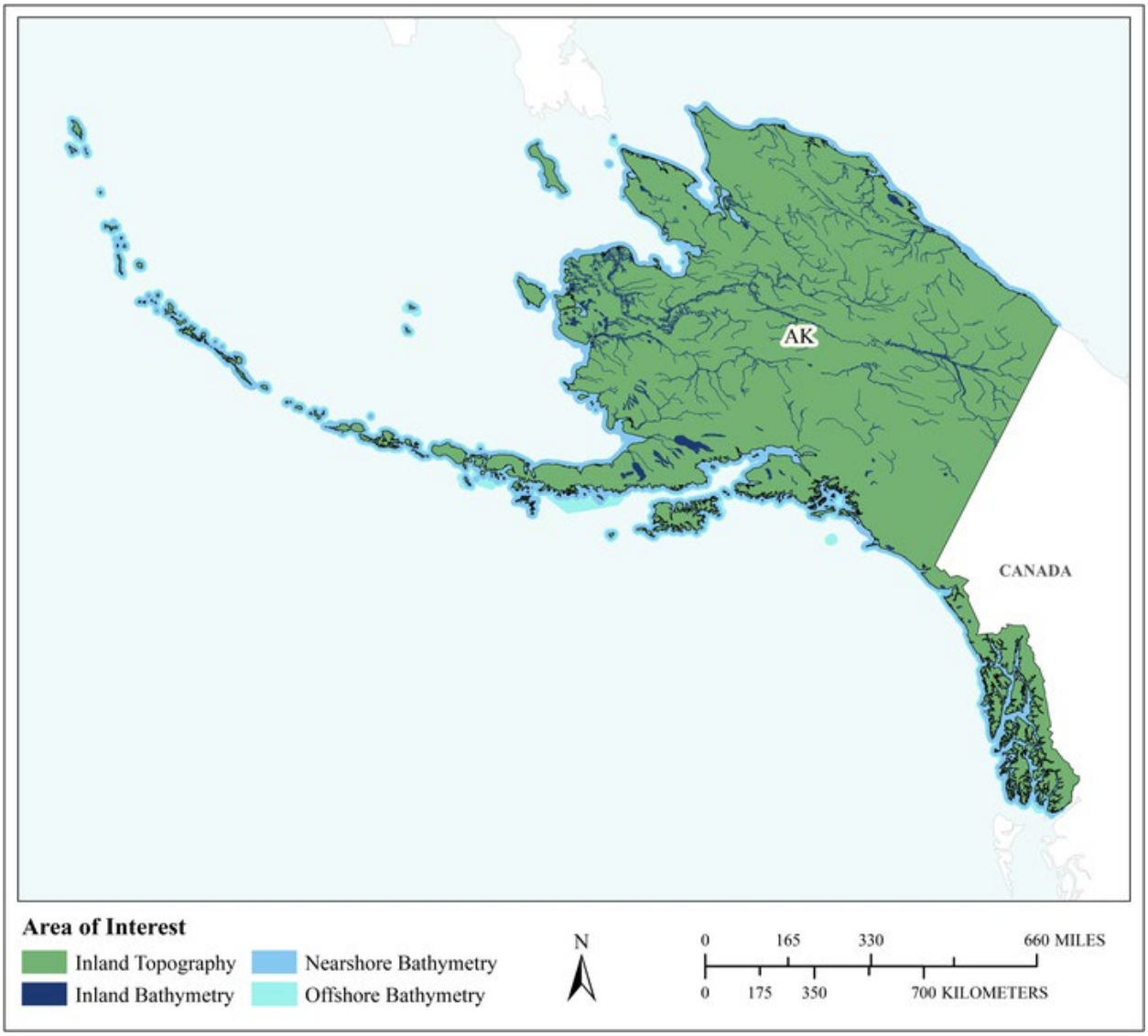
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost avoidance	Minor	Inland bathy data not available		
Increased revenues	Minor	Inland bathy data not available		
Mission-driven performance improvements	Minor	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Inland bathy data not available		
Improved response or timeliness	I don't know	Inland bathy data not available		
Improved customer experience	I don't know	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Inland bathy data not available		
Environmental	Moderate	Inland bathy data not available		
Public safety, including life and property	I don't know	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction	Minor	Unable to provide		I don't know	Unable to provide							
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide							
Increased revenues	Major	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$22,911,703		Annual dollars saved/ realized	$3,105,423						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	Major	Unable to provide		I don't know	Unable to provide							
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$84,138,763		Annual dollars saved/ realized	$139,798						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			I don't know								
Environmental	Major			I don't know								
Public safety, including life and property	Major			I don't know								
Other												
Other benefits	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Habitat Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Ensure sustainability and harvestable surplus of fish and wildlife resources. Elevation data are needed for habitat assessment and management for mammals, both marine and terrestrial. Anadromous fish habitats are modeled using slope and elevation. Commercial fisheries abound.
MCA Title	Habitat Management
MCA ID	21489
Organization Type	State or U.S. Territorial government
Organization Name	Alaska Department of Fish & Game
Sub-Agency or Division	
Organization Mission	To protect, maintain, and improve the fish, game, and aquatic plant resources of the state, and manage their use and development in the best interest of the economy and the well-being of the people of the state, consistent with the sustained yield principle.
Program Name	Fishing and Hunting
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	BU 09 - Fisheries Management and Aquaculture
Tertiary Business Use	BU 27 - Recreation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	200,000 sq mi - 2 million sq mi (e.g. large state, large multi-state region such as the Great Basin, standard Federal region, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Small streams to shrub in that we can identify the extent and path of very small streams and small features for potential habitat identification. Underwater habitat, rock ledges for commercial fisheries.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required

Inland Bathy Feature Size Requirements	Response
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B	QL0B	Special Order
Update Frequency	4-5 years	4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI	Statewide would be nice for stream management.			
Acceptable Horizontal Error	Up to 30 cm	The best horizontal accuracy achievable for the vertical accuracy I need	Up to 1 meter	Up to 1 meter
Acceptable Vertical Error	Up to 10 cm	Up to 20 cm	Up to 20 cm	Less than 1 meter
How far onshore needed			To Mean Lower Low Water (MLLW)	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MLLW	MLLW
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Highly desirable	Highly desirable	Highly desirable	Required	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Highly desirable	Highly desirable	Highly desirable
Raw point cloud data	Nice to have	Nice to have	Nice to have	Nice to have
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Not required	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	Highly desirable

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required	Required	Highly desirable	Highly desirable
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Nice to have	Highly desirable	Highly desirable	Highly desirable
Water column properties - Physical			Highly desirable	Highly desirable
Water column properties - Chemical			Highly desirable	Highly desirable
Water column properties - Biological			Highly desirable	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Highly desirable
Sea ice conditions			Highly desirable	Highly desirable
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Highly desirable	Highly desirable
Routes			Nice to have	Highly desirable
Offshore cadastral			Nice to have	Highly desirable
Lease areas			Nice to have	Highly desirable
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Highly desirable	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Lidar for a few areas 1 m bare earth DEM w/ hydro flattening 2011 Alaska IfSAR DSM image service From AGC Hillshade mosaic tileset generated from DTM IFSAR data From AGC akdem300m Statewide DEM with 300-m. resolution from AGDC 2002 sections of USGS NED 2 arc-second 1 x 1 degree ArcGrid 2017 sections of USGS NED 1/3 arc-second 1 x 1 degree ArcGrid 2015 Mid-Accuracy DEM Kenai Peninsula 2016	We have acquired our own bathy on many lakes, quality is moderate as it is gathered by untrained biologist. Otherwise we use whatever can be found online such as AOOS and NOAA	NOAA	NOAA
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			

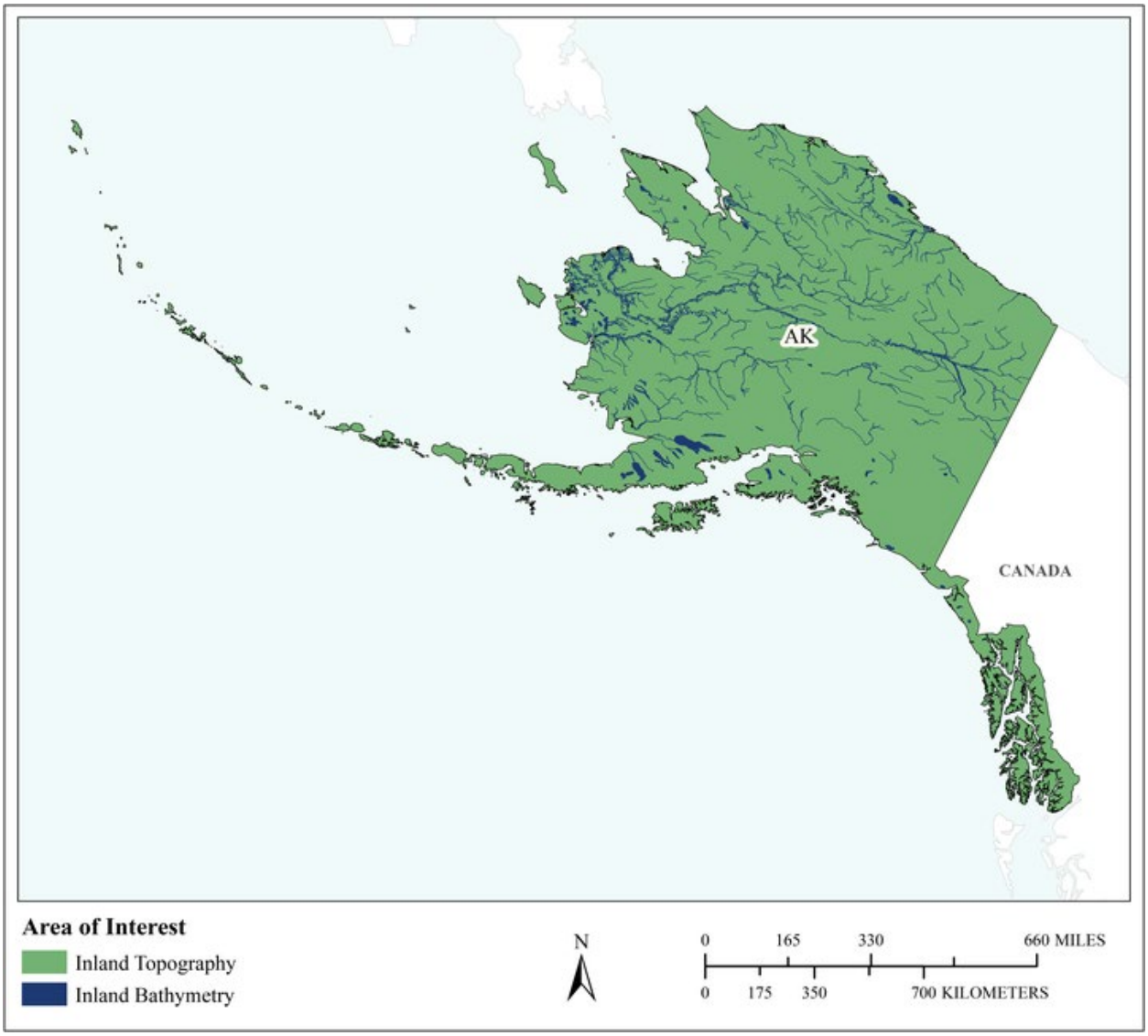
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Digital Coast				
NCEI		Yes	Yes	Yes
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	AGC (Alaska geospatial Council) the state's acquired imagery and elevation data in process			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Moderate	Minor
Cost savings/cost reduction	Major	Moderate	Moderate	Minor
Cost avoidance	Major	Minor	Major	Moderate
Increased revenues	None	None	None	None
Mission-driven performance improvements	Moderate	Minor	Minor	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Major	Major
Improved response or timeliness	Minor	Minor	Minor	Moderate
Improved customer experience	Moderate	Moderate	Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	Moderate	Moderate
Environmental	Moderate	Moderate	Major	Major
Public safety, including life and property	Moderate	Moderate	Major	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$241	Major	Annual dollars saved/realized	$603	Major	Annual dollars saved/realized	$17,487	Major	Annual dollars saved/realized	$17,487
Time savings description	Same maps and models different data. On site required regardless. Processes often only done once a year. If accuracy is better.			Project avoidance. Habitat determination.			Habitat determination. Population estimation/habitat.			Population estimation/habitat.		
Cost savings/cost reduction	None			None			None			Minor	Unable to provide	
Cost savings/cost reduction description										Processes often only done once a year.		
Cost avoidance	Moderate	Unable to provide		Minor	Annual dollars saved/realized	$3,618	Moderate	Annual dollars saved/realized	$7,538	Moderate	Annual dollars saved/realized	$3,316
Cost avoidance description	Avoiding reworking data.			Avoiding reworking data.			Avoiding reworking data.			Avoiding reworking data.		
Increased revenues	None			None			None			None		
Mission-driven performance improvements	Moderate	Annual percent improvement	5%	Moderate	Annual percent improvement	3%	Moderate	Annual percent improvement	2%	Moderate	Annual percent improvement	2%
Mission-driven performance improvements description				Improved modeling.			Improved modeling.			Improved modeling.		
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Minor	Annual dollars saved/realized	$2,412	Minor	Annual dollars saved/realized	$1,206	Minor	Annual dollars saved/realized	$1,206
Value added to products or services description				Area management/Habitat determination.			Area management/Habitat determination.			Area management/Habitat determination.		
Improved response or timeliness	Major	Annual dollars saved/realized	$4,522	Minor	Annual dollars saved/realized	$3,015	Minor	Annual dollars saved/realized	$1,206	Minor	Annual dollars saved/realized	$1,206
Improved response or timeliness description				Area management/customer service.			Area management/customer service.			Area management/customer service.		
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience description				Education outreach/management.			Education outreach/management.			Education outreach/management.		
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate			Minor		
Education or outreach description	Education outreach/improved management			Education outreach/improved management			Education outreach/improved management			Education outreach/improved management		
Environmental	Moderate			Minor			Moderate			Minor		
Environmental description	Education outreach/improved management			Education outreach/improved management			Education outreach/improved management			Education outreach/improved management		
Public safety, including life and property	Moderate			Minor			Moderate			Moderate		
Public safety, including life and property description	Education outreach/improved management			Education outreach/improved management			Education outreach/improved management			Education outreach/improved management		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes	Yes	Yes	Yes
Curvature maps				
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Agriculture and Precision Farming



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Farm pond design. Irrigation system design. Detailed site analysis to support precision farming. Analysis of farm sedimentation and runoff. Calibration of fertilizer application, fertilizer management, and irrigation planning. Optimized terraforming.
MCA Title	Agriculture and Precision Farming
MCA ID	60009
Organization Type	State or U.S. Territorial government
Organization Name	State of Alaska
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 08 - Agriculture and Precision Farming
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Nice to have
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL4B		
Update Frequency	2-3 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 10 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 50 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required			Not required	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Not required	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Not required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level			Up to double the required TVU at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Nice to have	Nice to have		
Edited/cube XYZ		Highly desirable		
Full waveform	Nice to have	Highly desirable		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Required	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Highly desirable		
Land use/land cover	Highly desirable	Required		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Nice to have	Required		
Cultural resources	Nice to have	Highly desirable		
Coastal and riverine structures	Highly desirable	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	None		
Cost savings/cost reduction	Major	I don't know		
Cost avoidance	Major	Moderate		
Increased revenues	None	I don't know		
Mission-driven performance improvements	Moderate	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None		

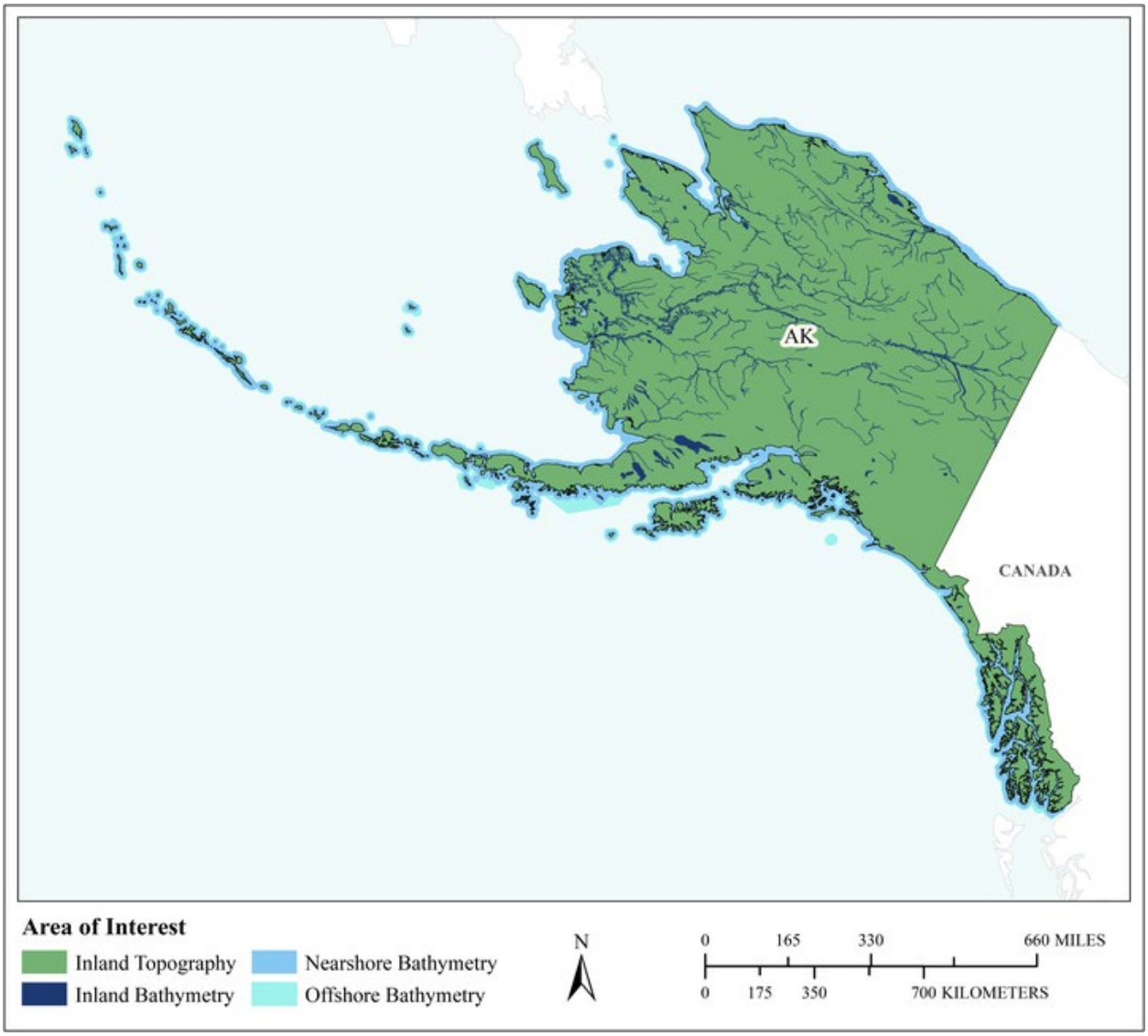
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	None		
Improved customer experience	Moderate	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	None		
Environmental	Major	I don't know		
Public safety, including life and property	Moderate	I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$676,309		Annual dollars saved/ realized	$1,184,901						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$536,154		Annual dollars saved/ realized	$536,154						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate								
Environmental	Major			Major								
Public safety, including life and property	Minor			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps				
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps		Yes		
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Fisheries Management and Aquaculture



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Management of fisheries. Sustainable aquaculture.
MCA Title	Fisheries Management and Aquaculture
MCA ID	60010
Organization Type	State or U.S. Territorial government
Organization Name	State of Alaska
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B	QL0B	Special Order
Update Frequency	2-3 years	6-10 years	6-10 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Nice to have	Nice to have	Required	Nice to have
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Required	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Required
DTM	Required	Highly desirable	Highly desirable	Nice to have
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Nice to have	Highly desirable	Nice to have
Classified point cloud	Highly desirable	Nice to have	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Nice to have
Tide Predictions			Not required	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Highly desirable	Required
Ground control/ground truthing	Required	Highly desirable	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Nice to have	Required
Acoustic imagery of the seafloor			Highly desirable	Required
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Required
Underwater videography			Nice to have	Highly desirable
Bottom texture			Nice to have	Required
Bottom type			Highly desirable	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Highly desirable	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Required
Floating observation/navigation systems			Nice to have	Required
Shorelines – current, historic, change rates	Required	Highly desirable	Highly desirable	
Land use/land cover	Required	Highly desirable	Nice to have	Nice to have
Wetlands	Required	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Highly desirable
Inland surface water features	Required	Required	Nice to have	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Not required	
Coastal and riverine structures	Required	Highly desirable	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	Moderate
Cost savings/cost reduction	Major	Moderate	Major	Minor
Cost avoidance	Moderate	Moderate	Minor	Minor
Increased revenues	Moderate	Moderate	Minor	None
Mission-driven performance improvements	Major	Major	Moderate	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Minor	Moderate

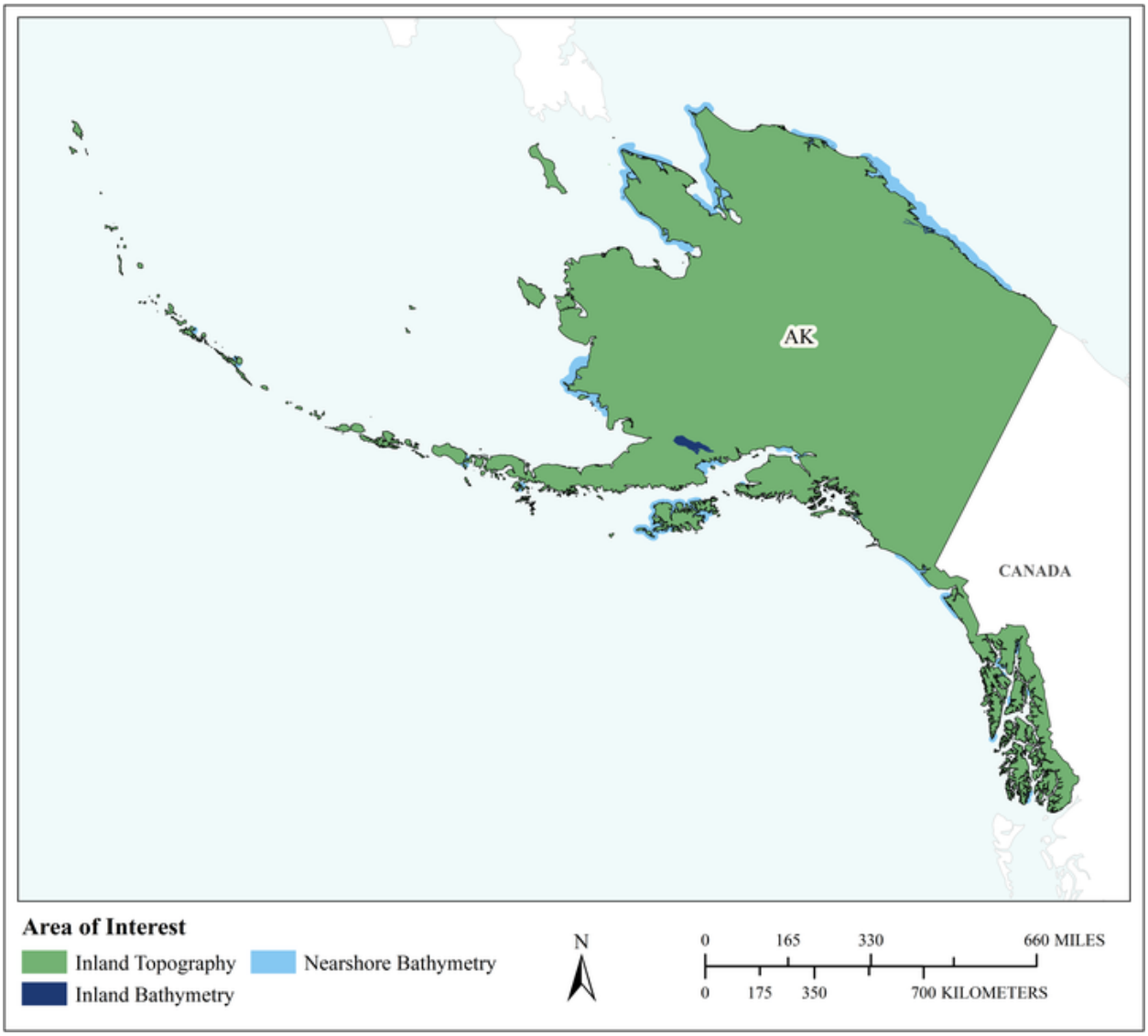
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major	Moderate	Minor
Improved customer experience	Moderate	Major	Minor	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Moderate	Moderate
Environmental	Major	Moderate	Moderate	Minor
Public safety, including life and property	Moderate	Minor	Minor	None

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		None		
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		None		
Increased revenues	Minor	Unable to provide		None			Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$597,110		Annual dollars saved/ realized	$1,168,810		Annual dollars saved/ realized	$6,336,771			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,296,971		Annual dollars saved/ realized	$531,972		Annual dollars saved/ realized	$465,386			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Moderate			Moderate		
Environmental	Moderate			Major			Major			Moderate		
Public safety, including life and property	Moderate			Moderate			Minor			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes		Yes	Yes
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Mapping of Geologic Resources and Geologic Hazards



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	Respondent provided own shapefile, KML, or geodatabase	Respondent provided own shapefile, KML, or geodatabase	
Sub Area Requirements		In areas of development (natural resources development such as oil and gas, mining)	Nearshore areas adjacent to respondent-defined areas	

MCA Description	Response
Mission Critical Activity	Mapping of geologic resources and geologic hazards within the State of Alaska. Elevation data are important to resource development activities (e.g. mining, oil, gas, coal, gravel, etc.), commercial and industrial activities, community development, transportation, geologic hazards analysis (e.g. landslide, earthquake, flooding, erosion, active faulting), and permafrost research for highway maintenance. Elevation data are also needed for mapping the impacts of removing resources, moving infrastructure, long term planning, and tsunami modeling.
MCA Title	Mapping of Geologic Resources and Geologic Hazards
MCA ID	1092
Organization Type	State or U.S. Territorial government
Organization Name	Alaska Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGS)
Sub-Agency or Division	
Organization Mission	Determine the potential of Alaskan land for production of metals, minerals, fuels, and geothermal resources, the locations and supplies of groundwater and construction material, and the potential geologic hazards to buildings, roads, bridges, and other installations and structures (AS 41.08.020).
Program Name	Determining the potential of Alaskan land for production of metals, minerals, fuels, and geothermal resources, the locations and supplies of groundwater and construction material, and the potential geologic hazards to buildings, roads, bridges, and other installations and structures
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 13 - Oil and Gas Resources
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	200,000 sq mi - 2 million sq mi (e.g. large state, large multi-state region such as the Great Basin, standard Federal region, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	We want to see features for change detection, hydro-modeling, etc.)

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable

Inland Bathy Feature Size Requirements	Response
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Nice to have
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	Cross sections and/or transects meet needs	QL2B	
Update Frequency	6-10 years	6-10 years	6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI	Higher quality level surveys could be/are event driven. For example, a post landslide survey would require QL0 HD.		Coastline surveys close to communities is of more importance than coastline hundreds of miles from any populated area.	
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 40 cm	
How far onshore needed			To Mean Higher High Water (MHHW)	
How far down the beach profile needed	To MHW		To MLLW	
Tide correction requirement			MSL	
Cross sections and/or transects meet needs		Yes		
Cross section/transect requirement		Specifications vary by survey area. In some locations, we'd require highly precise data, in others, very rough data would be acceptable.		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Nice to have	Highly desirable		Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Nice to have	Highly desirable		Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Not required		Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Required	Highly desirable	Nice to have		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level		Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Required	
DTM	Required	Highly desirable	Required	
DEM	Required	Highly desirable	Required	
Raw point cloud data	Required	Nice to have	Nice to have	
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Not required	Not required	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Not required	Not required	
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Not required	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Required	Nice to have	Nice to have	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Nice to have	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Required	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Required	Required	Highly desirable	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Highly desirable	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Highly desirable	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Highly desirable	Highly desirable	Nice to have	
Wetlands	Highly desirable	Highly desirable	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Nice to have	
Inland surface water features	Required	Required	Nice to have	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Required	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	The data we use varies, ranging from the Polar DEM to 20 year old ifsar data. See https://elevation.alaska.gov	Best available	Best available	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	
NCEI	Yes	Yes	Yes	
Open Topography	Yes			
NOAA nautical charts		Yes		
USACE navigation charts			Yes	
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	https://elevation.alaska.gov			
Other	Yes			
Other description	https://elevation.alaska.gov			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	None	None	
Cost savings/cost reduction	Major	None	None	

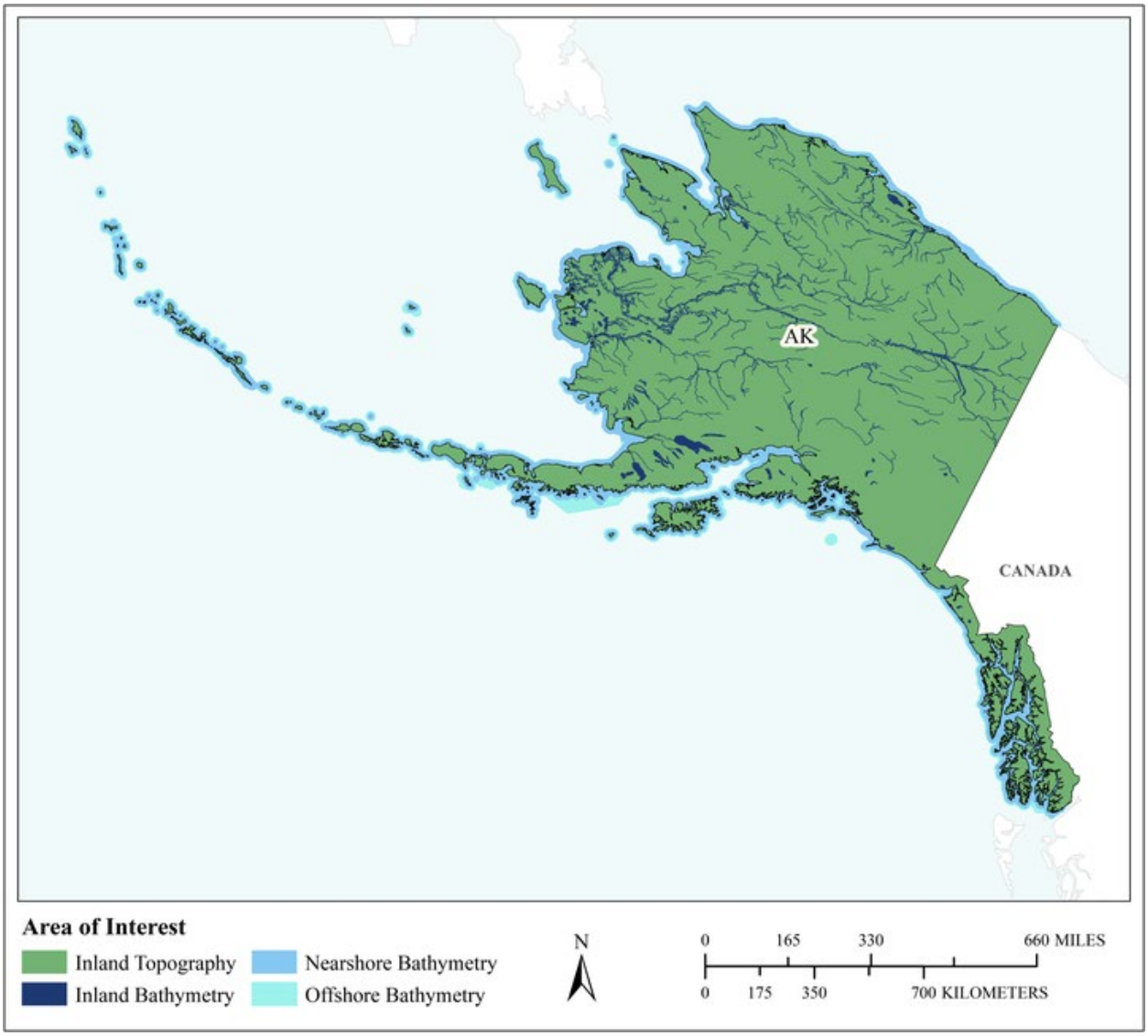
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Cost avoidance	Major	None	None	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	None	None	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate	None	
Improved response or timeliness	Moderate	Minor	Minor	
Improved customer experience	Moderate	Minor	None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	None	
Environmental	Moderate	Moderate	None	
Public safety, including life and property	Moderate	Moderate	None	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Increased revenues	Minor	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$123,306,248		Annual dollars saved/ realized	$12,019		Annual dollars saved/ realized	$658,786			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$2,164,641		Annual dollars saved/ realized	$13,207		Annual dollars saved/ realized	$1,059,961			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know			I don't know					
Environmental	I don't know			I don't know			I don't know					
Public safety, including life and property	I don't know			I don't know			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Natural Resource Management of State Lands and Water



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Natural Resource Management of State Lands and Water. Specifically evaluation of uses such as mining or gravel extraction to determine impacts and to make regulatory decisions to determine if the activity is warranted, to monitor resources relative to surrounding areas during extraction, and to identify needed restoration/reclamation after extraction, if needed. Elevation data are also needed to identify the quantity of gravel available for extraction.
MCA Title	Natural Resource Management of State Lands and Water
MCA ID	21756
Organization Type	State or U.S. Territorial government
Organization Name	Alaska Department of Natural Resources, Division of Mining, Land, and Water
Sub-Agency or Division	
Organization Mission	The Division of Mining, Land and Water (DMLW) manages all state-owned land except for trust property and units of the Alaska State Park System. DMLW also manage Alaska's 65 million acres of tidelands, shorelands, and submerged, including some 34,000 miles of coastline. The Water Section within DMLW manages all of the state's water resources. Within the Water Section is the Alaska Dam Safety Program. The Mining Section is responsible for the regulation of hard rock, coal and placer mines in the State. This includes the approval of the operation and reclamation plan for hard rock and placer mines on state owned lands and operation and reclamation plans for coal mining on all lands in the State.
Program Name	Division of Mining, Land and Water (DMLW); Mining Section; Water Section; and Alaska Dam Safety Program
Total Annual Program Budget	
Primary Business Use	BU 11 - Geologic Resource Mining and Extraction
Secondary Business Use	BU 01 - Water Supply and Quality
Tertiary Business Use	BU 15 - Flood Risk Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)

General Geographic Area and Size	
Description of smallest 3D features	For the division's work I would split out two levels of detail. For general adjudication for permits, being able to being able to distinguish trails (1-2 m wide) and structures. For Navigation and Survey Section work, being able to pick up rocks and the beds of small streams would make their work easier.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL3B	Order 1b
Update Frequency	4-5 years	4-5 years	Event driven only – Data need to coincide with a specific event.	4-5 years
Event type(s)			New development or other activity along the shore.	
Quality Level and/or update frequency variability across AOI	In areas of active development or in areas where there are significant changes in land form a more frequent collection would be necessary.			
Acceptable Horizontal Error	Up to 30 cm	Less than 50 cm	Up to 2 meters	Up to 10 meters
Acceptable Vertical Error	Up to 10 cm	Up to 20 cm	Up to 30 cm	Up to 5 meters
How far onshore needed			To Mean Higher High Water (MHHW)	
How far down the beach profile needed	Below MLLW		Below MLLW	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement			I don't know	MLLW
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Highly desirable

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Not required	Nice to have
Entire AOI under same environmental conditions	Required	Required	Nice to have	Nice to have	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Nice to have	Nice to have
DTM	Required	Highly desirable	Nice to have	Nice to have
DEM	Required	Highly desirable	Nice to have	Nice to have
Raw point cloud data	Required	Highly desirable	Highly desirable	Highly desirable
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Not required	Not required	Not required
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Required	Highly desirable	Nice to have	Nice to have
Ground control/ground truthing	Highly desirable	Highly desirable	Nice to have	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Highly desirable	Not required	Not required
Underwater videography			Not required	Not required
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Nice to have	Not required	Not required	Not required
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Not required	Not required
Tide/wave heights			Not required	Not required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Not required	Not required
Fixed obstructions			Not required	Not required
Floating observation/navigation systems			Not required	Not required
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Nice to have	
Land use/land cover	Highly desirable	Not required	Nice to have	Nice to have
Wetlands	Highly desirable	Nice to have	Not required	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Nice to have	Nice to have
Inland surface water features	Highly desirable	Nice to have	Nice to have	
Bridges/culverts	Highly desirable	Nice to have		
Landmark features	Highly desirable	Nice to have	Nice to have	
Cultural resources	Highly desirable	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Nice to have	Not required	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Project specific data provided by applicant. Available topographic data on the national map. IfSAR Data.	River Transects/soundings.	Best available	Best available
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	https://elevation.alaska.gov/			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available	I don't know	I don't know

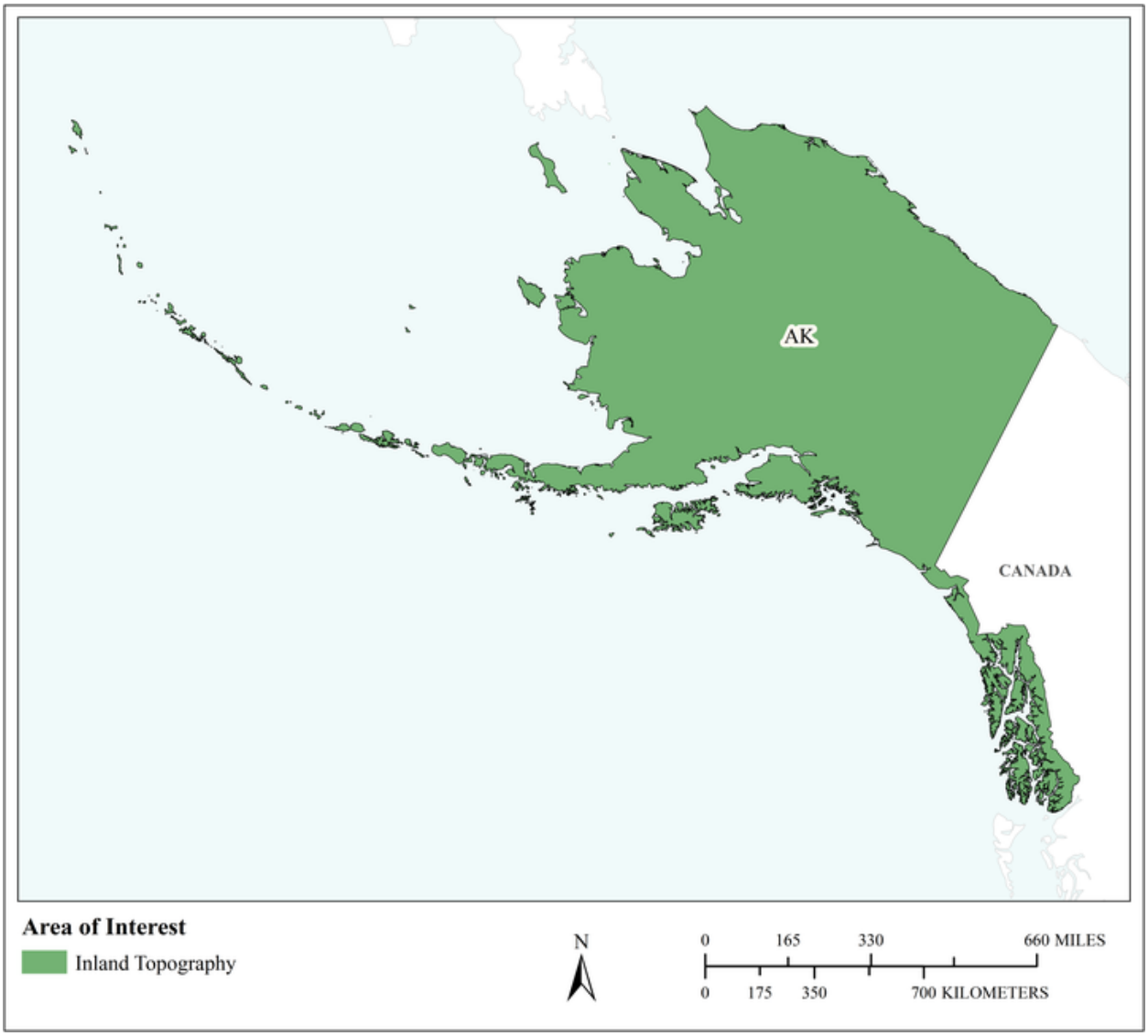
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost savings/cost reduction	Moderate	Inland bathy data not available	I don't know	I don't know
Cost avoidance	Moderate	Inland bathy data not available	I don't know	I don't know
Increased revenues	None	Inland bathy data not available	I don't know	I don't know
Mission-driven performance improvements	Moderate	Inland bathy data not available	I don't know	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Inland bathy data not available	I don't know	I don't know
Improved response or timeliness	Moderate	Inland bathy data not available	I don't know	I don't know
Improved customer experience	Moderate	Inland bathy data not available	I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Inland bathy data not available	I don't know	I don't know
Environmental	Major	Inland bathy data not available	I don't know	I don't know
Public safety, including life and property	None	Inland bathy data not available	I don't know	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Time savings description	We spend exorbitant amount of time scavenging for high quality 3D data for areas outside/adjacent to project areas.						Current project review is with current NOAA charts, USGS topos. I would expect significant time savings with new bathymetric products.					
Cost savings/cost reduction	None			I don't know	Unable to provide		None			I don't know	Unable to provide	
Cost avoidance	Minor	Unable to provide		I don't know	Unable to provide		None			I don't know	Unable to provide	
Increased revenues	Minor	Unable to provide		I don't know	Unable to provide		None			I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide		None			I don't know	Unable to provide	
Mission-driven performance improvements description	Any increase in the quality of topographic data adjacent to project would aid decision making within the Division.											
Future annual operational benefits added during validation		Annual dollars saved/ realized	$142,689									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	None			I don't know	Unable to provide		None			I don't know	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$94,652		Annual dollars saved/ realized	$9,759						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			I don't know			I don't know			I don't know		
Education or outreach description	Better/higher quality data would be tied into current outreach efforts to inform communities about project or other issues affection state lands.											
Environmental	Moderate			I don't know			Moderate			I don't know		
Public safety, including life and property	I don't know			I don't know			I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Renewable Energy Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Alternate energy development – solar, tidal, wind, wave, and ocean current. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Low head power potential for hydropower.
MCA Title	Renewable Energy Resources
MCA ID	60011
Organization Type	State or U.S. Territorial government
Organization Name	State of Alaska
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Not required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Minor			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor			

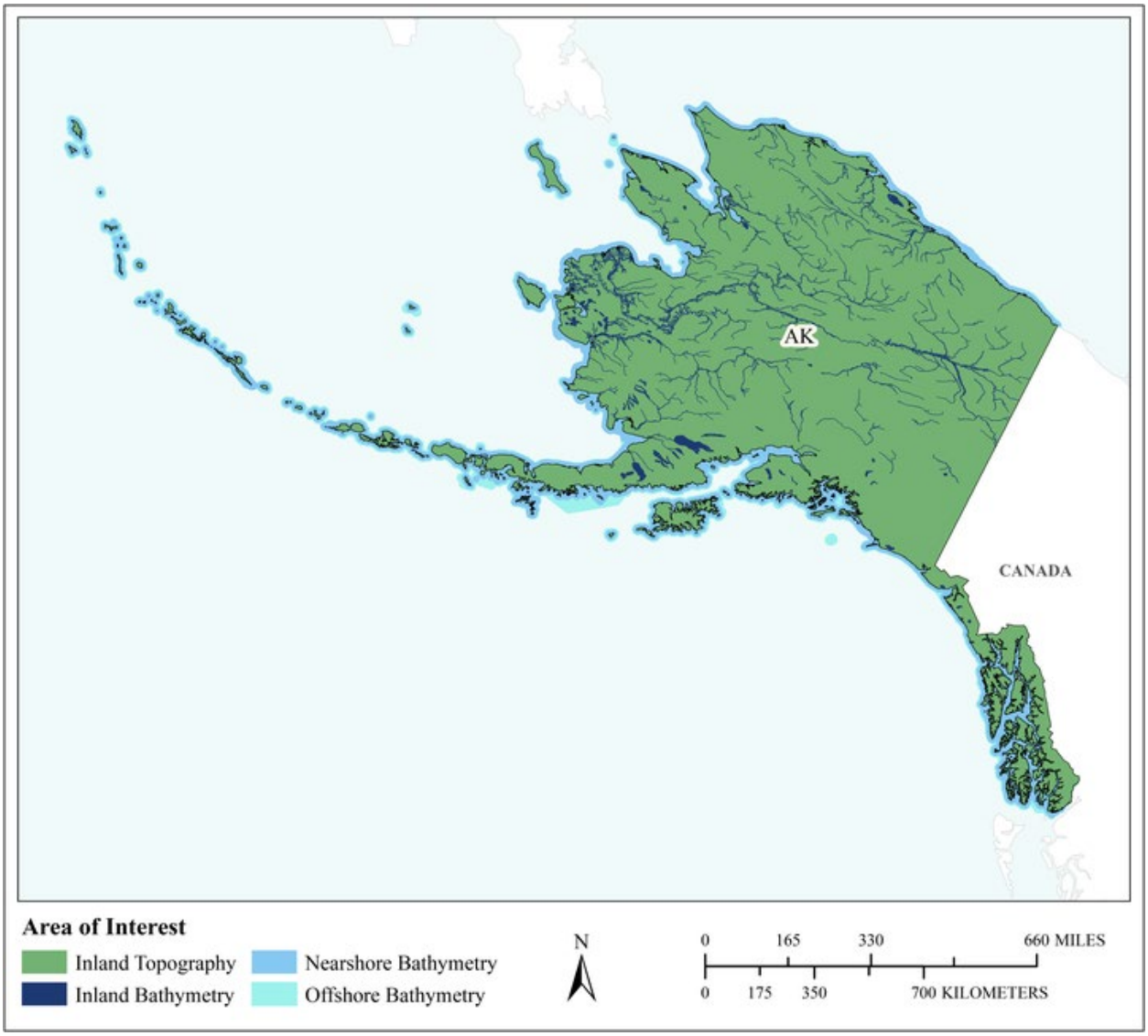
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	None											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Land Records



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Per Regulation: 11 AAC 53.020. Land records Land records trace the history of all land status from acquisition to disposal and consist of the following: (1) land status plats, which graphically portray all actions affecting state land and land in other ownership as required; these plats are for illustrative purposes only; the actual written documents remain the official record; there are two types of land status plats (A) land estate plats, which portray land actions and transactions on the surface of a township; and (B) mineral estate plats, which portray subsurface actions and transactions within a township; these plats may also show state tideland data; (2) the historical index, which is a narrative summary of and an index to state land actions and transactions that affect the title to, disposition of, or use status of state land or state tentatively approved land within a township; and (3) the serial register, which is a numerical index of land actions assigned division serial numbers.
MCA Title	Land Records
MCA ID	1209
Organization Type	State or U.S. Territorial government
Organization Name	Alaska Department of Natural Resources
Sub-Agency or Division	
Organization Mission	"Responsibly develop Alaska's resources by making them available for maximum use and benefit consistent with the public interest."
Program Name	Alaska Department of Natural Resources, Division of Mining, Land & Water; Division of Oil & Gas; Division of Forestry; and Division of Parks & Outdoor Recreation.
Total Annual Program Budget	
Primary Business Use	BU 13 - Oil and Gas Resources
Secondary Business Use	BU 17 - Wildfire Management, Planning, and Response
Tertiary Business Use	BU 30 - Maritime and Land Boundary Management

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Docks, mooring anchors, structures, tree, trails, roads, underwater wrecks

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable

Inland Bathy Feature Size Requirements	Response
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL2B	QL2B	Order 1a
Update Frequency	Annually	2-3 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need
Acceptable Vertical Error	Up to 10 cm	Up to 40 cm	Up to 40 cm	Less than 1 meter
How far onshore needed			To cover the beach slope	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			I don't know	I don't know
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Nice to have	Nice to have	Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Nice to have	Nice to have	Highly desirable	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Highly desirable	Highly desirable
DTM	Nice to have	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Highly desirable	Highly desirable	Highly desirable
Raw point cloud data	Nice to have	Nice to have	Nice to have	Nice to have
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Nice to have
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	Nice to have
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Underwater videography			Nice to have	Nice to have
Bottom texture			Nice to have	Nice to have
Bottom type			Nice to have	Nice to have
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Nice to have	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Highly desirable	Highly desirable
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Nice to have	Nice to have
Routes			Highly desirable	Highly desirable
Offshore cadastral			Highly desirable	Highly desirable
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Highly desirable	Highly desirable	Highly desirable	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	USGS Quadrangle maps	USGS Quadrangle maps	NOAA Bathymetric maps	NOAA Bathymetric Maps
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Elevation.alaska.gov			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Inland bathy data not available	I don't know	I don't know
Cost savings/cost reduction	Moderate	Inland bathy data not available	I don't know	I don't know
Cost avoidance	Moderate	Inland bathy data not available	I don't know	I don't know
Increased revenues	None	Inland bathy data not available	I don't know	I don't know

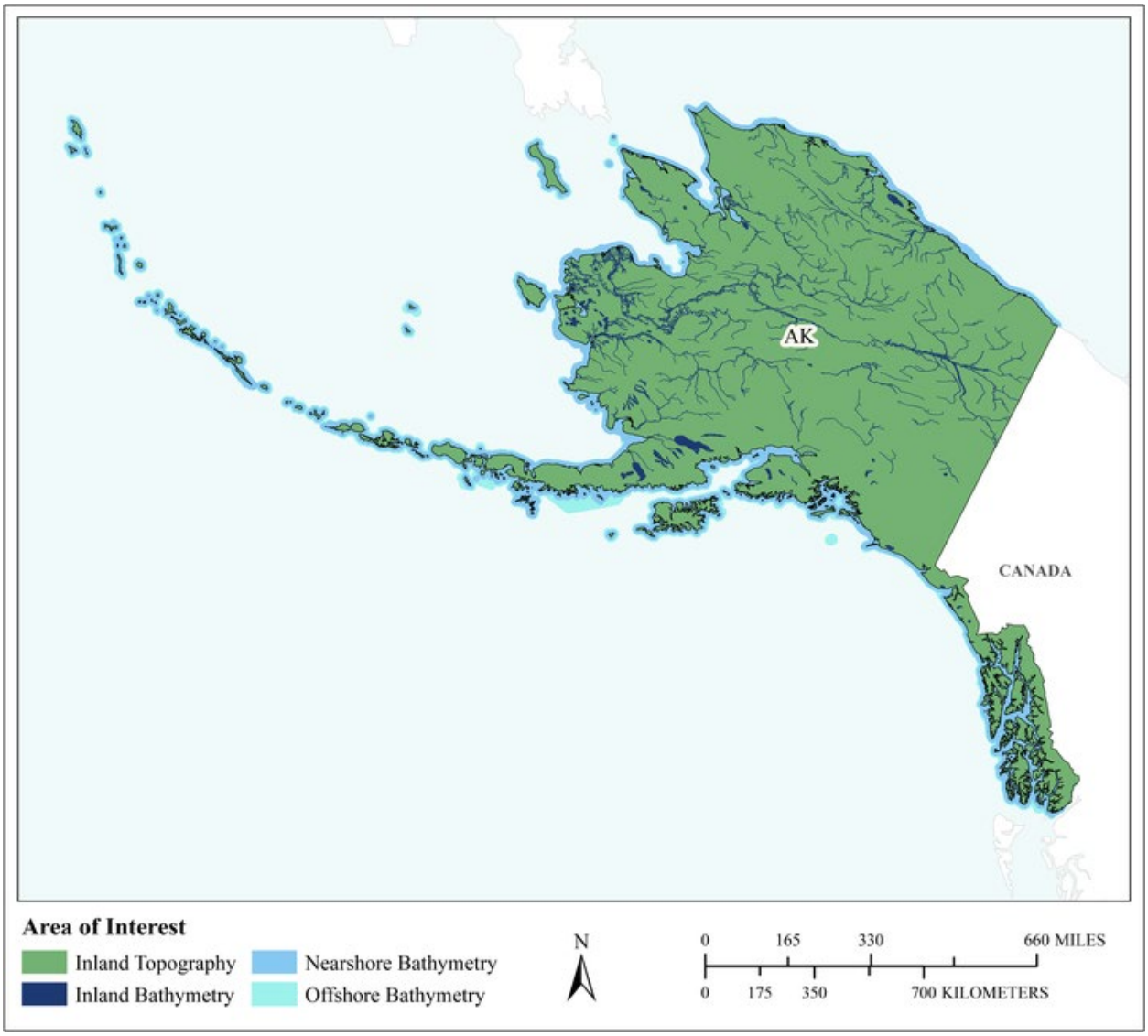
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Mission-driven performance improvements	Moderate	Inland bathy data not available	I don't know	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available	I don't know	I don't know
Improved response or timeliness	Moderate	Inland bathy data not available	I don't know	I don't know
Improved customer experience	Moderate	Inland bathy data not available	I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	Inland bathy data not available	I don't know	I don't know
Environmental	I don't know	Inland bathy data not available	I don't know	I don't know
Public safety, including life and property	I don't know	Inland bathy data not available	I don't know	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Time savings description	Having new elevation data would allow some workflows to take place as a GIS model rather than field work. Having current and accurate elevation data helps immensely with project evaluation and planning efforts. Having current and accurate 3D elevation data would help all parts of DNR avoid errors in data and analysis. Some other divisions may save time by having this data, but it doesn't affect what we do here.											
Cost savings/cost reduction	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction description	Data acquired, provided and supported through this program keeps DNR from having to acquire, house and serve similar data for the public.											
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$256,391					Annual dollars saved/ realized	$3,272,663			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know			I don't know			I don't know		
Environmental	I don't know			I don't know			I don't know			I don't know		
Public safety, including life and property	I don't know			I don't know			I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes		Yes	Yes
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes	Yes	
Hydrologic Flow Accumulation Grids		Yes	Yes	
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Cultural Resources Preservation and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Discovery and analysis of underwater archaeological and historical cultural sites. Site protection and preservation planning. Discovery and analysis of Native American and other historical cultural sites and subsistence activities.
MCA Title	Cultural Resources Preservation and Management
MCA ID	60012
Organization Type	State or U.S. Territorial government
Organization Name	State of Alaska
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	Order 1a
Update Frequency	4-5 years	6-10 years	4-5 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Not required	Nice to have	Nice to have	Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	Required
DTM	Required	Highly desirable	Nice to have	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Not required	Not required	Not required	Not required
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Not required	Nice to have
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Nice to have	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Highly desirable
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Nice to have	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Required
Nautical and/or navigation charts			Highly desirable	Required
Acoustic imagery of the seafloor			Highly desirable	Required
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Nice to have
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Required	Required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have	Highly desirable	Highly desirable	Highly desirable
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Highly desirable	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Highly desirable	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Required	Required
Floating observation/navigation systems			Highly desirable	Required
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Required	
Land use/land cover	Nice to have	Highly desirable	Nice to have	Highly desirable
Wetlands	Nice to have	Highly desirable	Nice to have	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Nice to have	Highly desirable	Nice to have	
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Nice to have	Highly desirable	Highly desirable	
Cultural resources	Required	Highly desirable	Required	
Coastal and riverine structures	Nice to have	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	Moderate
Cost savings/cost reduction	Moderate	Minor	Minor	Minor
Cost avoidance	Minor	Minor	Minor	Minor
Increased revenues	None	Minor	None	None
Mission-driven performance improvements	Moderate	Moderate	Minor	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor	None	Minor

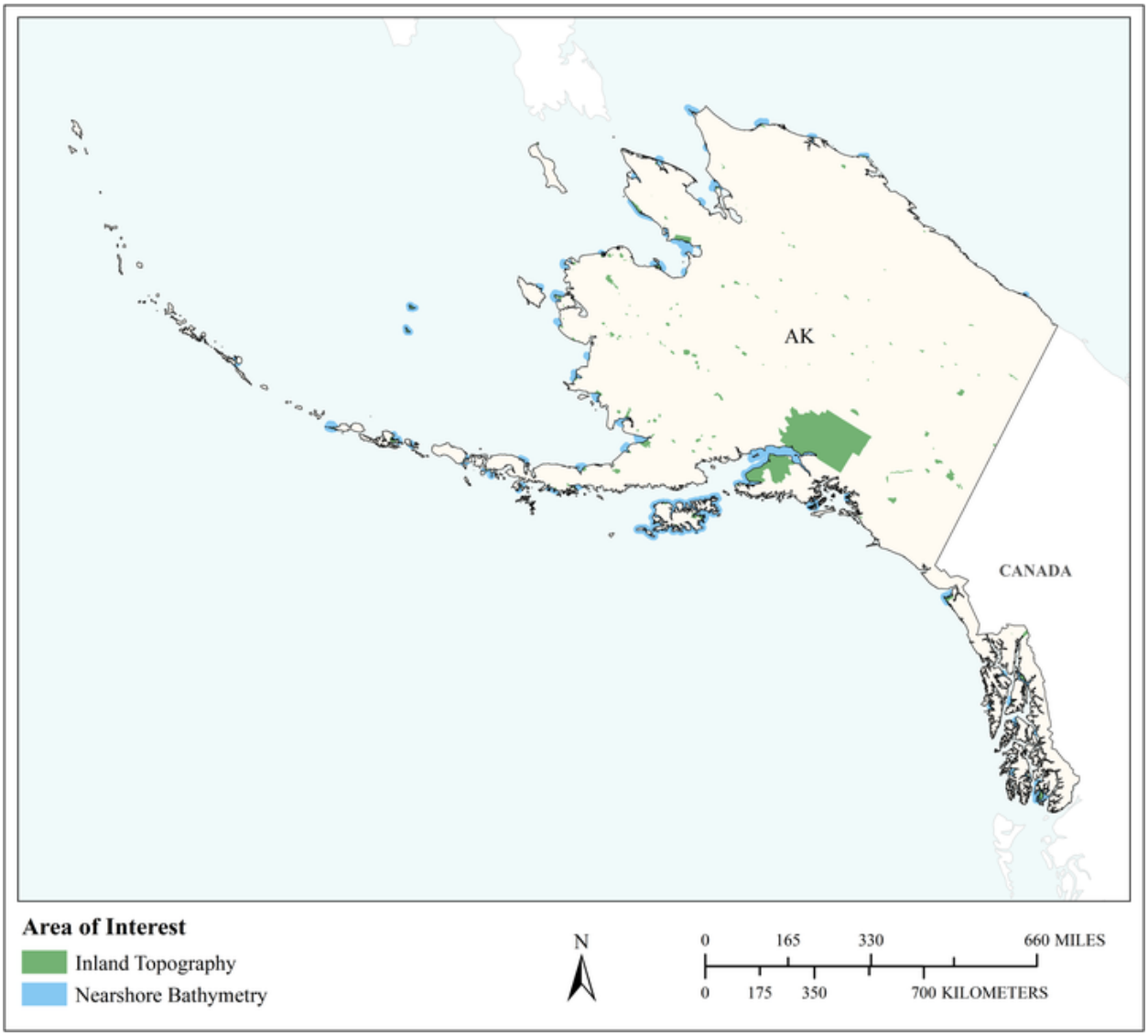
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major	Minor	Moderate
Improved customer experience	Moderate	Moderate	Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	Minor	Minor
Environmental	Minor	Moderate	Minor	Moderate
Public safety, including life and property	Minor	Moderate	None	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Increased revenues	None			None			None			None		
Mission-driven performance improvements	Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$107,068		Annual dollars saved/ realized	$256,755		Annual dollars saved/ realized	$115,445		Annual dollars saved/ realized	$83,461
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$93,611									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Moderate			Minor			Minor		
Environmental	Minor			Minor			Moderate			Moderate		
Public safety, including life and property	Minor			Minor			Minor			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				Yes

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Community Resilience and Climate Adaptation and Imminently-Threatened Alaska Native Villages



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	Custom description		Custom description	
Sub Area Requirements	Tribal lands in Alaska		Tribal lands in Alaska	

MCA Description	Response

Mission Critical Activity	1. Floodplain Management Program. Monitor community compliance by conducting Community Assistance Visits (CAV). Provide information to communities to reduce public and private sector losses and damage from flooding and erosion; provide coordination and technical assistance to National Flood Insurance Program (NFIP) communities; Provide assistance and coordination of ordinance updates in anticipation of map adoptions. Assist communities who want to enter the NFIP and assist building local floodplain management expertise and capability. 2. Community Resilience and Climate Adaptation Programs. The Division of Community and Regional Affairs (DCRA's) Community Resilience and Climate Adaptation Programs provide Alaskan communities with technical assistance, tools, training and funding to become healthier, stronger and more resilient to natural hazards and to adapt to the impacts of climate change. A. Community Decision-Making Continuum. Understanding risk is fundamental to making informed local decisions to respond and adapt to that risk. Communities can increase understanding of risk, leading to the decision-making process of planning, and ultimately, the implementation of actions to increase community resilience. DCRA's efforts to assist communities in each stage of this process are described below. B. Alaska Climate Change Impact Mitigation Program (ACCIMP). The Alaska Climate Change Impact Mitigation Program was established by Alaska's Twenty-Fifth Legislature to provide technical assistance and funding to communities imminently threatened by climate-related natural hazards such as erosion, flooding, storm surge, and thawing permafrost. The intent of the program has been to assist impacted communities develop a planned approach to shoreline protection, building relocation and/or eventual relocation of the village. The program is implemented through two measures: Hazard Impact Assessments and Community Adaptation Planning Grants. C. Alaska Community Coastal Protection Project (ACCPP). The Alaska Community Coastal Protection Project focuses on three of the most imminently threatened villages in Western Alaska: the communities of Kivalina, Shaktoolik and Shishmaref. The project is based on the premise that careful planning, agency collaboration and strong community leadership are essential to successfully addressing the needs of imperiled communities. Through this effort, comprehensive Strategic Management Plans were prepared for each community. These plans take a comprehensive approach to increasing community resilience to climate impacts and natural hazards by strengthening local capacity, assessing and guiding community and infrastructure development, and supporting environmental protection and human safety. During the planning process, Village Inter-Agency Planning Groups were organized for each community. D. Alaska Risk Mapping, Assessment and Planning (Risk MAP) Program. Risk MAP is a comprehensive, multi-year process in which FEMA and the State of Alaska work with a local government to identify and gather data on the natural hazards risks affecting the community, assess and analyze those risks, identify actions to reduce risk, and identify resources to implement those actions. The goal of Risk MAP is to increase community resilience by providing quality data and risk assessment tools to local governments, thereby enhancing local understanding of risk to natural hazards, and informing community decisions to take action to reduce risk. A new initiative of Risk MAP in Alaska focuses on imminently-threatened Alaska Native Villages. E. Village Inter-Agency Planning Groups. The focus of each inter-agency planning group is to reduce duplication and increase engagement between imminently-threatened communities, agencies and organizations to develop solutions to increase resilience in each community. The focus of

	the Newtok Planning Group has been on the village of Newtok's relocation to Mertarvik on Nelson Island. The inter-agency planning groups for Kivalina, Shaktoolik and Shishmaref have been focused on implementing the imminent a critical action items identified by each community in its Strategic Management Plan.
MCA Title	Community Resilience and Climate Adaptation and Imminently-Threatened Alaska Native Villages
MCA ID	21550
Organization Type	State or U.S. Territorial government
Organization Name	Alaska Department of Commerce, Community, and Economic Development (DCCED), Division of Community and Regional Affairs (DCRA)
Sub-Agency or Division	
Organization Mission	Promote strong communities and healthy economies.
Program Name	Community Resilience and Climate Adaptation Programs DCRA's Community Resilience and Climate Adaptation Programs provide Alaskan communities with technical assistance, tools, training and funding to become healthier, stronger and more resilient to natural hazards and to adapt to the impacts of climate change.
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 23 - Urban and Regional Planning
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Not required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Structures in the community. All structures would be great, but at a minimum the structures that are near the river banks or shoreline that could be affected by erosion greater than 25 square feet.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2		QL3B	
Update Frequency	4-5 years		4-5 years	
Event type(s)				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter		Up to 1 meter	
Acceptable Vertical Error	Up to 20 cm		Up to 40 cm	
How far onshore needed			To include the community if a community is located on the shore.	
How far down the beach profile needed	To MLLW		To MLLW	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable		Nice to have			Highly desirable
Entire AOI under same environmental conditions	Nice to have		Nice to have			Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable		Highly desirable			Nice to have
DEM for entire AOI needs to be seamless	Highly desirable		Highly desirable			Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable		Highly desirable	
DTM	Highly desirable		Nice to have	
DEM	Nice to have		Nice to have	
Raw point cloud data	Nice to have		Nice to have	
Classified point cloud	Highly desirable		Nice to have	
Edited/cube XYZ			Nice to have	
Full waveform	Nice to have		Not required	
Bathymetric Attributed Grid (BAG)			Not required	
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Highly desirable		Nice to have	
Ground control/ground truthing	Nice to have		Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Not required	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Highly desirable		Nice to have	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Not required	
Submerged features			Not required	
Subbottom characteristics			Not required	
Geologic and seismic data	Not required		Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Not required	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Highly desirable		Nice to have	
Land use/land cover	Highly desirable		Nice to have	
Wetlands	Highly desirable		Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Nice to have	
Inland surface water features	Highly desirable		Nice to have	
Bridges/culverts	Nice to have			
Landmark features	Nice to have		Nice to have	
Cultural resources	Nice to have		Nice to have	
Coastal and riverine structures	Highly desirable		Nice to have	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Use of planimetric data from our community profile mapping projects that has occurred in approximately 100 communities across the state of Alaska. Data accuracy for this meets the national mapping standards.		Seeing a detailed shoreline would work for our needs.	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories			Yes	

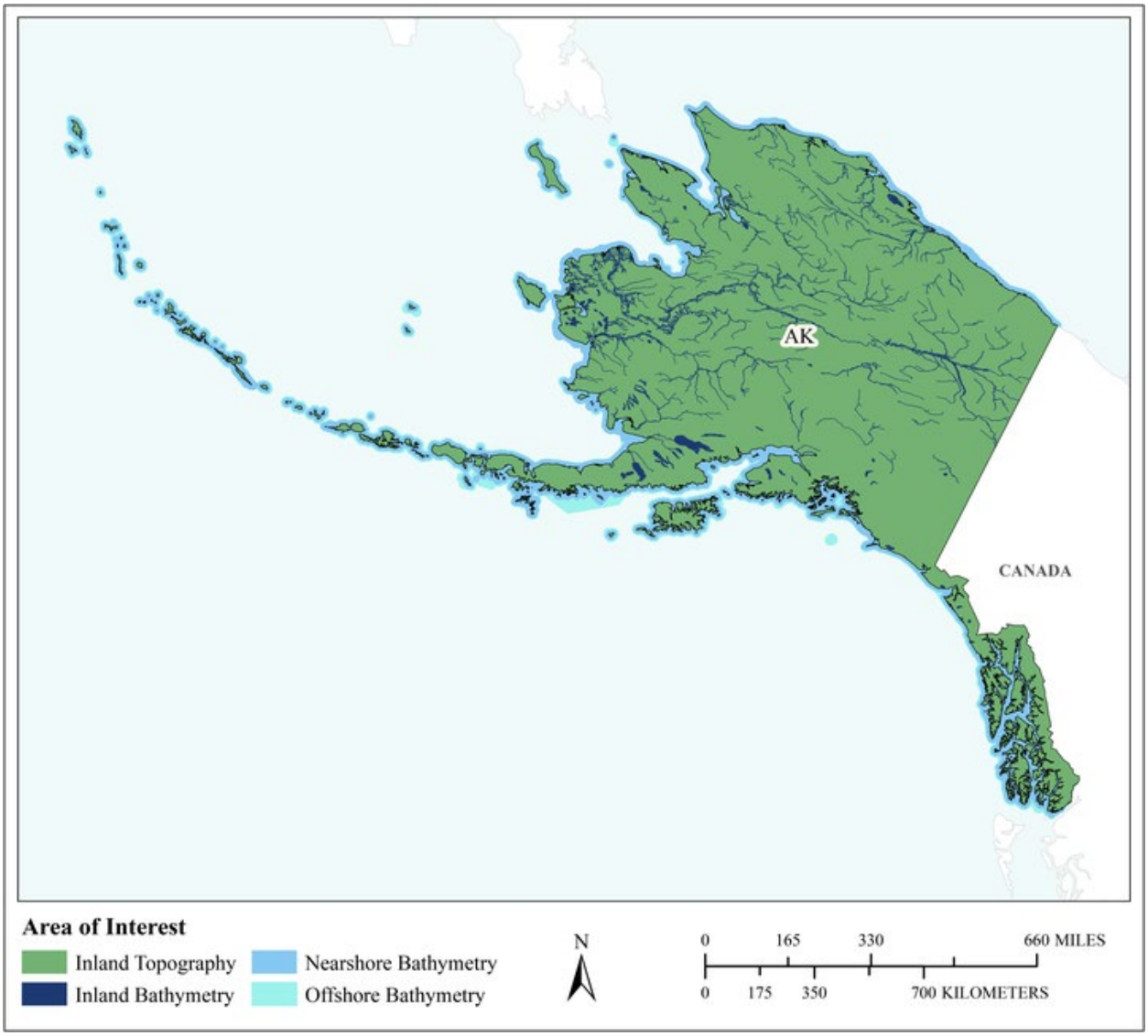
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State repositories used			Alaska Dept of Natural Resources 1:63360 shoreline, digitized from USGS quads.	
Other	Yes			
Other description	Use of planimetric data from our community profile mapping projects that has occurred in approximately 100 communities across the state of Alaska. Data accuracy for this meets the national mapping standards.			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor		None	
Cost savings/cost reduction	None		None	
Cost avoidance	None		None	
Increased revenues	None		None	
Mission-driven performance improvements	None		None	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor		None	
Improved response or timeliness	Minor		None	
Improved customer experience	Minor		None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor		None	
Environmental	Minor		None	
Public safety, including life and property	None		None	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide					Minor	Unable to provide				
Time savings description	Can be used to assist staff in infrastructure changes within a community. Can be used to assist staff in infrastructure changes within a community to save on site visits.						3D products will provide better mapping products for staff to use in their planning efforts to assist the communities.					
Cost savings/cost reduction	I don't know	Unable to provide					I don't know	Unable to provide				
Cost avoidance	I don't know	Unable to provide					Minor	Unable to provide				
Increased revenues	I don't know	Unable to provide					Minor	Unable to provide				
Increased revenues description							Could add some additional user mapping products.					
Mission-driven performance improvements	Moderate	Unable to provide					Moderate	Unable to provide				
Mission-driven performance improvements description	Can be used to assist staff in infrastructure changes within a community to save on site visits and to assist in planning within the community. Can be used to assist staff in infrastructure changes within a community to save on site visits.						Would provide better maps to assist in erosion projects with some communities. Better mapping would provide a better base for some of the projects our office is involved with.					
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide					Moderate	Unable to provide				
Value added to products or services description							Would provide better maps to assist in erosion projects with some communities.					
Improved response or timeliness	Minor	Unable to provide					Moderate	Unable to provide				
Improved response or timeliness description							Would provide better maps to assist in some projects with some communities.					
Improved customer experience	Minor	Unable to provide					I don't know	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor						I don't know					
Education or outreach description	Ability to see changes in infrastructure are valuable to some of our programs is very useful.											
Environmental	Minor						I don't know					
Environmental description	Ability to see changes in infrastructure are valuable to some of our programs is very useful, e.g. location of new tank farms that could have an effect on the area due to a spill.											
Public safety, including life and property	Minor						I don't know					
Public safety, including life and property description	Ability to see new infrastructure and how the shoreline has changed within the community is very useful to our office.											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	
Contours	Yes		Yes	
Hillshades	Yes		Yes	
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Flood Risk Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Flood risk modeling and mapping of riverine and coastal areas. Dam/dike/levee safety analysis. Emergency management. Flood forecasts.
MCA Title	Flood Risk Management
MCA ID	60013
Organization Type	State or U.S. Territorial government
Organization Name	State of Alaska
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL2B	Special Order
Update Frequency	4-5 years	4-5 years	4-5 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Required	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable	Required	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Required	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Required	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	Nice to have
Classified point cloud	Required	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Highly desirable
Ground control/ground truthing	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Highly desirable
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Nice to have	Highly desirable
Submerged features			Nice to have	Highly desirable
Subbottom characteristics			Not required	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Not required	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Not required	Nice to have
Water column properties - Biological			Not required	Nice to have
Currents			Nice to have	Highly desirable
Tide/wave heights			Highly desirable	Required
Sea ice conditions			Not required	Nice to have
Habitat distribution and classification			Nice to have	Required
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Not required	Nice to have
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Nice to have
Wetlands	Highly desirable	Highly desirable	Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Required
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Minor	Minor
Cost savings/cost reduction	Major	Minor	Minor	Minor
Cost avoidance	Major	Moderate	Minor	Moderate
Increased revenues	Minor	Minor	None	Minor
Mission-driven performance improvements	Major	Minor	Minor	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Minor	Moderate

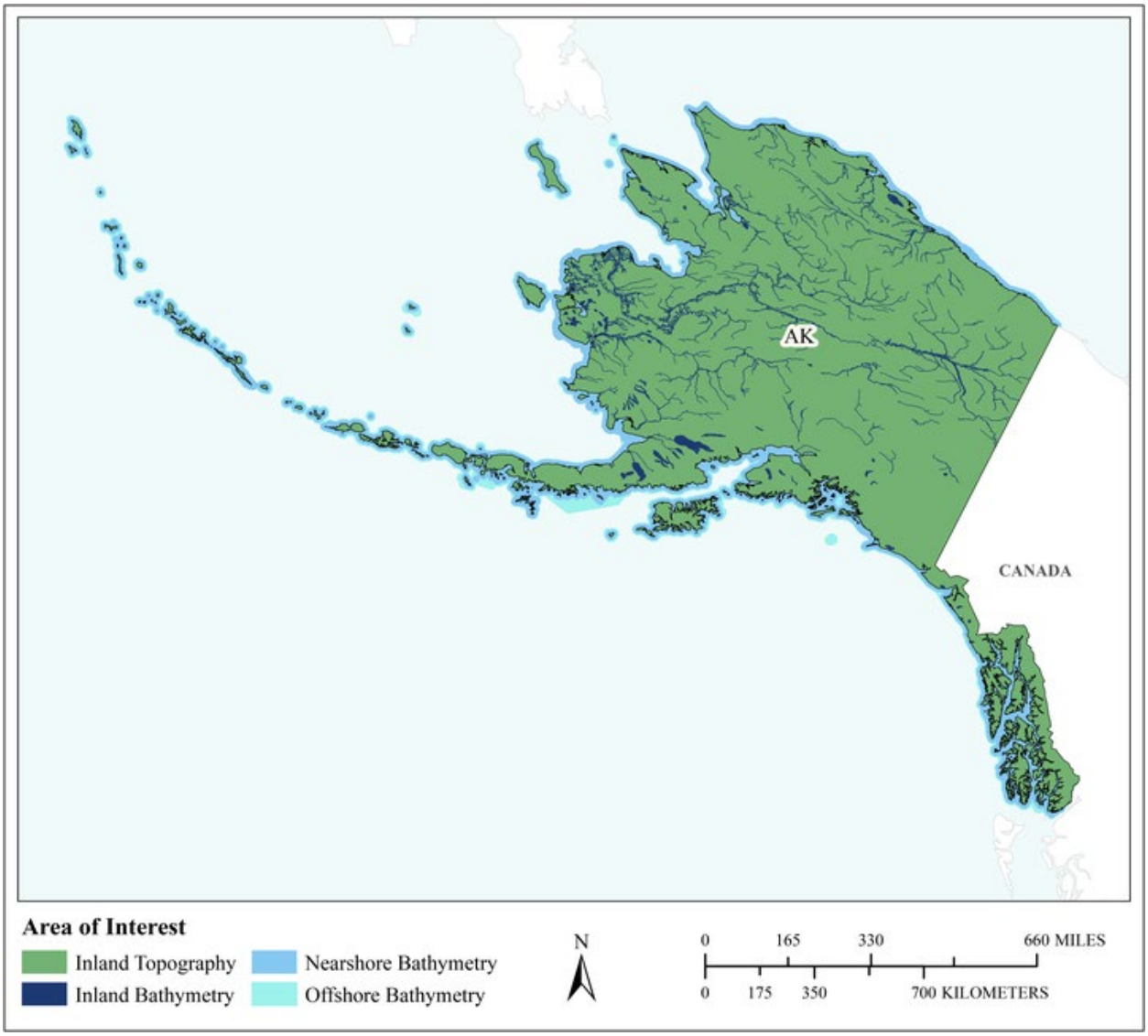
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	Minor	Major
Improved customer experience	Major	Moderate	Minor	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor	Minor	Minor
Environmental	Major	Moderate	Moderate	Moderate
Public safety, including life and property	Major	Moderate	Minor	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		None			Minor	Unable to provide		Moderate	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$82,016,806		Annual dollars saved/ realized	$5,697,455		Annual dollars saved/ realized	$7,637,097			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$14,350,373		Annual dollars saved/ realized	$6,396,781		Annual dollars saved/ realized	$5,660,175			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate			Major			Major		
Environmental	Moderate			Moderate			Moderate			Major		
Public safety, including life and property	Major			Major			Major			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			Yes
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		Yes
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Sea Level Rise and Subsidence



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Modeling and mapping the effects of sea level rise or subsidence. Population and economic vulnerability assessments. Coastal inundation and infrastructure assessment.
MCA Title	Sea Level Rise and Subsidence
MCA ID	60014
Organization Type	State or U.S. Territorial government
Organization Name	State of Alaska
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 16 - Sea Level Rise and Subsidence
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL1B	QL2B	Order 2
Update Frequency	4-5 years	4-5 years	2-3 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	Up to 20 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	Up to 2 meters
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Required	Required	Highly desirable	Highly desirable	Required
Entire AOI under same environmental conditions	Highly desirable	Required	Required	Highly desirable	Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Required	Required	Highly desirable	Required
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have	Highly desirable	Highly desirable
DTM	Required	Required	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Highly desirable	Nice to have	Nice to have
Classified point cloud	Required	Nice to have	Highly desirable	
Edited/cube XYZ		Not required	Not required	Not required
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Not required	Not required	Not required
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	Required
Tide Predictions			Required	Required
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Required
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Highly desirable	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Required
Nautical and/or navigation charts			Highly desirable	Required
Acoustic imagery of the seafloor			Nice to have	Not required
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Not required	Not required
Bottom texture			Not required	Not required
Bottom type			Nice to have	Nice to have
Submerged features			Nice to have	Not required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Not required
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Not required
Water column properties - Biological			Not required	Not required
Currents			Nice to have	Nice to have
Tide/wave heights			Required	Required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Required
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Not required	Not required
Lease areas			Not required	Not required
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Required	Required	Highly desirable	Highly desirable
Wetlands	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Required	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes	Yes	Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Major	Major
Cost savings/cost reduction	Major	Major	Major	Major
Cost avoidance	Major	Major	Major	Major
Increased revenues	None	Minor	Minor	None
Mission-driven performance improvements	Major	Major	Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	Major

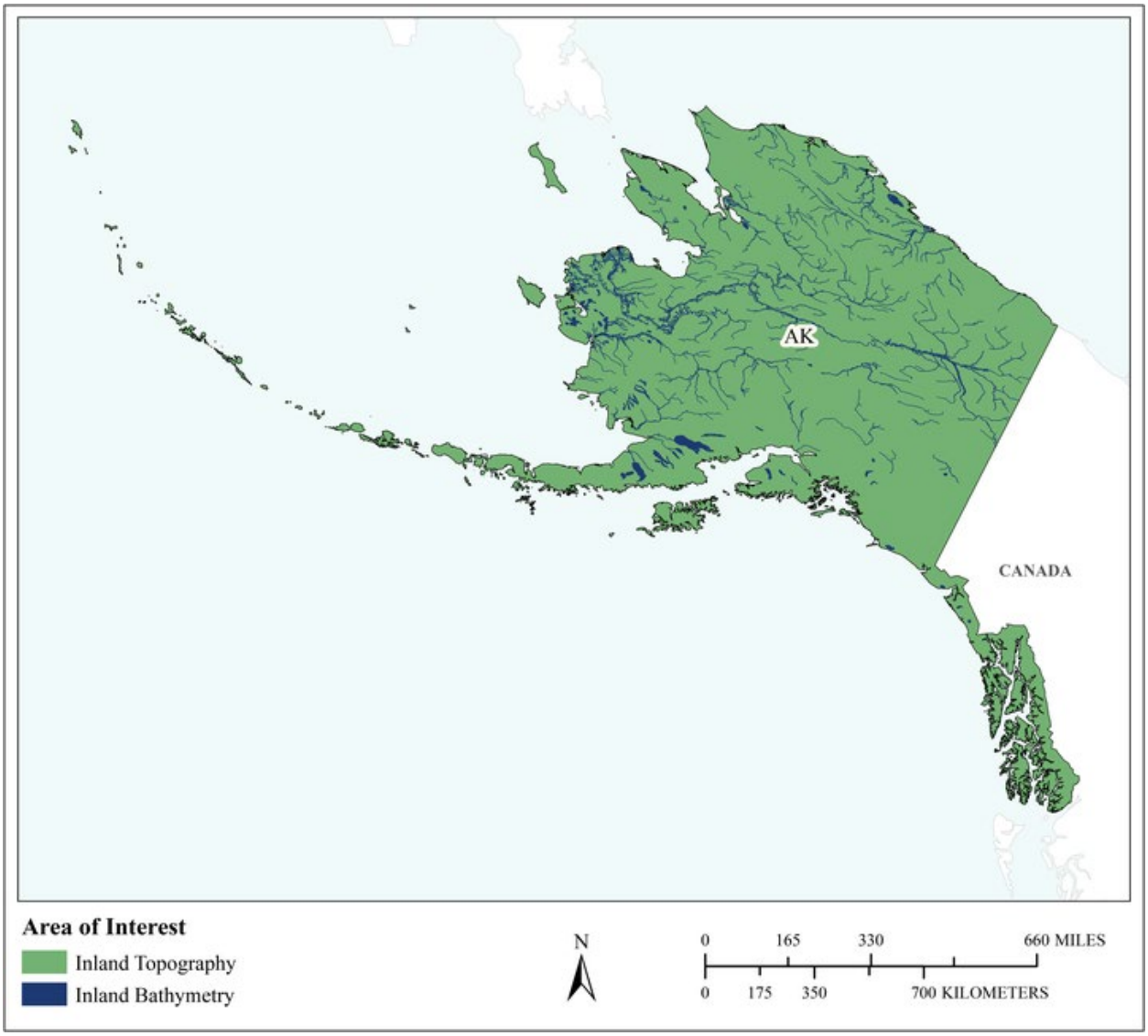
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Minor	Major	Major
Improved customer experience	Moderate	Moderate	Major	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Major	Moderate
Environmental	Moderate	Moderate	Major	Major
Public safety, including life and property	Major	Moderate	Major	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Increased revenues	Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$30,753,521									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Major			Major		
Environmental	Moderate			Major			Major			Major		
Public safety, including life and property	Moderate			Major			Minor			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		Yes
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Wildfire Management, Planning, and Response



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of forest fuel and fire susceptibility. Fire behavior modeling to support wildfire suppression activities. Wildland/urban interface building identification. Post fire analysis to determine landslide prone areas.
MCA Title	Wildfire Management, Planning, and Response
MCA ID	60015
Organization Type	State or U.S. Territorial government
Organization Name	State of Alaska
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 17 - Wildfire Management, Planning, and Response
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B		
Update Frequency	4-5 years	2-3 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Required			Required	
Entire AOI under same environmental conditions	Required	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Nice to have	Required		
Classified point cloud	Highly desirable	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Nice to have		
Ground control/ground truthing	Highly desirable	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Not required		
Land use/land cover	Highly desirable	Required		
Wetlands	Nice to have	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Required		
Bridges/culverts	Nice to have	Required		
Landmark features	Nice to have	Required		
Cultural resources	Nice to have	Required		
Coastal and riverine structures	Nice to have	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Major		
Increased revenues	Minor	Major		
Mission-driven performance improvements	Major	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		

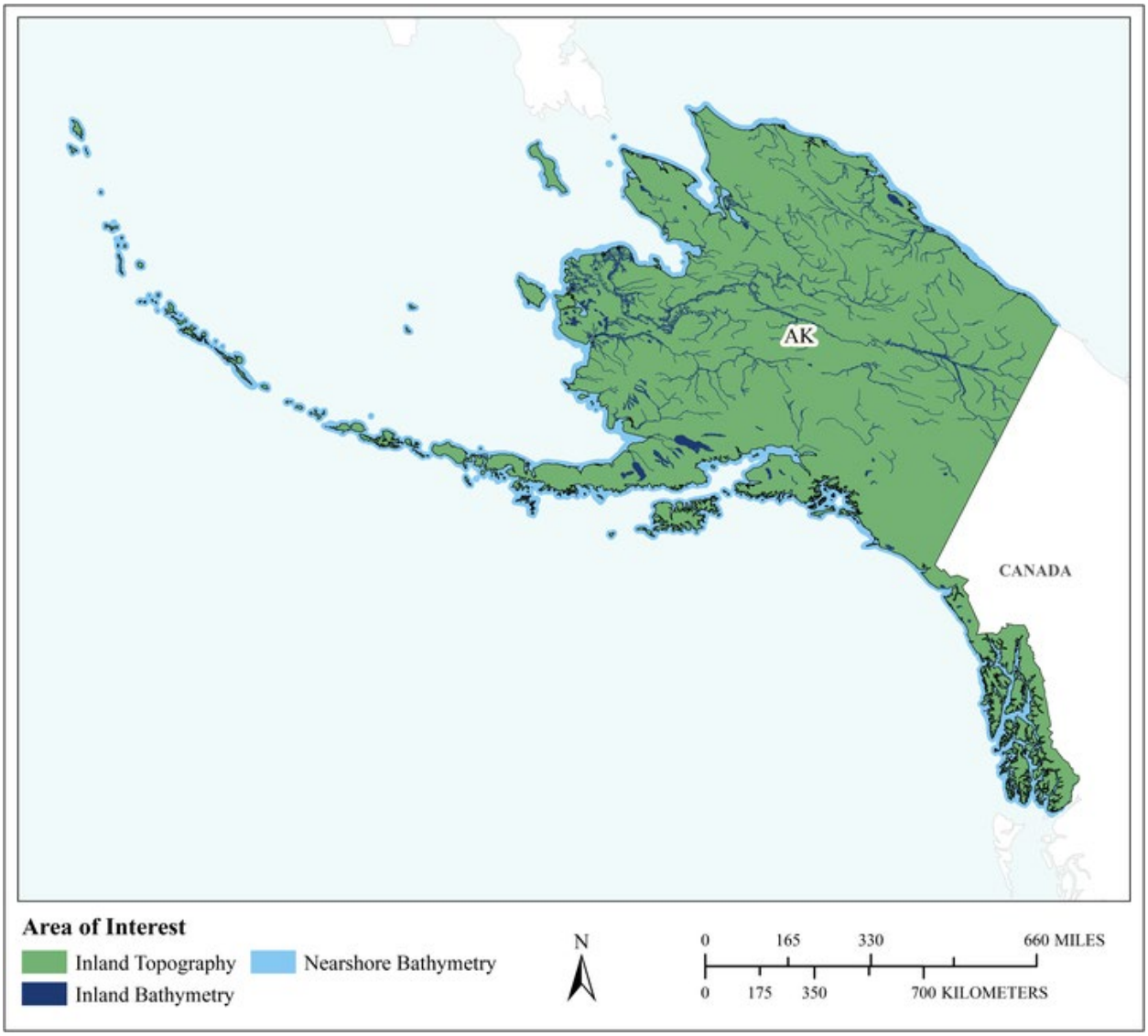
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major	Major		
Improved customer experience	Major	Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major		
Environmental	Major	Major		
Public safety, including life and property	Major	Major		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$3,138,503									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Major			Major								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement		Yes		
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Natural Disaster Response



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Natural Disaster Response, Disaster Preparedness, Mitigation, and Management.
MCA Title	Natural Disaster Response
MCA ID	1365
Organization Type	State or U.S. Territorial government
Organization Name	Alaska Department of Military and Veterans Affairs, Division of Homeland Security and Emergency Management (AKDHS&EM)
Sub-Agency or Division	
Organization Mission	Agency mission statement, "The mission of the Division of Homeland Security and Emergency Management is to lead the way in homeland security and emergency management and to foster a prepared, resilient Alaska capable of meeting the needs of its communities and citizens in response to all-hazards events."
Program Name	State of Alaska Department of Military and Veterans Affairs, Division of Homeland Security and Emergency Management
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 14 - Cultural Resources Preservation and Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	River basins, tidal estuaries, coastal community topography (tsunami inundation modeling), hillsides (ground failure)

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	Cross sections and/or transects meet needs	
Update Frequency	4-5 years	4-5 years	6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter	Up to 1 meter	
Acceptable Vertical Error	Up to 30 cm	Up to 20 cm	Up to 30 cm	
How far onshore needed			To the fall line	
How far down the beach profile needed	To MLLW		Below MLLW	
Tide correction requirement			MSL	
Cross sections and/or transects meet needs	Partial	Partial	Yes	
Cross section/transect requirement	QL1 quality. Cross sections would be required at riverine or coastal sections bordering communities.	For flood plain mapping and erosion studies, QL1 is required. However, for general planning and non-regulatory hazard modeling, QL2 is acceptable. Transects are needed along water bodies bordering communities.	The vertical accuracy needs to be consistent with QL1 for program requirements, such as community floodplain or tsunami inundation modeling.	

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have	Required		Nice to have	Highly desirable
Entire AOI under same environmental conditions	Nice to have	Highly desirable	Required		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Required	Required		Required	Required
DEM for entire AOI needs to be seamless	Highly desirable	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Required	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Required	Required	Required	
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Required	Required	
Full waveform	Highly desirable	Nice to have	Highly desirable	
Bathymetric Attributed Grid (BAG)		Required	Highly desirable	
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Required	
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Required	
Acoustic imagery of the seafloor			Required	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Nice to have	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Required	
Geologic and seismic data	Required	Required	Required	
Water column properties - Physical			Highly desirable	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Highly desirable	
Tide/wave heights			Required	
Sea ice conditions			Highly desirable	
Habitat distribution and classification			Nice to have	
Boundaries			Required	
Routes			Highly desirable	
Offshore cadastral			Nice to have	
Lease areas			Not required	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Highly desirable	Required	Nice to have	
Wetlands	Nice to have	Nice to have	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Highly desirable	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Required	Required	Highly desirable	
Cultural resources	Required	Required	Required	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Some QL1 and QL2 of a few communities in Alaska.	We are using publicly available bathymetric data for Alaska, which is typically QL1 or QL2. Most is available for download at the State of Alaska Division of Geological and Geophysical Surveys website, https://elevation.alaska.gov/#64.93751:-164.41040:8.Some coastal bathymetry from NOAA	Using some bathymetry data obtained by NOAA, covering small portions of the Gulf of Alaska and the Aleutian Islands. I don't know the quality level or date.	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	
NCEI		Yes		
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State Repositories	Yes	Yes		
State repositories used	Alaska Division of Geologic and Geophysical Science. https://elevation.alaska.gov/#64.93751:-164.41040:8	State of Alaska Department of Natural Resources, Division of Geological and Geophysical Surveys Elevation Portal at: https://elevation.alaska.gov/#64.93751:-164.41040:8		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	
Cost savings/cost reduction	Major	Major	Moderate	
Cost avoidance	Major	Major	Moderate	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	Moderate	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	None	
Improved response or timeliness	Major	Major	None	
Improved customer experience	Minor	Major	None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major	None	
Environmental	None	Major	None	
Public safety, including life and property	Major	Major	Minor	

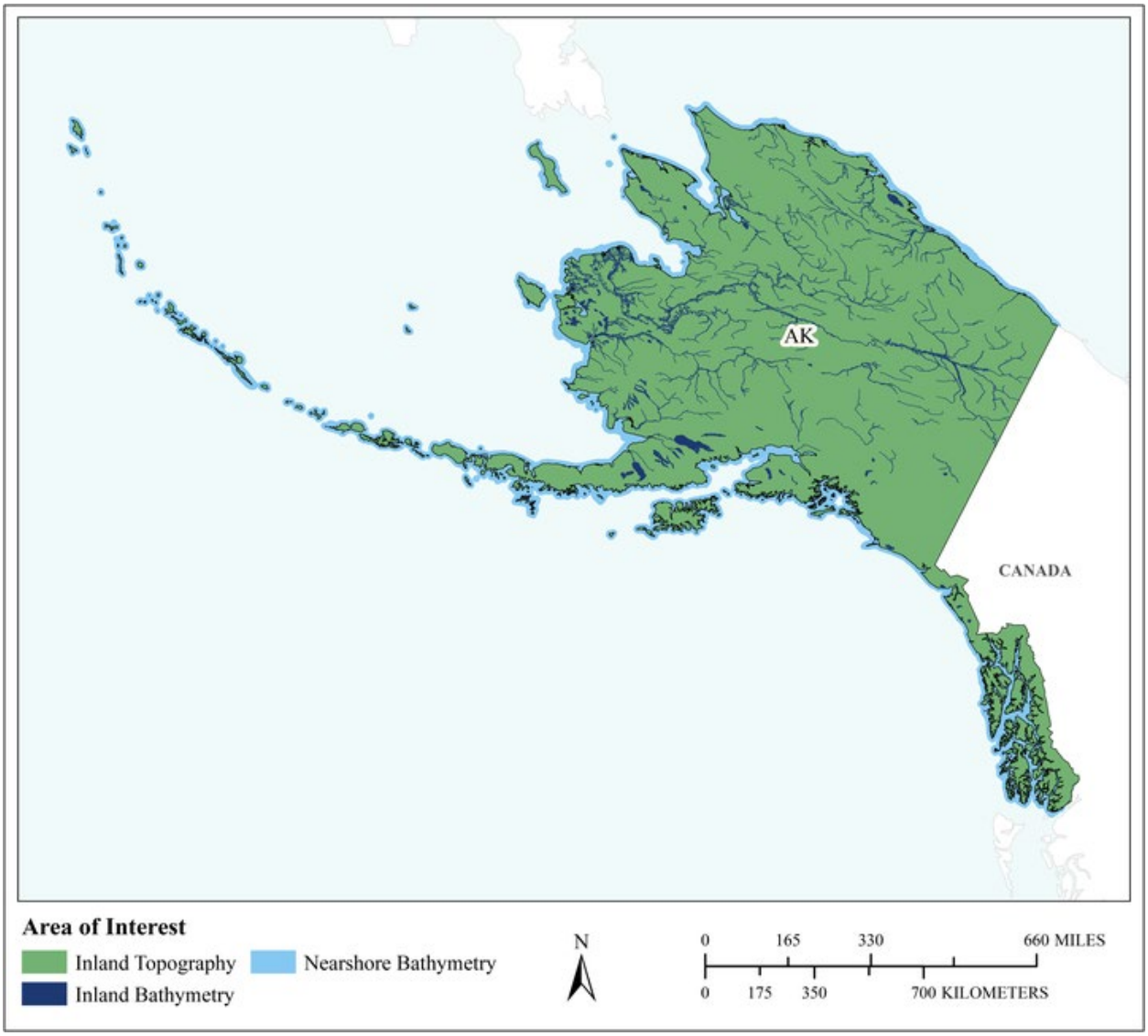
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$4,920	Major	Annual dollars saved/realized	$4,920	Major	Annual dollars saved/realized	$4,920			
Time savings description	Around 3 hours saved per map project. 3 hours less field visit time per disaster damage assessment. Around an hour saved per disaster assessment. 4-10 hours less time mapping while achieving greater mapping accuracy.			Around 3 hours saved per map project. 4-10 hours less time mapping while achieving greater mapping accuracy. 3 hours less field visit time per disaster damage assessment. Hours saved per community response. Hours saved from outsourcing through State contracting services.			3 hours less field visit time per disaster damage assessment. Around 3 hours saved per map project. Improves emergency preparedness and response operations. 4-10 hours less time mapping while achieving greater mapping accuracy. Hours saved outsourcing to state contracting services.					
Cost savings/cost reduction	Major	Annual dollars saved/realized	$8,333	Major	Annual dollars saved/realized	$8,333	Major	Annual dollars saved/realized	$8,333			
Cost savings/cost reduction description	Not applicable. Cost saved from acquiring LiDAR per community area.			Average cost of QL1 LiDAR acquisition.			Average cost of QL1 LiDAR.					
Cost avoidance	Major	Annual dollars saved/realized	$670,000	Major	Annual dollars saved/realized	$670,000	Major	Annual dollars saved/realized	$670,000			
Cost avoidance description	Cost saved from processing LiDAR data per community area. Annual savings from disaster mitigation haven't been quantified in Alaska, but sure to be millions of dollars. Estimate $2 million or more annually.			Average cost of processing LiDAR data. Annual savings from disaster mitigation haven't been quantified in Alaska, but sure to be millions of dollars. Estimate $2 million or more annually.			Annual savings from disaster mitigation haven't been quantified in Alaska, but sure to be millions of dollars. Estimate $2 million or more annually. Average cost of processing QL1 LiDAR per area.					
Increased revenues	None			None			None					
Mission-driven performance improvements	Major	Annual percent improvement	100%	Major	Annual percent improvement	100%	Major	Annual percent improvement	100%			
Mission-driven performance improvements description	Already experienced 100 percent improvement using some LiDAR based modeling.			Already experienced 100 percent improvement using som LiDAR based modeling.			Already experienced 100 percent improvement where LiDAR bathymetry was available.					
Other operational benefits	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Other operational benefits description	Improved modeling will more accurately determine the best community re-location sites. Community planning/ re-locations.			Improved modeling will more accurately determine the best community re-locaton sites. Community Planning/re-locations.			Improved modeling will more accurately determine the best community relocation sites. Community Planning / relocations.					
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$2,010	Major	Annual dollars saved/realized	$2,010	Major	Annual dollars saved/realized	$2,010			
Value added to products or services description	Contributes to flood studies and community relocation planning.			Improves flood studies and community relocation planning.			Improves flood studies and community relocation planning.					
Improved response or timeliness	Major	Annual dollars saved/realized	$11,899	Major	Annual dollars saved/realized	$11,296	Major	Annual dollars saved/realized	$8,281			
Improved response or timeliness description	Improves and expedites hazard preparedness and mitigation grant applications. Hours saved per disaster. 2-8 weeks saved per disaster. AK Emergency Management doesn't yet have this capability. Monthly hours saved on map projects.			Hours saved on improved flood plain mapping. Improves and expedites hazard preparedness and mitigation grant applications. 2-8 weeks saved per disaster. AK Emergency Management doesn't yet have this capability. 48 hours saved per disaster total across all data types.			Modernized disaster modeling and mapping is in high demand nationwide. Hours saved per disaster. Improves and expedites hazard preparedness and mitigation grant applications. 2-8 weeks saved per disaster. AK Emergency Management doesn't yet have this capability.					
Improved customer experience	Major	Annual dollars saved/realized	$601	Major	Annual dollars saved/realized	$601	Major	Annual dollars saved/realized	$601			
Improved customer experience description	A centralized data repository has been a desire in Alaska for many years.			A centralized data repository has been a desire in Alaska for many years.			A centralized data repository has been a desire in Alaska for many years.					
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major					

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Education or outreach description	Provides a visual model of the subsurface and disaster potential.	Provides a visual model of the subsurface and disaster potential.	Provides a visual model of the subsurface and disaster potential.	
Environmental	Minor	Minor	Minor	
Public safety, including life and property	Major	Major	Major	
Public safety, including life and property description	Data may be used to determine evacuation shelters, routes, and protective measures.	Data may be used to determine evacuation shelters, routes, and protection measures.	Data may be used to determine evacuation shelters, routes, and protection measures.	

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes		
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps		Yes		
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Land Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Road and railroad route selection and maintenance. Slope analysis for autonomous cars. GPS navigation visualization.
MCA Title	Land Navigation and Safety
MCA ID	60016
Organization Type	State or U.S. Territorial government
Organization Name	State of Alaska
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 19 - Land Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL0B	QL0B	
Update Frequency	2-3 years	2-3 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable		Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Highly desirable	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	
Classified point cloud	Highly desirable	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Highly desirable	
Full waveform	Nice to have	Nice to have	Highly desirable	
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	
Ground control/ground truthing	Required	Required	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Highly desirable	Highly desirable	Highly desirable	
Water column properties - Physical			Highly desirable	
Water column properties - Chemical			Highly desirable	
Water column properties - Biological			Highly desirable	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Highly desirable	
Boundaries			Highly desirable	
Routes			Highly desirable	
Offshore cadastral			Highly desirable	
Lease areas			Highly desirable	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Nice to have	Required	Highly desirable	
Land use/land cover	Highly desirable	Required	Highly desirable	
Wetlands	Required	Required	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Highly desirable	Highly desirable	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Minor	
Cost savings/cost reduction	Major	Minor	Minor	
Cost avoidance	Moderate	Minor	Minor	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	None	

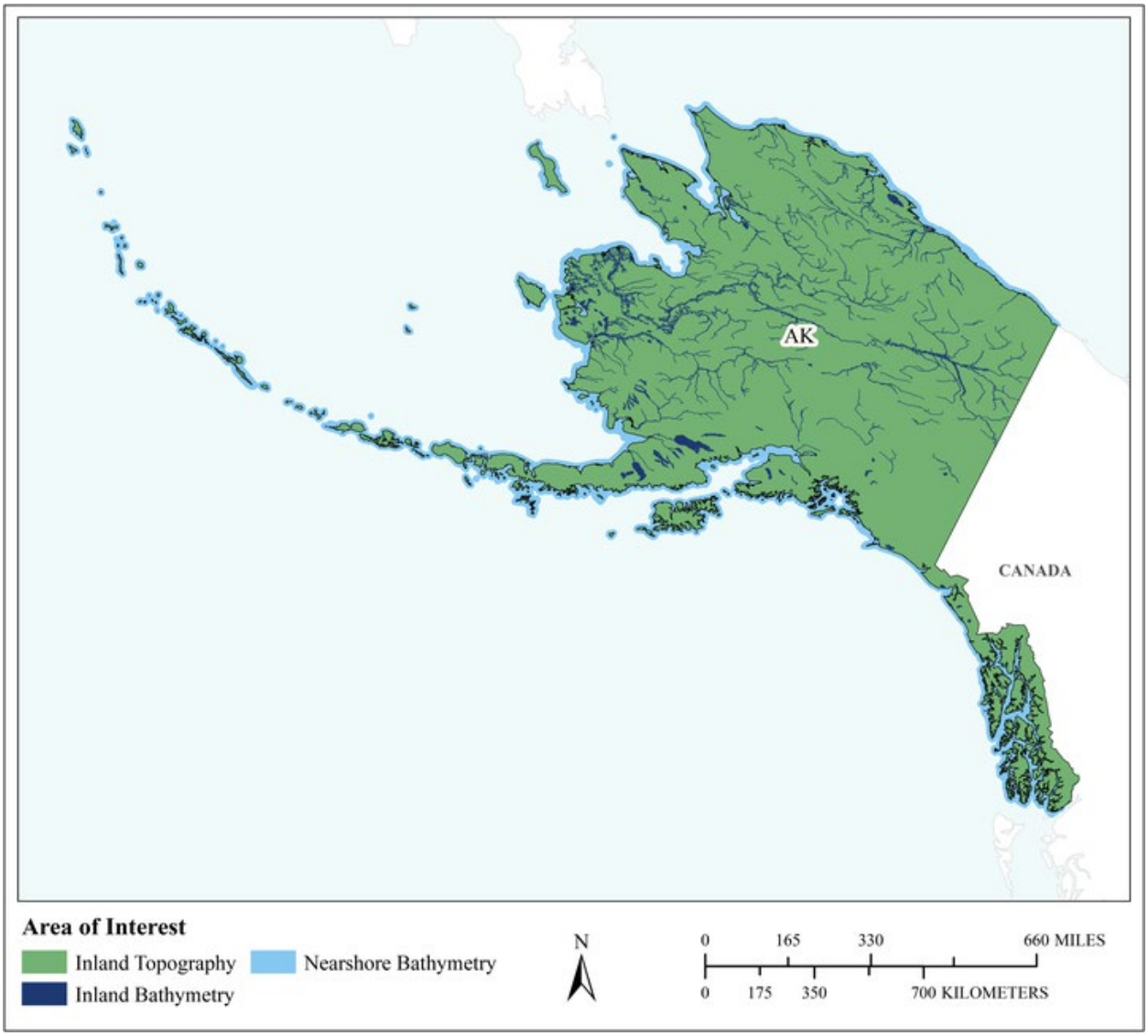
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	None	
Improved customer experience	Major	Minor	None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	None	
Environmental	Moderate	Moderate	Moderate	
Public safety, including life and property	Major	Minor	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		None					
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$7,567,181		Annual dollars saved/ realized	$322,773						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$611,087		Annual dollars saved/ realized	$3,339						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			None					
Environmental	Major			Moderate			Moderate					
Public safety, including life and property	Major			Moderate			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps	Yes		Yes	
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes		Yes	
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Marine and Riverine Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Nautical charting. Bathymetric measurements of nearshore submerged coastal topography. Identification of hazards to navigation. Sediment management at coastal navigation projects. Precision marine navigation. Movement of goods and fishing vessels.
MCA Title	Marine and Riverine Navigation and Safety
MCA ID	60017
Organization Type	State or U.S. Territorial government
Organization Name	State of Alaska
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Nice to have
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B	QL0B	
Update Frequency	2-3 years	2-3 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Nice to have	Nice to have		Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required		Required	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Required	
DTM	Required	Highly desirable	Required	
DEM	Required	Required	Required	
Raw point cloud data	Required	Nice to have	Required	
Classified point cloud	Required	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Highly desirable	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	
Breaklines required for standard hydro-flattening	Highly desirable	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Highly desirable	
Ground control/ground truthing	Required	Nice to have	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Required	Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Not required	Not required	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Highly desirable	
Boundaries			Nice to have	
Routes			Required	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Required	
Floating observation/navigation systems			Required	
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Nice to have	Nice to have	Nice to have	
Wetlands	Highly desirable	Required	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Highly desirable	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Required	Nice to have	Nice to have	
Cultural resources	Highly desirable	Highly desirable	Nice to have	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts		Yes	Yes	
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	
Cost savings/cost reduction	Major	I don't know	Minor	
Cost avoidance	Moderate	Major	Minor	
Increased revenues	Moderate	None	Minor	
Mission-driven performance improvements	Moderate	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	None	Minor	

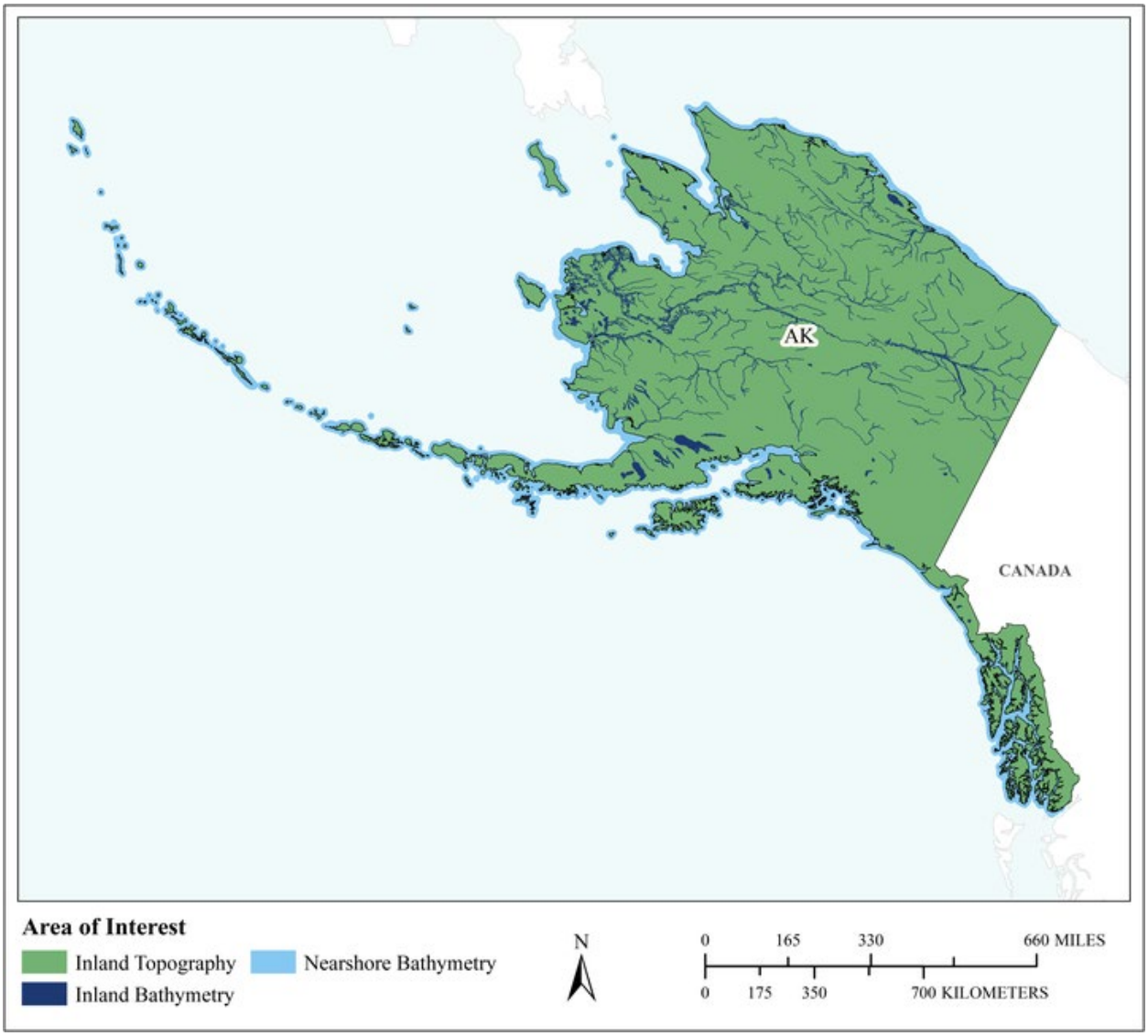
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor	None	Minor	
Improved customer experience	Moderate	None	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	None	Minor	
Environmental	Moderate	None	Minor	
Public safety, including life and property	Major	None	Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Increased revenues	None			Moderate	Unable to provide		Major	Unable to provide				
Mission-driven performance improvements	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$22,377,442		Annual dollars saved/ realized	$10,655,214		Annual dollars saved/ realized	$30,920,455			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Future annual customer service benefits added during validation					Annual dollars saved/ realized	$1,402,349		Annual dollars saved/ realized	$1,046,877			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			Moderate			Minor					
Environmental	None			Moderate			Major					
Public safety, including life and property	Minor			Moderate			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps				
Aspect maps				
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Aviation Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of in-flight hazards and path obstructions. Aeronautical charting. Runway construction and repair.
MCA Title	Aviation Navigation and Safety
MCA ID	60018
Organization Type	State or U.S. Territorial government
Organization Name	State of Alaska
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 21 - Aviation Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Nice to have
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B	I don't know	
Update Frequency	Annually	Annually	Annually	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	I don't know	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	I don't know	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Nice to have		Highly desirable	Nice to have
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Highly desirable	
DTM	Required	Required	Highly desirable	
DEM	Required	Required	Highly desirable	
Raw point cloud data	Highly desirable	Highly desirable	Nice to have	
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Nice to have	
Full waveform	Highly desirable	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Nice to have	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Nice to have	
Submerged features			Not required	
Subbottom characteristics			Not required	
Geologic and seismic data	Nice to have	Nice to have	Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Highly desirable	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Not required	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Required	Required	Required	
Wetlands	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Required	Highly desirable	Not required	
Cultural resources	Required	Highly desirable	Nice to have	
Coastal and riverine structures	Highly desirable	Nice to have	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	
Cost savings/cost reduction	Major	Major	Moderate	
Cost avoidance	Major	Major	Moderate	
Increased revenues	Major	None	None	
Mission-driven performance improvements	Major	Major	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Moderate	

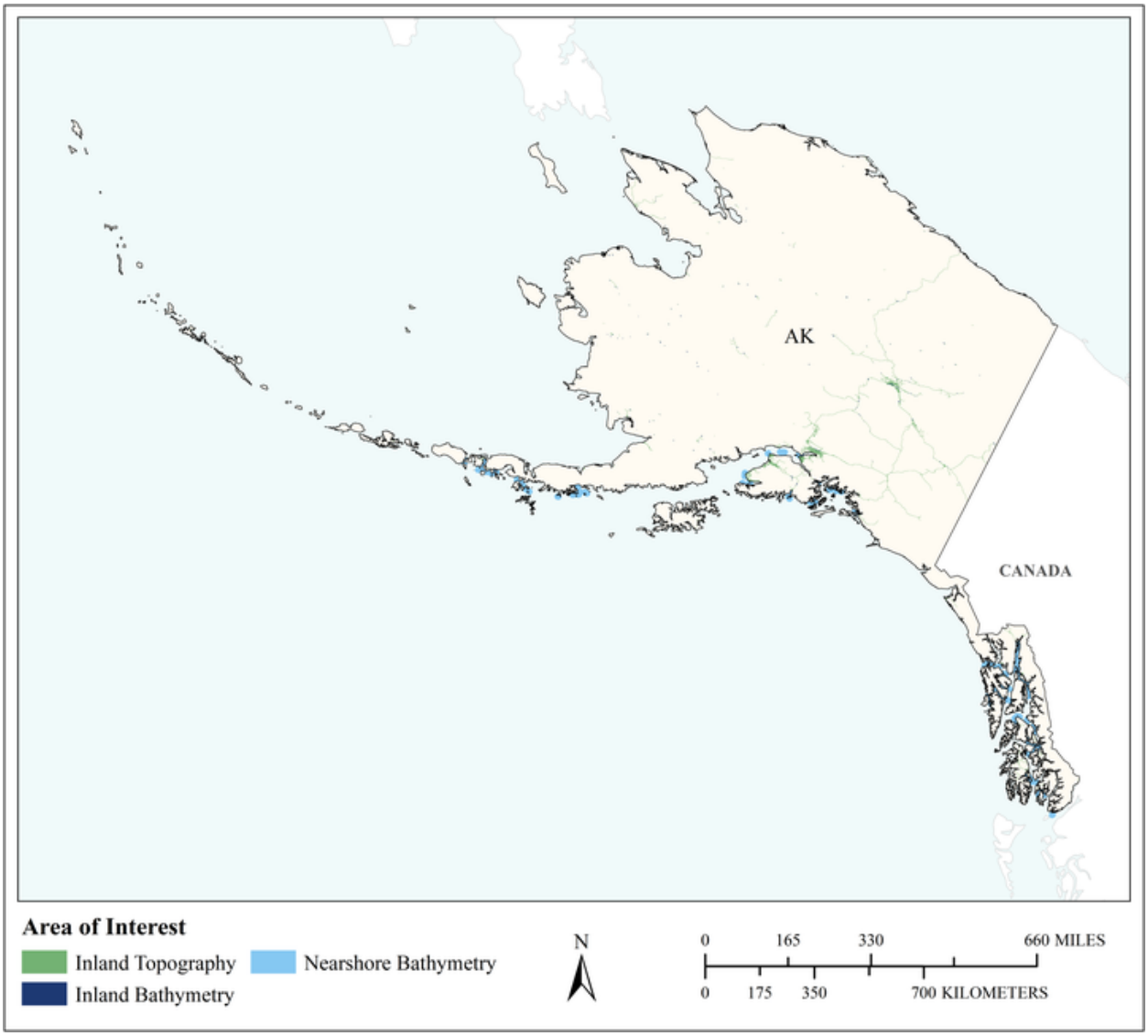
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major	Minor	
Improved customer experience	Major	Major	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	Minor	None	
Environmental	Major	Moderate	None	
Public safety, including life and property	Major	Moderate	None	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Increased revenues	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,974,715		Annual dollars saved/ realized	$393,226						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$2,459,441									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Moderate			I don't know					
Environmental	Moderate			Major			I don't know					
Public safety, including life and property	Moderate			Major			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes	Yes	Yes	
Curvature maps	Yes			
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Transportation Infrastructure Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Custom description	Custom description	Custom description	
Sub Area Requirements	200 feet right-of-way buffer around Alaska's highway system	200 feet right-of-way buffer around Alaska's highway system	200 feet buffer around Alaska's marine highway system	

MCA Description	Response
Mission Critical Activity	Planning, design, construction, and maintenance of transportation facilities (roads, bridges, airports, marine highway ferries and terminals, and other public facilities)
MCA Title	Transportation Infrastructure Management
MCA ID	1369
Organization Type	State or U.S. Territorial government
Organization Name	Alaska Department of Transportation & Public Facilities
Sub-Agency or Division	
Organization Mission	"Keep Alaska Moving through service and infrastructure."
Program Name	Statewide Transportation Improvement Program Alaska DOT&PF Long Range Transportation Plan (http://dot.alaska.gov/stwdplng/areaplans/index.shtml)
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 21 - Aviation Navigation and Safety
Tertiary Business Use	BU 23 - Urban and Regional Planning

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Not required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Varies per project. The Alaska DOT&PF collects 3D elevation survey data for every project and this includes (within specified study limits) existing structures (including small structural features: bridge piers, wing walls, culverts, etc.), property boundaries, jurisdiction boundaries, topographic and bathymetric data (of varying levels of point density), and roadside features (signs, luminaires, guardrail, etc.). (A broad 3D elevation data collection effort would be nice, but the Alaska DOT&PF will still need current survey-grade data for boundary control work and engineering design applications.)

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	(a) QL2 (b) QL5	I don't know	I don't know	
Update Frequency	(a) 4-5 years (b) 6-10 years and certain events.	Event driven only – Data need to coincide with a specific event.	Event driven only – Data need to coincide with a specific event.	
Event type(s)	A project.	A project.	A project.	
Quality Level and/or update frequency variability across AOI	Areas of greatest interest to Alaska DOT&PF (QL2 data every 4-5 years) are targeted and would be the transportation corridors, airports, prospective project locations (undeveloped areas), and other public transportation-related assets. Quality level and update frequency can be less for external areas (QL5 every 6-10 years).		Data requirements vary per project.	
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	
Acceptable Vertical Error	I don't know	I don't know	I don't know	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed			To the High Tide Line (jurisdictional boundary), though we would likely collect data inland as needed to satisfy all project objectives.	
How far down the beach profile needed	Depends upon application: For Marine highway routes and terminals, we may want data below MLLW. For other coastal projects, perhaps 3D data to the MLLW is sufficient.		Depends upon the project. For marine facilities, data requirements may extend well below MLLW.	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs	Partial	Partial	Partial	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross section/transect requirement	Accuracy and density requirements vary per project and per the respective needs of DOT&PF's functional groups (highway, marine, airports, etc.). For bridge hydraulics applications, requests for cross section data are strategically selected to capture geometric features and site-specific details, with higher data density near the stream crossing and within work zone areas. Survey-grade horizontal and vertical accuracy is desired near the hydraulic structure for most design purposes, accepting that rivers change over time. In contrast, the vertical and horizontal data accuracy and density can be less for basin hydrology studies.	Cross section/transect requirements vary per project. In general, accurate high-density data coverage is always desirable to the analyst, but maybe not cost-effective to the project and there might be diminishing returns for the investment into high quality data. For example, bathymetric data along a dynamic gravel bed river has a limited duration of accuracy. For riverine studies and modeling, the cross section/transect requirements need to capture relevant geometric features and extend far enough upstream and downstream to accommodate modeling needs.	Bathymetric data needs vary per project and activity. For design work, data accuracy would need to be fairly high. For planning and coastal hazard assessments, transects (as many needed to complete the task, case-by-case) can often suffice.	

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Not required	Not required		Not required	Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Required	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have	Highly desirable	
DTM	Required	Required	Required	
DEM	Highly desirable	Highly desirable	Highly desirable	
Raw point cloud data	Nice to have	Nice to have	Nice to have	
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Required	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Highly desirable	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Required	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Highly desirable	Highly desirable	Required	
Water column properties - Physical			Highly desirable	
Water column properties - Chemical			Highly desirable	
Water column properties - Biological			Highly desirable	
Currents			Required	
Tide/wave heights			Required	
Sea ice conditions			Required	
Habitat distribution and classification			Highly desirable	
Boundaries			Required	
Routes			Required	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Required	
Floating observation/navigation systems			Required	
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Nice to have	Nice to have	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Within project limits, we routinely collect survey-grade topographic data, including property and jurisdictional boundaries. This collection of data points are used to create a DTM that can then be used for road design and construction. For areas beyond project limits, Alaska DOT&PF may elect to collect Lidar data ahead of a project or to use existing data from others. This non-survey-grade data beyond project limits might be used for a variety of purposes - planning, reconnaissance, and analyses in support of design.	The Alaska DOT&PF frequently sends out surveyors ahead of a project to collect inland bathymetric data and topographic data. The extent of the survey-grade data collection may not extend far beyond the state right-of-way, though surveyed channel cross sections might extend upstream and downstream a long way. These survey work products establish the horizontal and vertical control for public works construction and maintenance. 3D elevation data, when available, helps with our hydrologic and hydraulic analyses, such as basin areas and 2D hydraulic modeling.	Alaska Marine Highway facilities and operations require and use bathymetric data. (A post-survey follow-up might be beneficial with representatives of that Alaska DOT&PF functional group). Alaska also has bridge projects in intertidal areas. Bathymetric data can be very helpful in planning and in selecting site locations. (Further inquiry is needed regarding what data has been used, its quality, and how frequently it is updated.)	

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes	Yes	Yes	

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State repositories used	(I am not a surveyor nor an expert on available elevation/mapping data sources. That said...) For the purpose of this survey, I am referring to the in-house surveying expertise within Alaska DOT&PF as a "state repository". Alaska DOT&PF surveyors maintain horizontal and vertical control systems for our transportation assets. Many rural areas in Alaska have locally-based control systems. Due to Alaska's enormous coastline, there are substantial differences in tidal datums and tidal ranges around the state. In areas where isostatic rebound is an issue (due to glacial retreat), there are vertical control systems that are not tied to the most current NOAA tidal datum publications (for practical reasons).	In-house Alaska DOT&PF survey records.	In-house Alaska DOT&PF Marine Structures Design Group and Surveyors.	
Other	Yes			
Other description	We send out surveyors to collect project-specific data			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Moderate	
Cost savings/cost reduction	Moderate	I don't know	Minor	
Cost avoidance	Minor	I don't know	Minor	

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	I don't know	None	None	
Mission-driven performance improvements	Moderate	Moderate	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor	Minor	
Improved response or timeliness	Major	I don't know	I don't know	
Improved customer experience	Moderate	I don't know	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Moderate	
Environmental	Moderate	I don't know	Moderate	
Public safety, including life and property	Moderate	Moderate	I don't know	

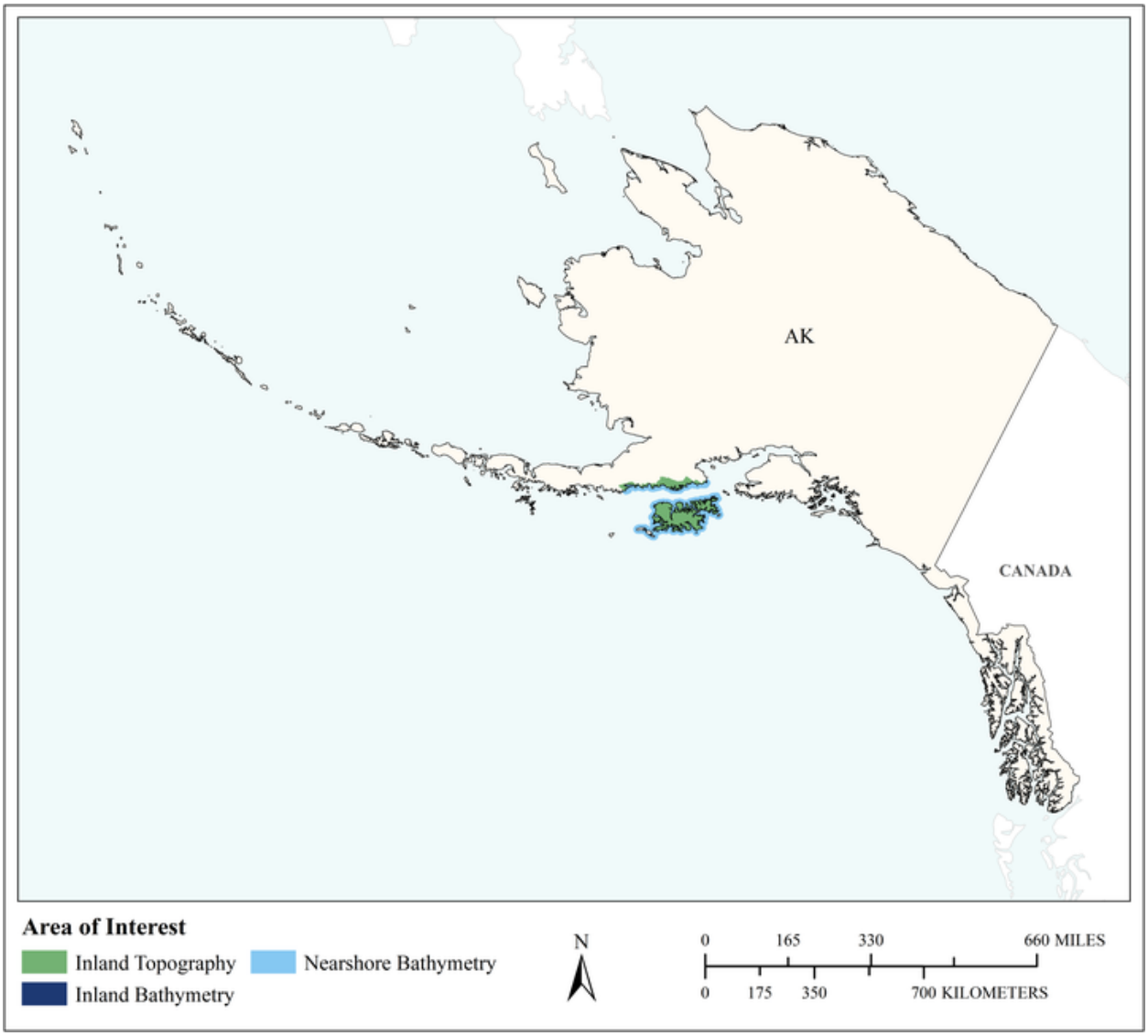
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide				
Time savings description	Alaska DOT&PF is too large of an organization to quantify accurately... Alaska DOT&PF is too large of an organization to quantify accurately the time/financial benefits from 3D inland topographic data. Our transportation infrastructure is not as spatially-broad as other state departments with land/resource management responsibilities, yet we use basin-scale data for flood studies and geologic hazard mapping. For our work, field visits and inspections will likely always be required, but having inland 3D topographic elevation data would certainly help with preliminary engineering and reconnaissance level work. Alaska DOT&PF is too large of an organization to quantify accurately. I consider it unlikely that permitting processes would become streamlined by providing more 3D elevation data. Also, jurisdictional and property boundaries will still need review/concurrence by licensed surveyors for control work.			The Alaska DOT&PF is too large to estimate this accurately. More available data does not necessarily equate to streamlined operations. The Alaska DOT&PF is too large to estimate this accurately. For 2D hydraulic modeling, having 3D inland bathymetric data available could be very helpful. The Alaska DOT&PF is too large to estimate this accurately...			Alaska DOT&PF is too large to accurately quantify the benefits. Alaska DOT&PF does not currently have coastal engineers on staff (though we have had coastal engineers in the past).					
Cost savings/cost reduction	Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Cost savings/cost reduction description	As 3D elevation becomes more readily available around Alaska, and as that data becomes refined and improved over time, I can foresee a reduction in project costs (we could omit Lidar survey costs, for example).			The Alaska DOT&PF is too large to estimate this accurately. (Even with 3D Nation data available, Alaska DOT&PF would likely still likely require the collection of current survey-grade data in our localized AOI for public works projects.).			Alaska DOT&PF is too large to accurately quantify the benefits.					
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Cost avoidance description	Alaska DOT&PF is too large of an organization to quantify accurately... 3D elevation data is helpful, but not the only tool we use for tracking natural hazards or disaster events. Consider stream gaging, aerial reconnaissance, on-site observations, etc. Maybe... Given the ever-growing cadre of GIS and mapping specialists performing data manipulations, I suspect we will see a corresponding increase in quality variability.			Maybe. 3D inland bathymetric data, especially if updated periodically, can be very helpful for flood hazard risk assessment and for determining rates of change (e.g., erosion, channel migration).			Alaska DOT&PF is too large to accurately quantify the benefits.					
Increased revenues	None			None			None					
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements description	Alaska DOT&PF is too large of an organization to quantify accurately...			The Alaska DOT&PF is too large to estimate this accurately... But I see 3D inland bathymetric data being very useful for hydraulic engineering applications. The Alaska DOT&PF is too large to estimate this accurately...			Alaska DOT&PF is too large to accurately quantify the benefits.					
Future annual operational benefits added during validation		Annual dollars saved/ realized	$43,657		Annual dollars saved/ realized	$14,709		Annual dollars saved/ realized	$1,013			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide				
Value added to products or services description	Alaska DOT&PF is too large of an organization to quantify accurately...			The Alaska DOT&PF is too large to estimate this accurately...			Alaska DOT&PF is too large to accurately quantify the benefits.					
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness description	It seems plausible that response and planning for these scenarios could be improved with 3D inland topographic data. Alaska DOT&PF is too large of an organization to quantify accurately... For Alaska communities participating in the FEMA National Flood Insurance Program, having regularly-update 3D elevation data would facilitate revisions to flood hazard studies. Alaska DOT&PF is too large of an organization to quantify accurately. Data availability can help illustrate project details, but would not necessarily lead to faster reviews and approvals.			Maybe. I can envision scenarios whereby emergency services on waterways use 3D inland bathymetric data, though many Alaska rivers are dynamic and river beds change often. Maybe. More data would not necessarily lead to faster reviews and approvals. The Alaska DOT&PF is too large to estimate this accurately...			Alaska DOT&PF is too large to accurately quantify the benefits.					
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved customer experience description	Alaska DOT&PF is too large of an organization to quantify accurately... Data stewardship is always a challenge when it comes to multi-agency collaborations. Better availability sounds good; loss of agency "autonomy" might not be as well-received.			Alaska DOT&PF is expanding its use of 2D hydraulic modeling tools and the availability of 3D inland bathymetry will be helpful to that end. The Alaska DOT&PF is too large to estimate this accurately...			Alaska DOT&PF is too large to accurately quantify the benefits.					
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$128,476		Annual dollars saved/ realized	$1,527		Annual dollars saved/ realized	$139			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate			Moderate					
Environmental	Moderate			Minor			Moderate					
Public safety, including life and property	Moderate			I don't know			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Kodiak Island Borough Government Services



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements	Kodiak Island Borough, AK	Kodiak Island Borough, AK	Kodiak Island Borough, AK	

MCA Description	Response
Mission Critical Activity	Property valuation, emergency preparedness, land cover, drainage, greenspace, parcel alignment. Roads, hydro and coastline are the baseline for a large percentage of our data. These features often define survey boundaries, which serve as the basis for all of our datasets. Accurate elevation data are needed in order to better align these features to reality.
MCA Title	Kodiak Island Borough Government Services
MCA ID	22348
Organization Type	Regional, County, City, or other local government
Organization Name	Kodiak Island Borough
Sub-Agency or Division	
Organization Mission	The Kodiak Island Borough government exists to provide effective and efficient government services within its powers and duties that will improve the quality of life in its community.
Program Name	Community Development (Planning), Assessing, Engineering & Facilities
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 22 - Infrastructure and Construction Management
Tertiary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Our current road network data is slightly offset from reality, so it would be nice to improve the positional accuracy of our road network. Same holds for hydro features. In aligning parcel/property boundaries, the dream would be to pull out streams, lakes and roads from a high-res LiDAR dataset since these features often define parcel/property boundaries. With respect to property valuation, small docks would be the smallest features we'd be interested in.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have

Inland Bathy Feature Size Requirements	Response
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	I don't know	QL1B	
Update Frequency	4-5 years	Event driven only – Data need to coincide with a specific event.	I don't know	
Event type(s)		Event driven only		
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	I don't know	Less than 50 cm	
Acceptable Vertical Error	Up to 20 cm	I don't know	Up to 30 cm	
How far onshore needed			To cover the beach slope	
How far down the beach profile needed	To MHW		To MLLW	
Tide correction requirement			MHW	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have	Highly desirable		Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Nice to have	Highly desirable		Nice to have	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Nice to have	Highly desirable		Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Nice to have	Highly desirable		Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness		I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have	Required	
DTM	Highly desirable	Nice to have	Required	
DEM	Highly desirable	Nice to have	Required	
Raw point cloud data	Not required	Nice to have	Nice to have	
Classified point cloud	Highly desirable	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Not required	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	
Ground control/ground truthing	Highly desirable	Nice to have	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required	Nice to have	Highly desirable	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Not required	Not required	Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Nice to have	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Highly desirable	
Lease areas			Highly desirable	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Required	Highly desirable	Highly desirable	
Land use/land cover	Nice to have	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Highly desirable	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Nice to have	Nice to have	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			
Other	Highly desirable			
Other description	Buildings			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Best available	None	Best available	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI			Yes	
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know	Inland bathy data not available	None	
Cost savings/cost reduction	I don't know	Inland bathy data not available	None	
Cost avoidance	I don't know	Inland bathy data not available	None	

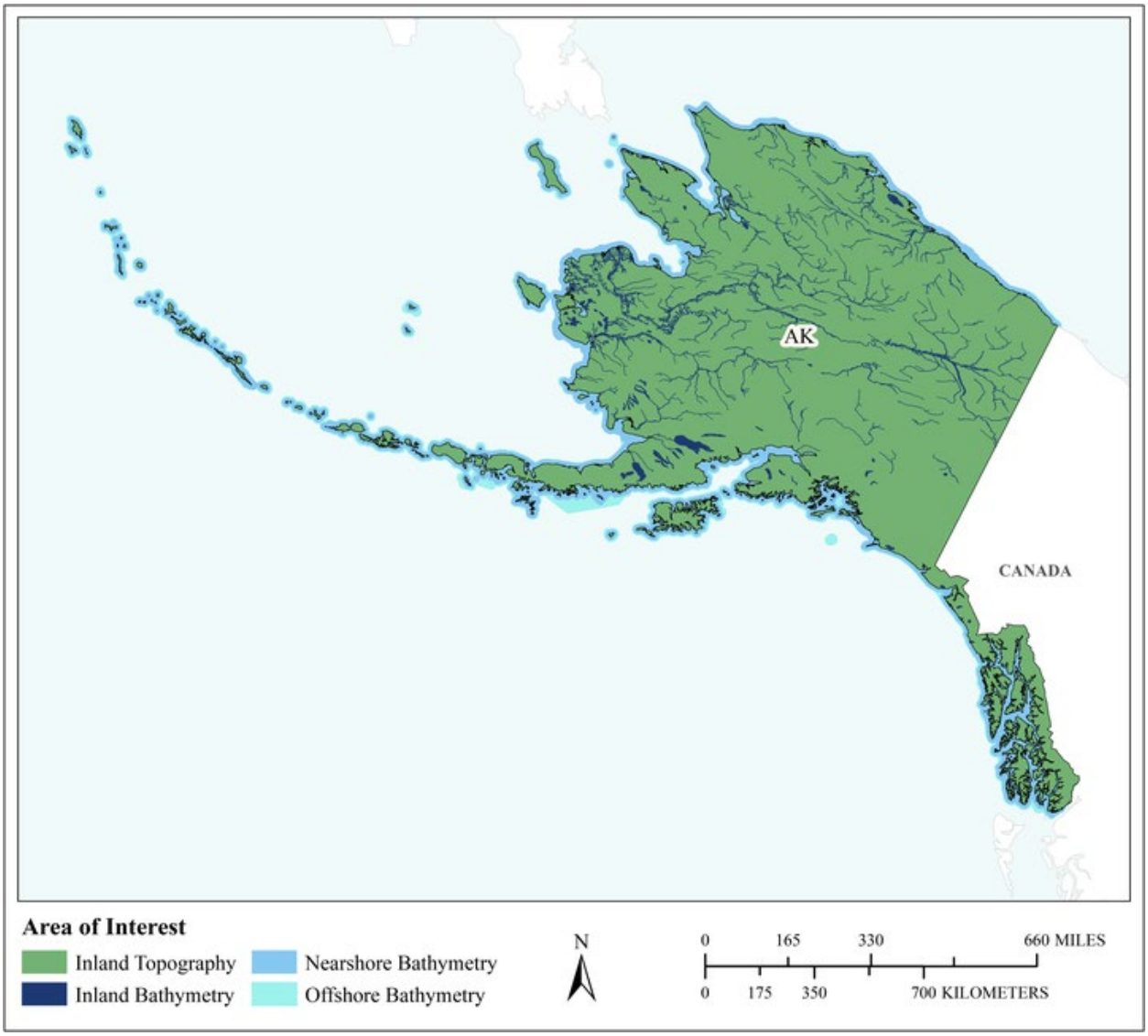
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	I don't know	Inland bathy data not available	None	
Mission-driven performance improvements	I don't know	Inland bathy data not available	None	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know	Inland bathy data not available	Minor	
Improved response or timeliness	I don't know	Inland bathy data not available	None	
Improved customer experience	I don't know	Inland bathy data not available	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	Inland bathy data not available	Minor	
Environmental	I don't know	Inland bathy data not available	None	
Public safety, including life and property	I don't know	Inland bathy data not available	None	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide				
Time savings description	Especially hydro, roads, buildings. Major benefits if high res elevation data could be collected every 3-5 years for developed areas and along the coast.											
Cost savings/cost reduction	Major	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction description	Drainage plan for Kodiak is an expressed need. Drainage issues are problematic throughout developed areas.											
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide				
Increased revenues	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide				
Increased revenues description	Major benefits if high resolution elevation data could be collected every 3-5 years.											
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide				
Mission-driven performance improvements description	3D inland topographic data would allow for more accurate information for planning and assessment decisions.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know			Moderate					
Environmental	I don't know			I don't know			I don't know					
Public safety, including life and property	Major			I don't know			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			
Other (please specify)	Yes			
Other description	Landcover			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Urban and Regional Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Land development and zoning. Municipal mapping of building footprints and elevations. Port resilience planning. Parks and transportation planning. Virtual city creation. Urban ecology planning.
MCA Title	Urban and Regional Planning
MCA ID	60019
Organization Type	State or U.S. Territorial government
Organization Name	State of Alaska
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL2B	Cross sections and/or transects meet needs
Update Frequency	4-5 years	6-10 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				Yes
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Required	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Required	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Required	Required
DTM	Required	Required	Required	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Required	Nice to have	Highly desirable	Highly desirable
Classified point cloud	Required	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Highly desirable
Full waveform	Nice to have	Nice to have	Nice to have	Required
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Highly desirable
Tide Predictions			Nice to have	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Highly desirable
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Highly desirable
Ground control/ground truthing	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	Required
Nautical and/or navigation charts			Highly desirable	Required
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Highly desirable
Underwater videography			Not required	Nice to have
Bottom texture			Nice to have	Highly desirable
Bottom type			Nice to have	Highly desirable
Submerged features			Nice to have	Highly desirable
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Not required	Highly desirable
Water column properties - Chemical			Not required	Highly desirable
Water column properties - Biological			Not required	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Nice to have	Required
Routes			Nice to have	Highly desirable
Offshore cadastral			Nice to have	Highly desirable
Lease areas			Nice to have	Highly desirable
Fixed obstructions			Nice to have	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Required	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Nice to have	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Minor	Major
Cost savings/cost reduction	Major	Minor	Minor	Major
Cost avoidance	Major	Minor	Minor	Major
Increased revenues	Minor	Minor	None	Moderate
Mission-driven performance improvements	Major	Minor	Minor	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Minor	Major

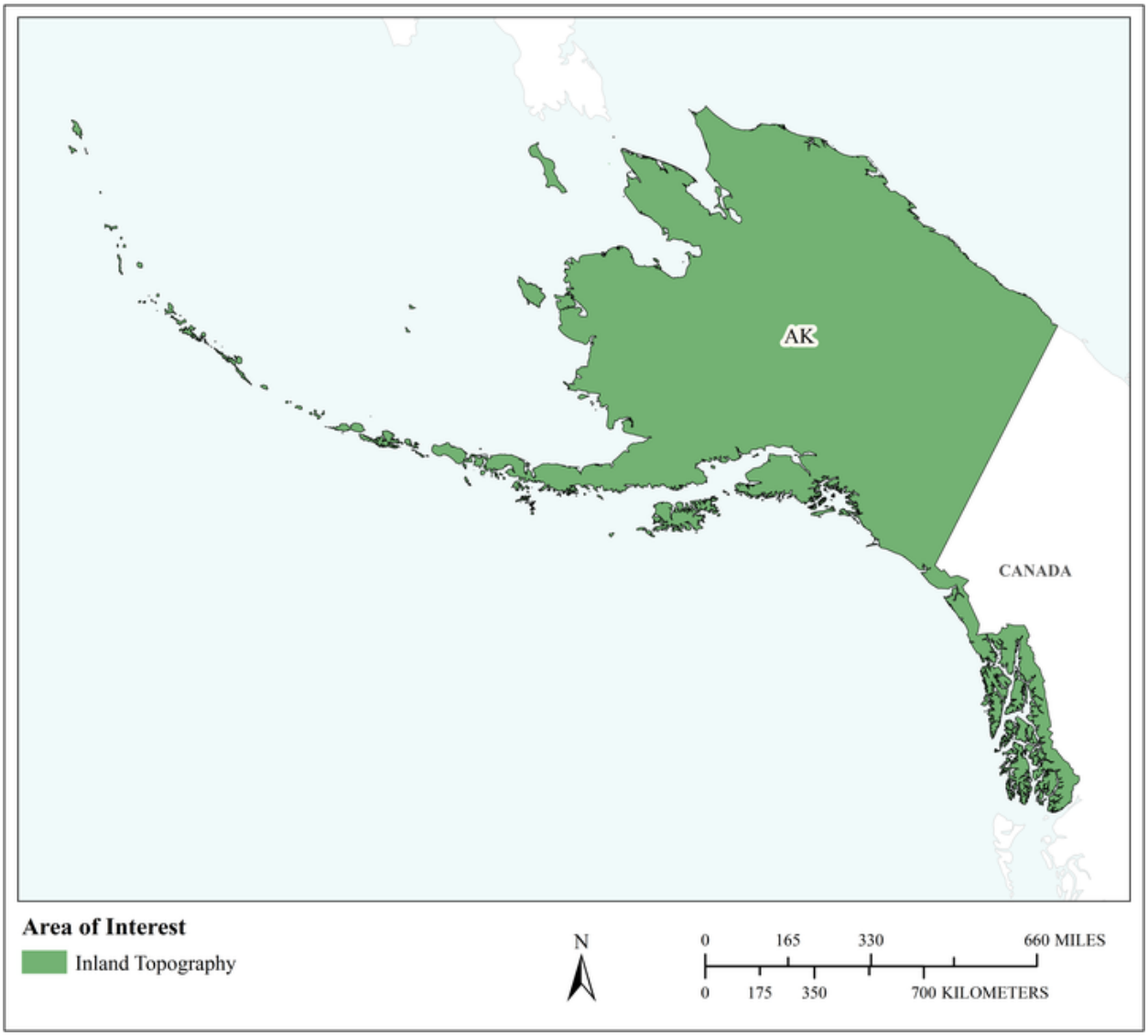
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	Minor	Major
Improved customer experience	Major	Moderate	Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	Major
Environmental	Major	Minor	Minor	Major
Public safety, including life and property	Major	Minor	Minor	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide		Major	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Major	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$157,169,570		Annual dollars saved/ realized	$6,401,242		Annual dollars saved/ realized	$7,382,568			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$18,145,298		Annual dollars saved/ realized	$8,098,125		Annual dollars saved/ realized	$7,788,320			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate			Major		
Environmental	Major			Moderate			Moderate			Major		
Public safety, including life and property	Major			Major			Moderate			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes		Yes	
Aspect maps	Yes			Yes
Curvature maps				Yes
Cross sections		Yes	Yes	Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Health and Human Services



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Health emergency response. Habitat modeling and disease prevention. Defining boundaries for health advisories for swimming and fishing. Marine-based bioproducts and pharmaceuticals. Public health and safety. Prevention of waterborne diseases.
MCA Title	Health and Human Services
MCA ID	60020
Organization Type	State or U.S. Territorial government
Organization Name	State of Alaska
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 24 - Health and Human Services
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Not required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required			
DTM	Required			
DEM	Highly desirable			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Nice to have			
Wetlands	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Not required			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			

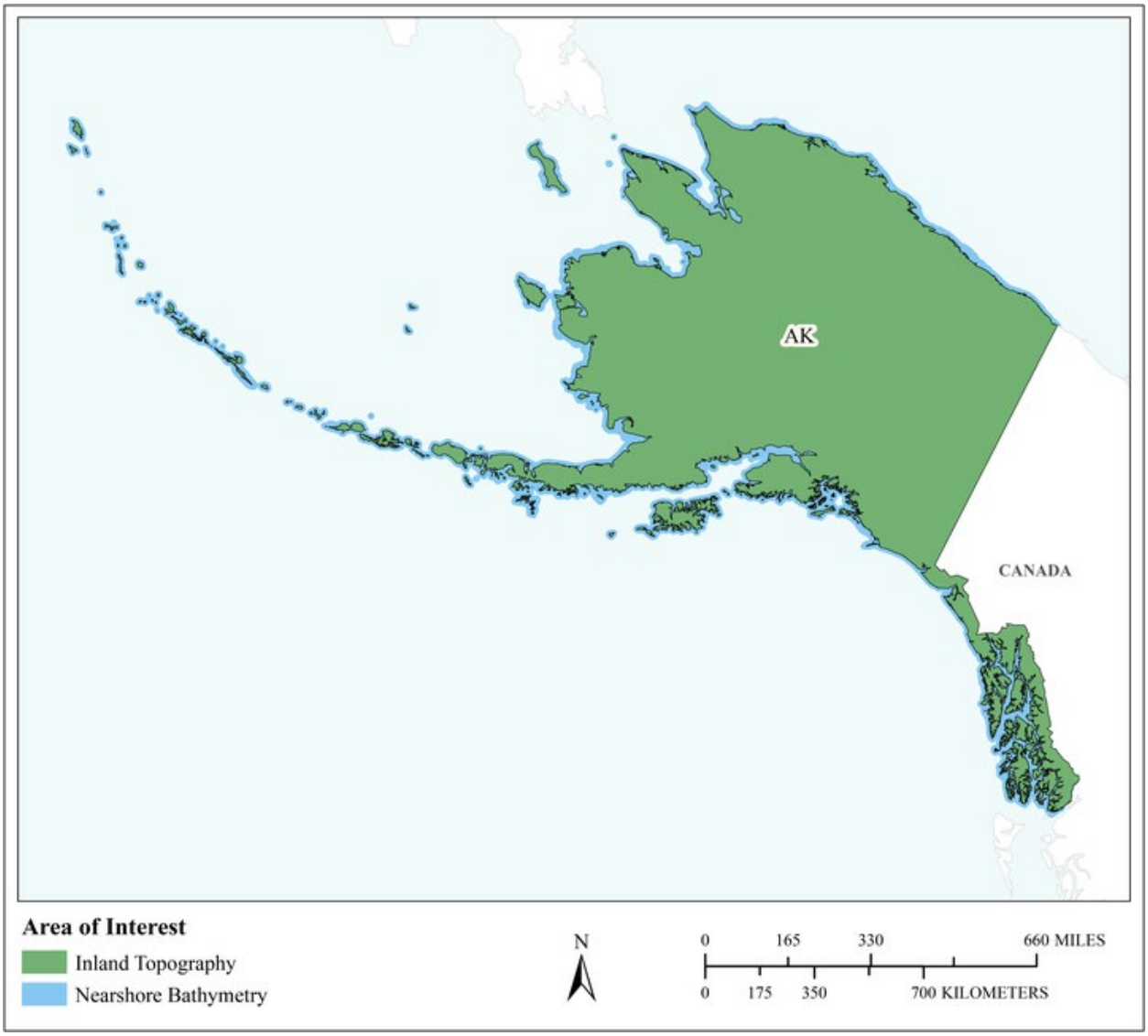
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Moderate			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$208,429									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide										
Improved response or timeliness	Minor	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$26									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Moderate											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Real Estate, Banking, Mortgage, and Insurance



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Assessment of risk for natural hazards (e.g., sinkholes, flooding) to inform insurance policy rates and the determination of mandatory insurance. Building permit compliance.
MCA Title	Real Estate, Banking, Mortgage, and Insurance
MCA ID	60021
Organization Type	State or U.S. Territorial government
Organization Name	State of Alaska
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 25 - Real Estate, Banking, Mortgage, and Insurance
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD		QL2B	
Update Frequency	4-5 years		2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter		Up to 5 meters	
Acceptable Vertical Error	Up to 20 cm		Up to 40 cm	
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable		Nice to have			Highly desirable
Entire AOI under same environmental conditions	Highly desirable		Highly desirable			Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable		Nice to have			Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable		Highly desirable			Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level		Up to triple the required TVU at the 95% confidence level			Up to triple the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable		Highly desirable	
DTM	Required		Highly desirable	
DEM	Required		Required	
Raw point cloud data	Nice to have		Nice to have	
Classified point cloud	Required		Nice to have	
Edited/cube XYZ			Nice to have	
Full waveform	Nice to have		Nice to have	
Bathymetric Attributed Grid (BAG)			Highly desirable	
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable		Highly desirable	
Ground control/ground truthing	Required		Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Highly desirable		Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Highly desirable	
Bottom type			Nice to have	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have		Required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Highly desirable	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Nice to have	
Boundaries			Highly desirable	
Routes			Nice to have	
Offshore cadastral			Highly desirable	
Lease areas			Highly desirable	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Highly desirable		Required	
Land use/land cover	Nice to have		Highly desirable	
Wetlands	Nice to have		Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Highly desirable		Nice to have	
Bridges/culverts	Nice to have			
Landmark features	Nice to have		Nice to have	
Cultural resources	Nice to have		Nice to have	
Coastal and riverine structures	Nice to have		Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Major	
Cost savings/cost reduction	Major		Major	
Cost avoidance	Major		Moderate	
Increased revenues	None		None	
Mission-driven performance improvements	Moderate		Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		Major	

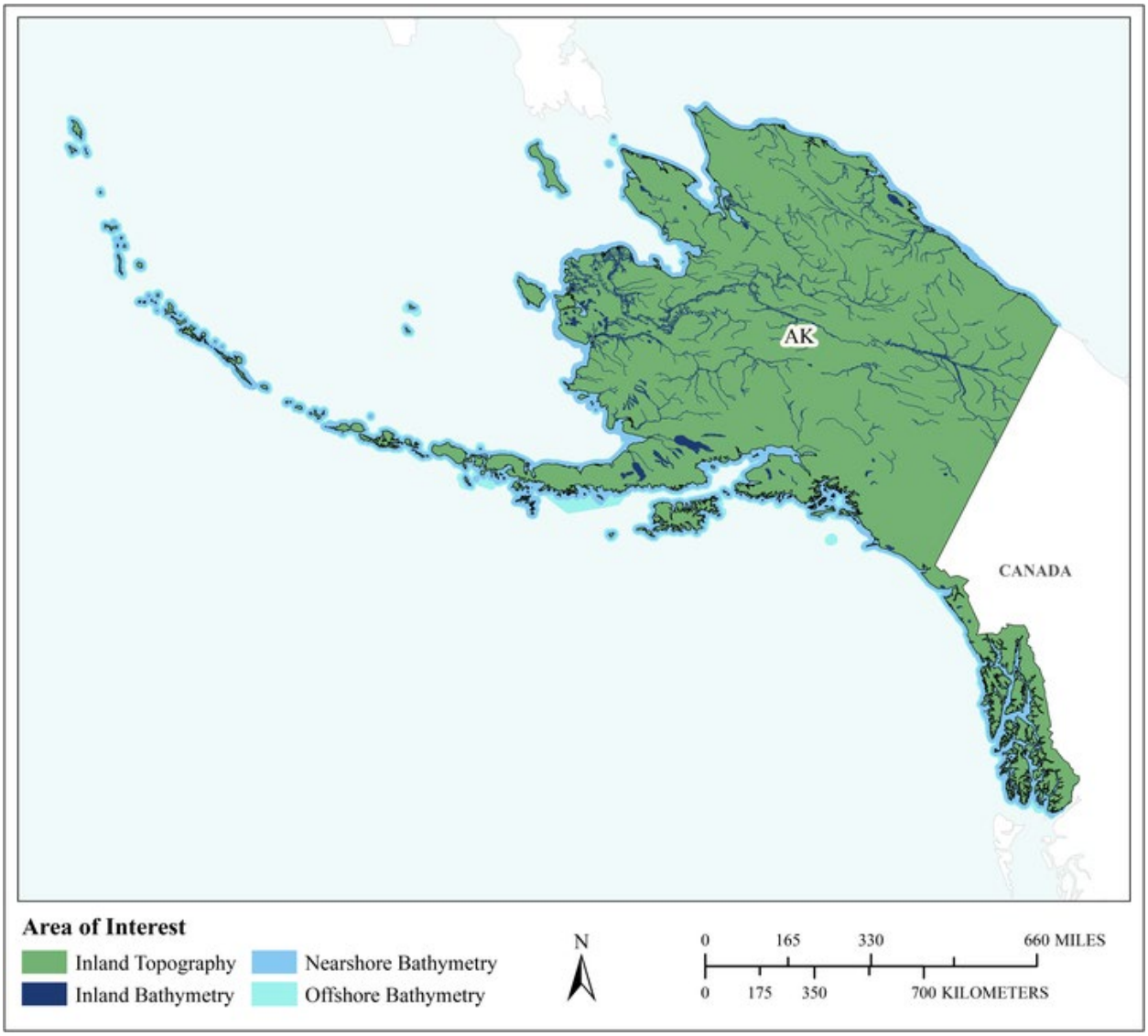
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate		Minor	
Improved customer experience	Major		Major	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate		Major	
Environmental	Moderate		Minor	
Public safety, including life and property	Moderate		Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide					Major	Unable to provide				
Cost avoidance	Major	Unable to provide					Major	Unable to provide				
Increased revenues	Minor	Unable to provide					Moderate	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide					Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$20,296,209									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide					Major	Unable to provide				
Improved customer experience	Moderate	Unable to provide					Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor						Major					
Environmental	Minor						Moderate					
Public safety, including life and property	Major						Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	
Contours	Yes		Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids			Yes	
Hydrologic Flow Accumulation Grids			Yes	
Hydrologic networks (e.g. streams, lakes)	Yes		Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)			Yes	
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Education K12 and Beyond, Basic Research



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Development of 3-D visualizations to help students understand the Earth they live on. Understanding of continental-scale climate change impacts. Ocean science. Ocean education. Scientific research. Data dissemination. Development of training simulators.
MCA Title	Education K12 and Beyond, Basic Research
MCA ID	60022
Organization Type	State or U.S. Territorial government
Organization Name	State of Alaska
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 26 - Education K12 and Beyond, Basic Research
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL1B	QL2B	Order 1a
Update Frequency	2-3 years	4-5 years	4-5 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Nice to have	Not required	Highly desirable	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Required	Nice to have	Not required	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required	Highly desirable	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Required	Required
DTM	Required	Highly desirable	Required	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Required	Required	Required	Required
Classified point cloud	Required	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Nice to have	Nice to have
Ground control/ground truthing	Highly desirable	Highly desirable	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Highly desirable
Underwater videography			Nice to have	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Highly desirable	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Highly desirable
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Required	Highly desirable	Highly desirable	Nice to have
Wetlands	Required	Highly desirable	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Nice to have	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Major	Minor
Cost savings/cost reduction	Major	Minor	Moderate	Minor
Cost avoidance	Major	Minor	Major	Moderate
Increased revenues	Minor	None	Minor	None
Mission-driven performance improvements	Major	Moderate	Major	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Major	Moderate

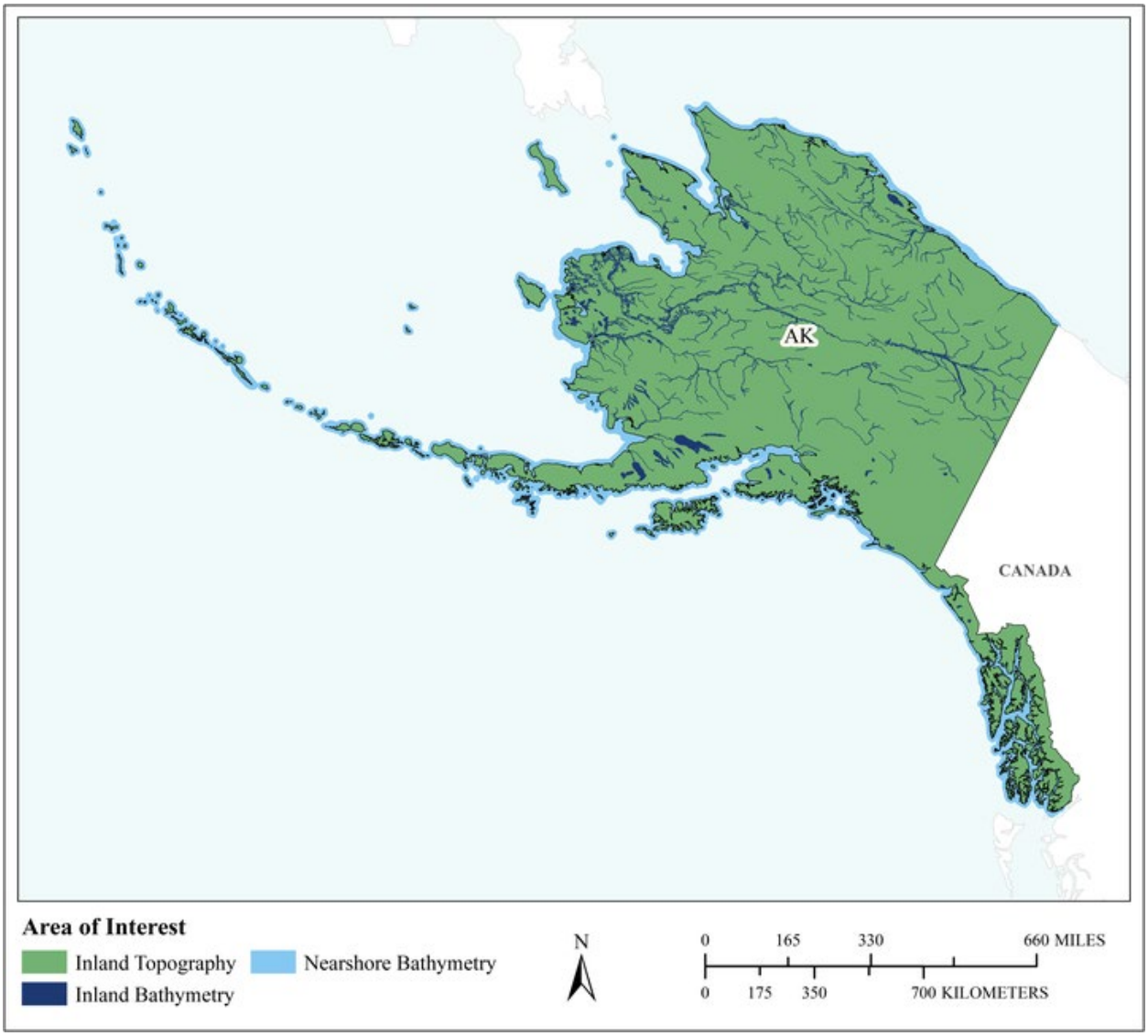
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	Minor	Minor
Improved customer experience	Major	Minor	Moderate	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major	Major	Major
Environmental	Major	Minor	Minor	Minor
Public safety, including life and property	Major	Moderate	Minor	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$3,069,728		Annual dollars saved/ realized	$802,769		Annual dollars saved/ realized	$264,552		Annual dollars saved/ realized	$66,659
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$7,337,545					Annual dollars saved/ realized	$10,440			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major			Major		
Environmental	Major			Major			Major			Minor		
Public safety, including life and property	Major			Major			Minor			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes			Yes
Aspect maps	Yes			Yes
Curvature maps	Yes			
Cross sections	Yes		Yes	Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Recreation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Planning and development of recreational facilities such as rafting, boating, swimming, diving, and fishing areas; ski slopes; and golf courses. Location- based products and services such as maps and guides. Tourism. Trail and vista site planning. Orienteering.
MCA Title	Recreation
MCA ID	60023
Organization Type	State or U.S. Territorial government
Organization Name	State of Alaska
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 27 - Recreation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required	Highly desirable		Not required	Not required
Entire AOI under same environmental conditions	Required	Not required	Highly desirable		Not required	Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Nice to have		Nice to have	Not required
DEM for entire AOI needs to be seamless	Required	Nice to have	Nice to have		Nice to have	Not required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	
DTM	Nice to have	Highly desirable	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Nice to have	Not required	
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Nice to have	
Full waveform	Not required	Nice to have	Not required	
Bathymetric Attributed Grid (BAG)		Highly desirable	Nice to have	
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Not required	Nice to have	Not required	
Ground control/ground truthing	Nice to have	Nice to have	Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required	Required	Not required	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Not required	Highly desirable	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Not required	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Not required	Highly desirable	Highly desirable	
Land use/land cover	Nice to have	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Not required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Minor	
Cost savings/cost reduction	Moderate	Minor	Minor	
Cost avoidance	Major	Minor	Minor	
Increased revenues	None	Minor	Minor	
Mission-driven performance improvements	Major	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor	Minor	

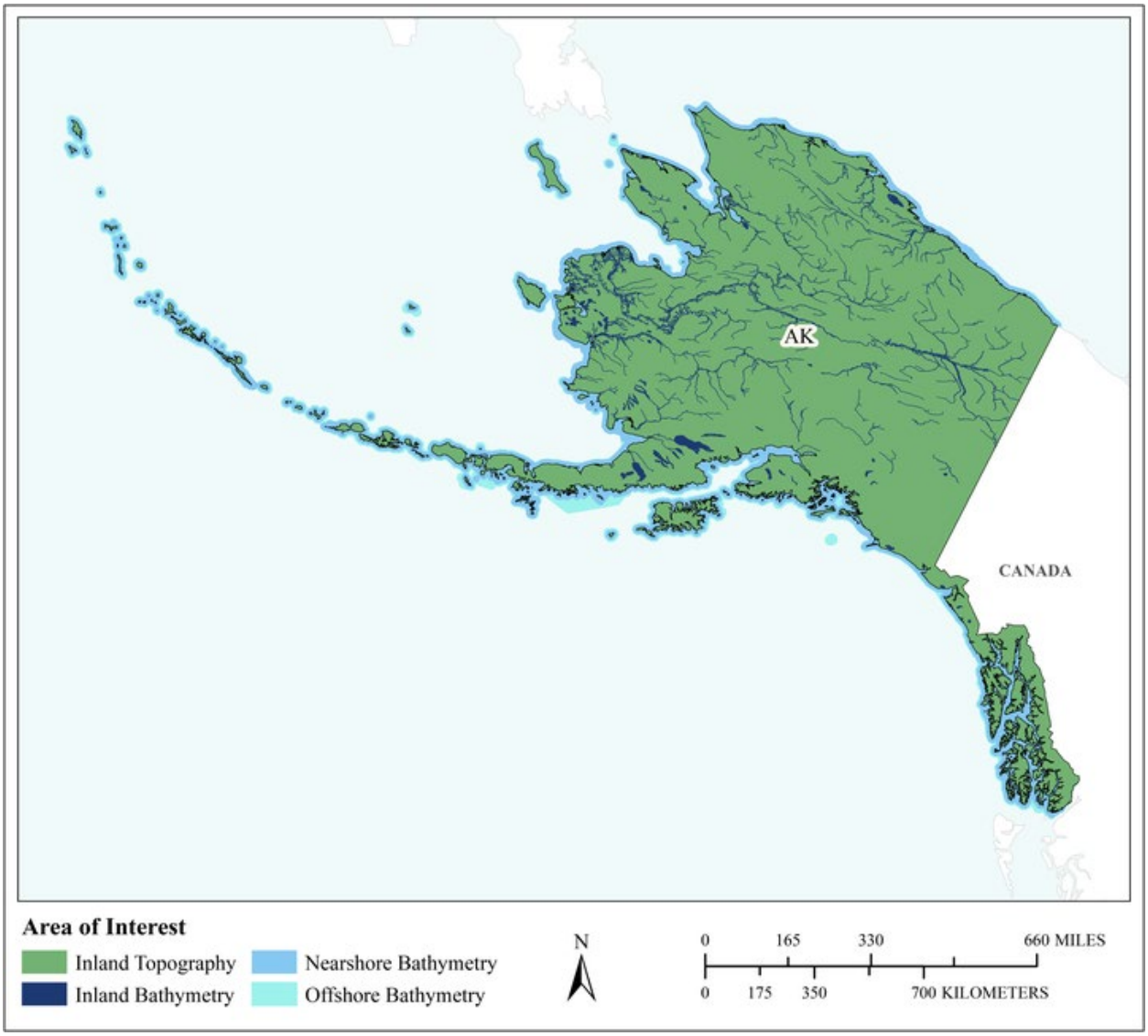
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Minor	Minor	
Improved customer experience	Moderate	Minor	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	
Environmental	Major	Minor	Minor	
Public safety, including life and property	Major	Minor	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	None			Moderate	Unable to provide		Moderate	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$134,037		Annual dollars saved/ realized	$80,720		Annual dollars saved/ realized	$5,220,226			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Major					
Environmental	Moderate			Major			Major					
Public safety, including life and property	Moderate			Moderate			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes		
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Telecommunications



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Telecommunication tower site selection. Design of radio and radar systems. Interference analysis. Path profiles. Undersea telecommunication route selection and deployment.
MCA Title	Telecommunications
MCA ID	60024
Organization Type	State or U.S. Territorial government
Organization Name	State of Alaska
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 28 - Telecommunications
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B	QL2B	Cross sections and/or transects meet needs
Update Frequency	4-5 years	4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				Yes
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required	Highly desirable	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Not required	Highly desirable	Nice to have	Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Not required	Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Not required	Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have	Highly desirable	Nice to have
DTM	Highly desirable	Nice to have	Highly desirable	Nice to have
DEM	Highly desirable	Nice to have	Highly desirable	Nice to have
Raw point cloud data	Highly desirable	Nice to have	Highly desirable	Nice to have
Classified point cloud	Required	Nice to have	Highly desirable	
Edited/cube XYZ		Nice to have	Highly desirable	Required
Full waveform	Highly desirable	Nice to have	Highly desirable	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Nice to have
Tide Predictions			Highly desirable	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Nice to have
Intensity imagery/sidescan imagery	Highly desirable	Not required	Highly desirable	Nice to have
Ground control/ground truthing	Highly desirable	Nice to have	Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Nice to have
Nautical and/or navigation charts			Highly desirable	Nice to have
Acoustic imagery of the seafloor			Highly desirable	Nice to have
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Nice to have
Underwater videography			Highly desirable	Not required
Bottom texture			Highly desirable	Nice to have
Bottom type			Highly desirable	Nice to have
Submerged features			Highly desirable	Not required
Subbottom characteristics			Highly desirable	Not required
Geologic and seismic data	Nice to have	Highly desirable	Nice to have	Nice to have
Water column properties - Physical			Highly desirable	Nice to have
Water column properties - Chemical			Highly desirable	Nice to have
Water column properties - Biological			Highly desirable	Nice to have
Currents			Highly desirable	Not required
Tide/wave heights			Highly desirable	Not required
Sea ice conditions			Highly desirable	Not required
Habitat distribution and classification			Highly desirable	Not required
Boundaries			Highly desirable	Not required
Routes			Highly desirable	Not required
Offshore cadastral			Highly desirable	Not required
Lease areas			Highly desirable	Nice to have
Fixed obstructions			Highly desirable	Nice to have
Floating observation/navigation systems			Highly desirable	Nice to have
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	I don't know
Wetlands	Required	Highly desirable	Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Nice to have
Inland surface water features	Required	Highly desirable	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Required	Highly desirable	Highly desirable	
Cultural resources	Required	Highly desirable	Highly desirable	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI		Yes		
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	I don't know	I don't know
Cost savings/cost reduction	Major	Major	I don't know	I don't know
Cost avoidance	Major	Major	I don't know	I don't know
Increased revenues	None	None	I don't know	I don't know
Mission-driven performance improvements	Major	Major	I don't know	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	I don't know	I don't know

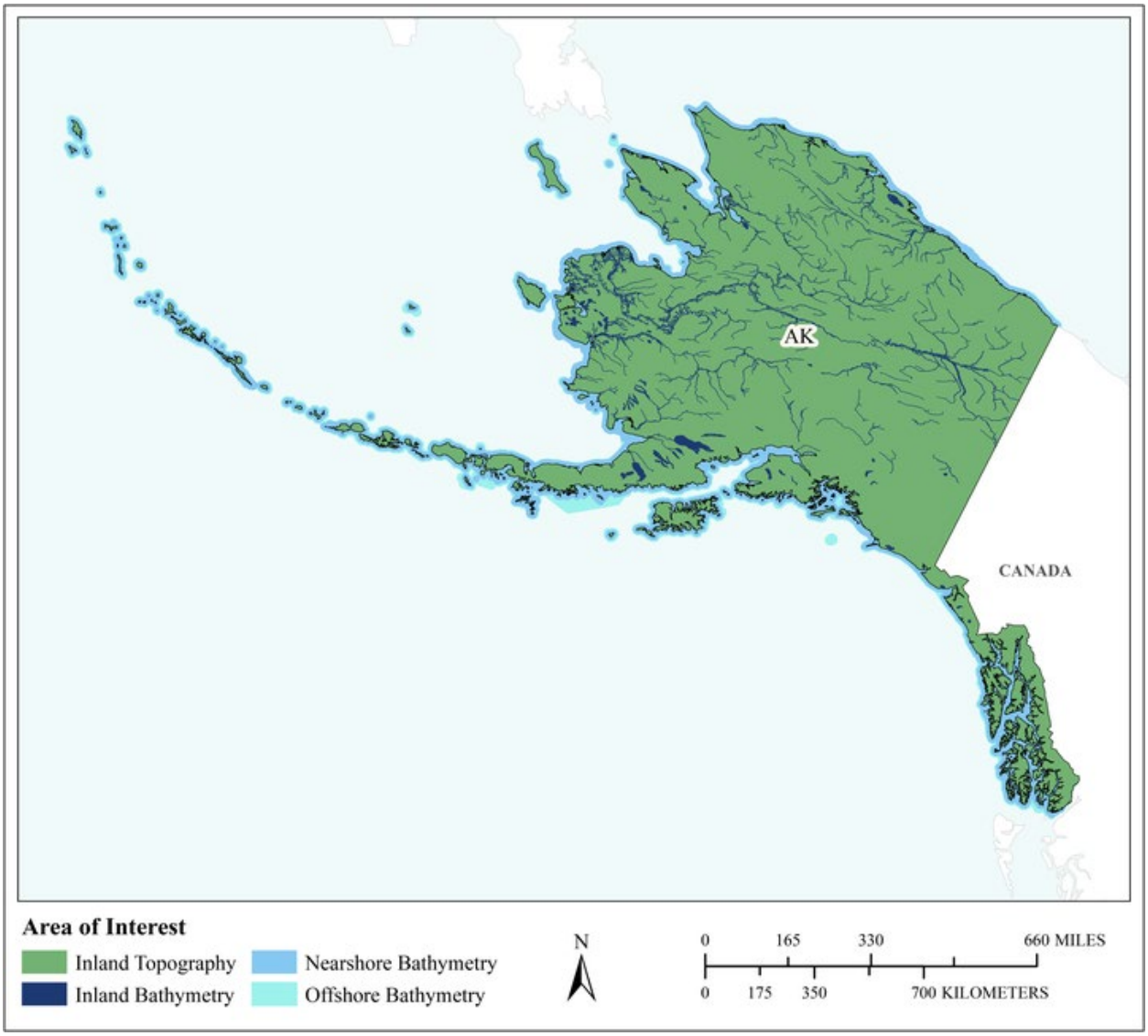
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major	I don't know	I don't know
Improved customer experience	Major	Major	I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	I don't know	I don't know
Environmental	Minor	Minor	I don't know	I don't know
Public safety, including life and property	Major	Major	I don't know	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know			I don't know			I don't know		
Environmental	I don't know			I don't know			I don't know			I don't know		
Public safety, including life and property	I don't know			Major			I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Maritime and Land Boundary Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Delimitation of legal and other coastal boundaries, inland boundaries, and ordinary high water lines (OHWL).
MCA Title	Maritime and Land Boundary Management
MCA ID	60025
Organization Type	State or U.S. Territorial government
Organization Name	State of Alaska
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 30 - Maritime and Land Boundary Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B	QL0B	I don't know
Update Frequency	6-10 years	6-10 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Highly desirable	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Nice to have	Nice to have	Highly desirable	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable	Highly desirable	Required	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable	Highly desirable	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	Required
DTM	Required	Required	Required	Required
DEM	Highly desirable	Required	Required	Required
Raw point cloud data	Nice to have	Highly desirable	Required	Required
Classified point cloud	Highly desirable	Highly desirable	Required	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Not required	Nice to have
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Not required
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Nice to have	Required	Not required	Not required
Ground control/ground truthing	Highly desirable	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Required	Highly desirable	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Nice to have
Water column properties - Biological			Not required	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Highly desirable	Nice to have
Routes			Nice to have	Highly desirable
Offshore cadastral			Highly desirable	Nice to have
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Required	Required
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Nice to have
Wetlands	Required	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Highly desirable	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Minor	None	I don't know
Cost savings/cost reduction	Moderate	None	Minor	Moderate
Cost avoidance	Moderate	None	Minor	Moderate
Increased revenues	Minor	None	None	I don't know
Mission-driven performance improvements	Major	None	Moderate	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None	None	I don't know

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	None	Minor	Moderate
Improved customer experience	Major	None	Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	Moderate
Environmental	Major	Minor	Minor	Moderate
Public safety, including life and property	Moderate	None	Minor	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	Minor	Unable to provide		None			None			I don't know	Unable to provide	
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$657,314		Annual dollars saved/ realized	$493,291		Annual dollars saved/ realized	$9,265,541			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$2,520,175									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Moderate			Moderate		
Environmental	Minor			Major			Major			Major		
Public safety, including life and property	None			Moderate			Moderate			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps		Yes		
Cross sections		Yes		
Height-Above-Ground maps		Yes		
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

American Samoa

Current status of elevation data for American Samoa

American Samoa currently has topographic lidar generated in 2012 by NOAA. The lidar data are Quality Level 3 (QL3) and cover Tutuila, Aunu‘u, Ofu, Olosega, Rose Atoll, and part of Ta‘u. Large extents of bathymetry data from 2004 are available around Tutuila and Manua from NOAA, much of it with a 5-m grid. Newer data could be collected with a topo-bathy project as a new reference dataset to complement the NOAA data. American Samoa has a large GIS community (GIS Users Group) with many government agencies, private sectors, and individual users, all of whom would benefit from elevation data.

Importance of elevation data to American Samoa

The data are commonly used in planning, risk management, hazard evaluation, and post disaster recovery efforts. The American Samoa Department of Commerce (DOC) and the Project Notifications and Review System (PNRS) need elevation data to review development and building permits, determine a proposed structure’s proximity to shore, identify flood or landslide prone areas, monitor beach erosion, and determine the environmental impacts of new development. The main island of Tutuila is subsiding, causing the benchmarks to be off, so a resurvey to include topobathymetric lidar is needed. Concerns include tsunami and storm surge, so elevation data (both topo and bathy) are needed for modeling. The Coral Reef Advisory Group, a collaboration of multiple agencies, needs elevation data for natural resources management to monitor change over time of habitats, algae, coral, fish, invertebrates, pollution and sediment from land, construction induced change, sedimentation, etc. American Samoa Power Authority (ASPA) relies heavily on elevation data for engineering design and decisions. ASPA has limited survey equipment and most of the waterline, wells, and tank designs are dependent on the accuracy of elevations. ASPA uses existing DEM data for most of this information and also use elevations to run hydraulic analyses. AS Department of Port Administration needs a bathymetric study conducted every three years to ensure the deep draft vessels can continue to dock safely in the main port and five small boat harbors. Cruise ships and cargo ships routinely ask for current bathymetric data. It is also relevant for project planning (particularly MLLW data), such as building or replacing a revetment and siting dock structures. Bathymetry is desired for future projects such as aquaculture, etc. Lidar data are needed for H&H modeling, design of water and wastewater systems, also for electric transmission and distribution, to locate wind and solar elements, and for future design work. Other uses of elevation data include forest resources management, renewable energy resources, cultural resources preservation and management, sea level rise and subsidence, land navigation and safety, urban and regional planning, and telecommunications.

High-level summary of elevation data requirements

American Samoa needs topographic data and all the bathymetric data types - inland, nearshore, and offshore. Many American Samoa activities involve underwater work so new bathymetric data are critical. Offshore data are needed to a depth of 30 meters. American Samoa requires Quality Level 1 (QL1) inland topography, QL1B inland and nearshore bathymetry, and Order 1b offshore bathymetry updated every 4-5 years. Given the higher data collection costs in the Pacific Basin, it would be preferable to collect the topo/bathy lidar to the highest practicable level for increased utility.

High-level summary of benefits that would come from higher resolution elevation data

American Samoa is heavily dependent on its coastal and offshore environment, so the better these environments can be visualized, the more closely they can be monitored for changes. American Samoa Department of Commerce closely monitors construction and other activities along the shoreline and requires both topography and bathymetry elevation. Hazard detection, erosion, and developmental

impacts are all critical and require elevation data. Coastal erosion is of particular concern in American Samoa due to the high exposure of shorelines to erosion which is further exacerbated by island subsidence. Major benefits will come from more efficient modeling and mapping and potential loss prevention from disasters. Nearshore bathymetric data are critical for coral reef monitoring to detect changes. Numerous benefits include time saved in the field and in planning; reduction of errors and accident avoidance to save people, property, and the reefs. For utilities, data will identify at-risk sites. Large benefits for power generation come not only for maintenance of the grid but also siting offshore power (bathy) and solar (topo). Bathymetric data can also aid in determining new offal sites, for example for the tuna processing plant.

Additional comments

The local GIS Users Group tries to cover all necessary data for all partners' regulations. For now, most of the collaboration and data in file are within American Samoa Islands (which includes Tutuila and the Manua Islands (Tau, Ofu, and Olosega)). Updated accurate topographic and bathymetric data for at least Tutuila at the most accurate quality level possible is highly desirable. Acquiring the funds to get updated data is complicated, so every opportunity to justify a relative study, and receiving the most accurate data set is always appreciated. Bathymetric data should ideally include the reefs and entire harbor.

The Territory of American Samoa has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	American Samoa Power Authority	33022	Planning and Design for Electric, Water, Wastewater, and Solid Waste Utilities	Inland Topo	QL0 HD	Annually	$431	$115	Major	Major	Major
				Inland Bathy	QL0B	Annually	$1,866	$194	Major	Major	Major
				Nearshore Bathy	QL0B	Annually	$32	$54	Major	Major	Major
BU 03 – Coastal Zone Management	American Samoa Department of Commerce	21567	Coastal Hazard Mitigation, Inundation Mapping, and Land Use Mapping	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
				Nearshore Bathy	QL0B	6-10 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
BU 04 – Forest Resource Management	Territory of American Samoa	60026	Forest Resources Management	Inland Topo	QL1	2-3 years	$317	$460	Major	Major	Major
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL2B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	I don't know
BU 06 – Natural Resource Management	American Samoa Community College	33074	Research, Extension, and Educational Programs and Services	Inland Topo	QL1	4-5 years	$3,052	$11,211	Major	Major	Major
BU 07 – Wildlife and Habitat Management	Coral Reef Advisory Group, AS	21509	Conservation and Management of Coral Reef Communities and Associated Ecosystems	Inland Topo	QL2	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Inland Bathy	QL2B	Annually	Unable to quantify	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL0B	2-3 years	$24,120	Unable to quantify	Major	Major	Major
				Offshore Bathy	Order 1	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 09 – Fisheries Management and Aquaculture	Territory of American Samoa	60027	Fisheries Management and Aquaculture	Inland Topo	QL2	2-3 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	6-10 years	Unable to quantify	Unable to quantify	Major	Major	Moderate
				Nearshore Bathy	QL0B	6-10 years	Unable to quantify	Unable to quantify	Moderate	Major	Minor
				Offshore Bathy	Special Order	6-10 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Minor
BU 12 – Renewable Energy Resources	Territory of American Samoa	60028	Renewable Energy Resources	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	None
				Inland Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 14 – Cultural Resource Management	Territory of American Samoa	60029	Cultural Resources Preservation and Management	Inland Topo	QL1	4-5 years	$14	$12	Minor	Minor	Minor
				Inland Bathy	QL0B	6-10 years	$35	Unable to quantify	Moderate	Minor	Minor
				Nearshore Bathy	QL0B	4-5 years	$2	Unable to quantify	Minor	Moderate	Minor
BU 15 – Flood Risk Management	DEPARTMENT OF PUBLIC WORKS	33077	Coastal and Flooding Hazard and Landslide and Rockfall Mitigation	Inland Topo	Cross sections and/or transects meet needs	4-5 years	$2,894 to $4,341	Unable to quantify	Minor	Minor	Major
BU 16 – Sea Level Rise and Subsidence	Territory of American Samoa	60030	Sea Level Rise and Subsidence	Inland Topo	QL1 HD	4-5 years	$4,227	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Minor
BU 18 – Homeland Security	ASDHS	33084	Emergency Management and Disaster Response	Inland Topo	QL2	2-3 years	$2,368	$41	Major	Moderate	Major
				Inland Bathy	QL2B	2-3 years	$667	$42	Major	Major	Major
				Nearshore Bathy	QL2B	2-3 years	$9	Unable to quantify	Major	Major	Major
				Offshore Bathy	Order 2	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 19 – Land Navigation	Territory of American Samoa	60031	Land Navigation and Safety	Inland Topo	QL0	2-3 years	$1,040	$83	Minor	Major	Major
				Inland Bathy	QL0B	2-3 years	$44	Unable to quantify	Minor	Moderate	Moderate
				Nearshore Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	None	Moderate	Moderate
BU 22 – Infrastructure Management	American Samoa Telecommunications Authority (ASTCA)	22526	Underground Location of Infrastructure	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Inland Bathy	QL2B	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 23 – Urban and Regional Planning	Territory of American Samoa	60032	Urban and Regional Planning	Inland Topo	QL1	4-5 years	$21,603	$2,494	Moderate	Major	Major
				Inland Bathy	QL1B	6-10 years	$879	$1,113	Moderate	Moderate	Major
				Nearshore Bathy	QL2B	4-5 years	$187	$198	Moderate	Moderate	Moderate
BU 28 – Telecom-munications	Territory of American Samoa	60033	Telecommunications	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Inland Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	Major
				Nearshore Bathy	QL2B	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

MCA Title: Planning and Design for Electric, Water, Wastewater, and Solid Waste Utilities

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Custom description	Custom description	Custom description	
Sub Area Requirements	Manu'a Group and Tutuila	Manu'a Group and Tutuila	Manu'a Group and Tutuila	

MCA Description	Response
Mission Critical Activity	In engineering design and decisions we rely heavily on elevations. We have limited survey equipment and most of our waterline, wells, and tank designs are dependent on the accuracy of elevations. We use our existing DEM file for most of this information. We also use elevations to run our hydraulic analysis. Bathymetry is desired for future projects such as siting wind farms, etc. Lidar data are needed for H&H modeling, design of water and wastewater systems, also for electric transmission and distribution, to locate wind and solar elements, and for future design work.
MCA Title	Planning and Design for Electric, Water, Wastewater, and Solid Waste Utilities
MCA ID	33022
Organization Type	State or U.S. Territorial government
Organization Name	American Samoa Power Authority
Sub-Agency or Division	
Organization Mission	American Samoa Power Authority (ASPA) is a development-oriented public utility providing electricity, water, wastewater and solid waste service to over 60,000 residents of American Samoa. We install, operate and maintain American Samoa's public utility infrastructure and offer our customers the highest quality services at affordable rates. ASPA is both mandated by law and motivated by ideals of community service to operate as a viable and successful business entity of American Samoa Government. ASPA is directed by a five member board of directors, and administered by a Chief Executive Officer. Members are nominated to the board by American Samoa's Governor and confirmed by the Legislature of American Samoa Government.
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 11 - Geologic Resource Mining and Extraction
Tertiary Business Use	BU 22 - Infrastructure and Construction Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Curbs, trees, anything projected around project areas. Underwater obstructions.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B	QL0B	
Update Frequency	Annually	Annually	Annually	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Less than 50 cm	Less than 50 cm	
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm	Less than 10 cm	
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed	Not applicable		To MHHW	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Highly desirable	Highly desirable		Highly desirable	Required
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable		Highly desirable	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Required
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable		Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Required	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Required	Required	Required	
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Required	Required	
Full waveform	Nice to have	Required	Required	
Bathymetric Attributed Grid (BAG)		Required	Required	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have	Required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Required	
Intensity imagery/sidescan imagery	Required	Required	Required	
Ground control/ground truthing	Required	Required	Required	
Other		Required		
Other description				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Required	
Acoustic imagery of the seafloor			Required	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Required	
Bottom texture			Required	
Bottom type			Required	
Submerged features			Required	
Subbottom characteristics			Required	
Geologic and seismic data	Required	Required	Required	
Water column properties - Physical			Required	
Water column properties - Chemical			Required	
Water column properties - Biological			Required	
Currents			Required	
Tide/wave heights			Required	
Sea ice conditions			Required	
Habitat distribution and classification			Not required	
Boundaries			Required	
Routes			Required	
Offshore cadastral			Required	
Lease areas			Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Fixed obstructions			Required	
Floating observation/navigation systems			Required	
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Required	Required	Required	
Wetlands	Required	Required	Required	
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Required	Required	Required	
Cultural resources	Required	Required	Required	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	The only topographic data that we have is our Digital Elevation Model which we got from the American Samoa Department of Commerce.	USGS DEM	NOAA bathy	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI			Yes	
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories				
State repositories used				

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Major	Major	
Cost savings/cost reduction	Minor	Major	Major	
Cost avoidance	Minor	Major	Major	
Increased revenues	Minor	Major	Major	
Mission-driven performance improvements	Minor	Major	Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	Major	Major	
Improved response or timeliness	Moderate	Major	Major	
Improved customer experience	Moderate	Major	Major	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Major	Major	
Environmental	Moderate	Major	Major	
Public safety, including life and property	Moderate	Major	Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$431		Annual dollars saved/ realized	$1,866		Annual dollars saved/ realized	$32			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Other customer service benefits				Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$115		Annual dollars saved/ realized	$194		Annual dollars saved/ realized	$54			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major					
Environmental	Major			Major			Major					
Public safety, including life and property	Major			Major			Major					
Other												
Other benefits				Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes	Yes	Yes	
Curvature maps	Yes	Yes	Yes	
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes	Yes	Yes	
Viewshed maps	Yes	Yes	Yes	
Hydrologic Flow Direction Grids	Yes	Yes	Yes	
Hydrologic Flow Accumulation Grids	Yes	Yes	Yes	
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement	Yes	Yes	Yes	
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Coastal Hazard Mitigation, Inundation Mapping, and Land Use Mapping

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	Custom description		Custom description	
Sub Area Requirements	Manu'a Group and Tutuila		Manu'a Group and Tutuila	

MCA Description	Response
Mission Critical Activity	Coastal hazard mitigation, Inundation mapping, Land use mapping. Elevation data are needed for the review of development and building permits, to determine a proposed structure's proximity to shore, to identify flood or landslide prone areas, to monitor beach erosion, and determine the environmental impacts of new development.
MCA Title	Coastal Hazard Mitigation, Inundation Mapping, and Land Use Mapping
MCA ID	21567
Organization Type	State or U.S. Territorial government
Organization Name	American Samoa Department of Commerce
Sub-Agency or Division	
Organization Mission	To improve the quality of life for individuals and communities through economic development and sustainable resource management.
Program Name	Coastal Zone Management
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	House, buildings, roads, and streams, bottom surface underwater.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2		QL0B	
Update Frequency	4-5 years		6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	I don't know		Up to 1 meter	
Acceptable Vertical Error	I don't know		Less than 10 cm	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed			To MHW	
How far down the beach profile needed	To MHW		To MHW	
Tide correction requirement			MHW	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required		Highly desirable			Highly desirable
Entire AOI under same environmental conditions	Not required		Not required			Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable		Highly desirable			Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable		Highly desirable			Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know		I don't know			I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have		Highly desirable	
DTM	Highly desirable		Highly desirable	
DEM	Required		Highly desirable	
Raw point cloud data	Nice to have		Highly desirable	
Classified point cloud	Required		Highly desirable	
Edited/cube XYZ			Highly desirable	
Full waveform	Not required		Highly desirable	
Bathymetric Attributed Grid (BAG)			Highly desirable	
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Highly desirable		Highly desirable	
Ground control/ground truthing	Nice to have		Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required		Required	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Required	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Nice to have		Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Required	
Tide/wave heights			Required	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Required	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Highly desirable	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Required		Required	
Land use/land cover	Required		Required	
Wetlands	Required		Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required		Required	
Bridges/culverts	Nice to have			
Landmark features	Nice to have		Highly desirable	
Cultural resources	Nice to have		Highly desirable	
Coastal and riverine structures	Nice to have		Nice to have	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We currently are using Lidar collected back in 2012 by the USGS and Photo Science.		5m bathymetry collected by NOAA	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes		Yes	
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other			Yes	
Other description			Our server. Sent from NOAA	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Minor	
Cost savings/cost reduction	Major		Major	

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost avoidance	Major		I don't know	
Increased revenues	I don't know		None	
Mission-driven performance improvements	Major		Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		Major	
Improved response or timeliness	Major		Major	
Improved customer experience	Major		Moderate	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate		Moderate	
Environmental	Major		Moderate	
Public safety, including life and property	Major		Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide					Minor	Unable to provide				
Cost avoidance	Major	Unable to provide					I don't know	Unable to provide				
Increased revenues	Minor	Unable to provide					None					
Mission-driven performance improvements	Major	Unable to provide					Major	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide					Major	Unable to provide				
Improved customer experience	Major	Unable to provide					Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate						Moderate					
Environmental	Major						Moderate					
Public safety, including life and property	Major						Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes		Yes	
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes		Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes		Yes	
Breaklines for road edge-of-pavement	Yes		Yes	
Rugosity/Surface Roughness	Yes		Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	1
Update frequency	3

MCA Title: Forest Resources Management

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Forest health assessment. Determination of standing inventory of forest resources. Prescribed burn planning. Analysis of carbon stocks for trade. Harvest systems planning.
MCA Title	Forest Resources Management
MCA ID	60026
Organization Type	State or U.S. Territorial government
Organization Name	Territory of American Samoa
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL2B	
Update Frequency	2-3 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Not required		Highly desirable	Nice to have
Entire AOI under same environmental conditions	Required	Required	Highly desirable		Required	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Not required	Not required	
DTM	Required	Not required	Not required	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Highly desirable	Required	
Classified point cloud	Required	Highly desirable	Required	
Edited/cube XYZ		Not required	Not required	
Full waveform	Nice to have	Nice to have	Not required	
Bathymetric Attributed Grid (BAG)		Nice to have	Not required	
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Not required	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Not required	
Ground control/ground truthing	Highly desirable	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Not required	
Subbottom characteristics			Not required	
Geologic and seismic data	Nice to have	Not required	Not required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Not required	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Required	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates	Nice to have	Required	Required	
Land use/land cover	Required	Required	Required	
Wetlands	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Highly desirable	Required		
Landmark features	Nice to have	Nice to have	Not required	
Cultural resources	Highly desirable	Nice to have	Not required	
Coastal and riverine structures	Nice to have	Required	Not required	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	I don't know	
Cost savings/cost reduction	Major	Major	I don't know	
Cost avoidance	Major	Major	I don't know	
Increased revenues	Minor	Moderate	I don't know	
Mission-driven performance improvements	Major	Major	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	I don't know	

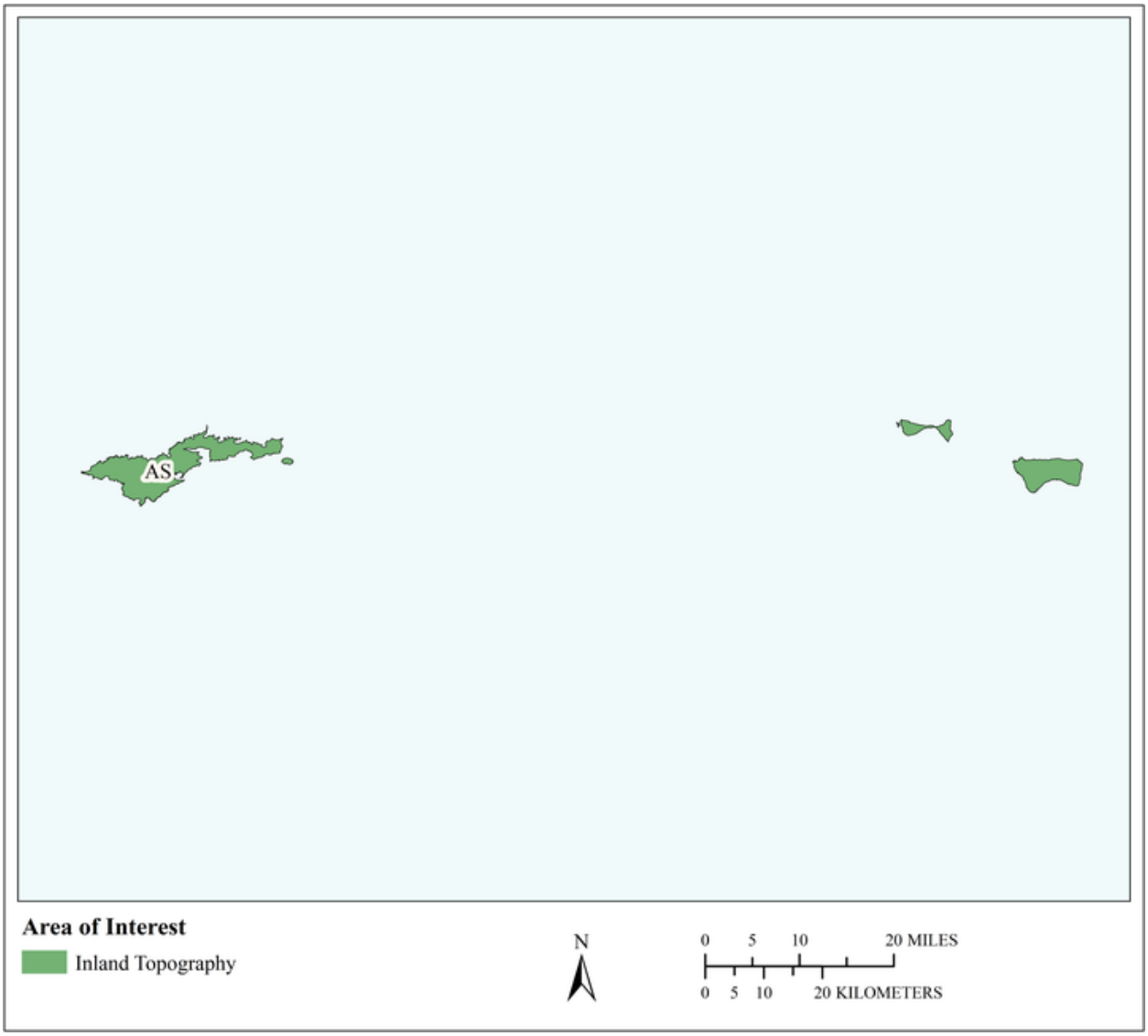
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	Major	I don't know	
Improved customer experience	Moderate	Major	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Major	Major	
Environmental	Major	Major	Major	
Public safety, including life and property	Moderate	Major	I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$317									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$460									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major					
Environmental	Major			Major			Major					
Public safety, including life and property	Major			Major			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes	Yes	
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes		Yes	
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Research, Extension, and Educational Programs and Services



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Custom description			
Sub Area Requirements	The inhabited islands of Tutuila, Aunu'u, Ofu, Olosega, and Ta'u			

MCA Description	Response
Mission Critical Activity	Provide GIS support for Forestry and Agriculture programs
MCA Title	Research, Extension, and Educational Programs and Services
MCA ID	33074
Organization Type	State or U.S. Territorial government
Organization Name	American Samoa Community College
Sub-Agency or Division	
Organization Mission	To serve American Samoa's diverse community by providing research, extension and educational programs and services in agriculture, natural resources and wellness, enhancing the quality of life and fragile ecosystem while honoring the fa'asamoa (the Samoan Way)
Program Name	Forestry extension program, Agriculture extension program
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	BU 04 - Forest Resources Management
Tertiary Business Use	BU 08 - Agriculture and Precision Farming

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Nice to have
Other	Required
Other description	Aerial imagery

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Interested in 3D for houses throughout the Island

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed	To MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	2012 lidar with 1-meter post spacing provided by NOAA Coastal Services Center. The data cover American Samoa including islands of Tutuila, Aunu'u, Ofu, Olosega, and Ta'u..			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes			
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	Department of Commerce			
Data that meet my needs are not available				

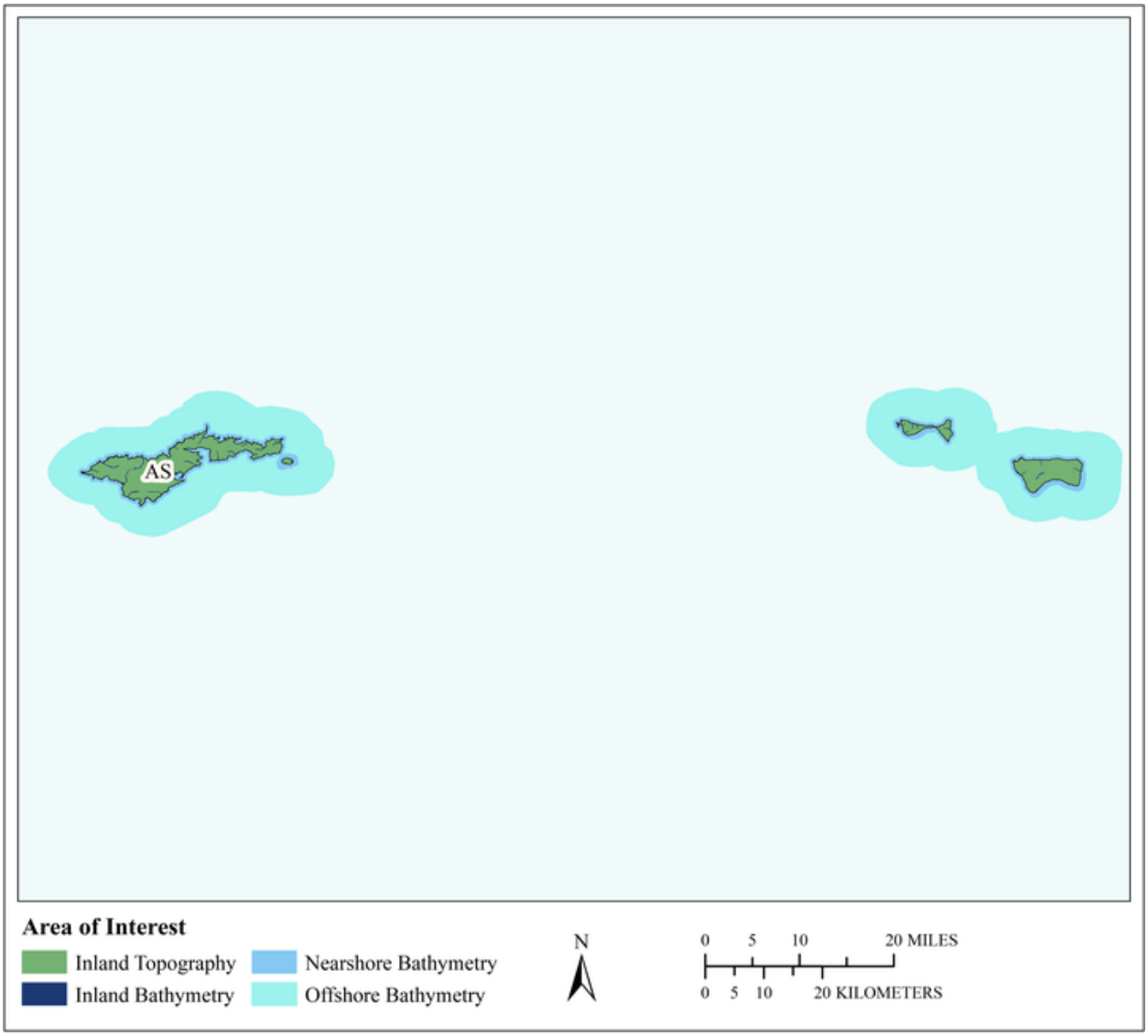
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Moderate			
Increased revenues	Moderate			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Other operational benefits	Major	Unable to provide										
Other operational benefits description	Current data that accurately represents the situation on ground.											
Future annual operational benefits added during validation		Annual dollars saved/ realized	$3,052									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$11,211									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Education or outreach description	Identify areas where community can conserve natural resources											
Environmental	Major											
Environmental description	Identify areas for forest rehabilitation											
Public safety, including life and property	Major											
Public safety, including life and property description	Able to identify threats to community (steep slopes, fire prone areas)											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Conservation and Management of Coral Reef Communities and Associated Ecosystems



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Nice to have
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Custom description
Sub Area Requirements				American Samoa out to 30 m depth

MCA Description	Response
Mission Critical Activity	Conservation and management of coral reef communities and associated ecosystems. Elevation data are needed for natural resources management to monitor change over time of sea grass, algae, coral, fish, invertebrates, pollution and sediment from land, construction induced change, land use changes, sedimentation, etc.
MCA Title	Conservation and Management of Coral Reef Communities and Associated Ecosystems
MCA ID	21509
Organization Type	State or U.S. Territorial government
Organization Name	Coral Reef Advisory Group, AS
Sub-Agency or Division	
Organization Mission	Promote the health and resilience of American Samoa's coral reef ecosystems using scientific research and community engagement to implement effective management for current and future generations.
Program Name	Coral Reef Ecosystem Management
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	BU 09 - Fisheries Management and Aquaculture
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required
Other	Required
Other description	Coral reef colonies

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Interested in things like coral colonies, marine debris from shipwrecks, piers, roads, streams, groups of mangroves

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have

Inland Bathy Feature Size Requirements	Response
Greater than 2,500 ft	Not required
Other	Required
Other description	Small streams (not navigable)
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Not required
Greater than 10 acres	Not required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B	QL0B	Order 1
Update Frequency	2-3 years	Annually	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 40 cm	Less than 1 meter
How far onshore needed			To Mean Higher High Water (MHHW)	
How far down the beach profile needed	To MLW		To MLW	
Tide correction requirement			MHW	MHW
Cross sections and/or transects meet needs			Partial	
Cross section/transect requirement			For beach profiling	

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Required	Highly desirable	Nice to have	Highly desirable	Required
Entire AOI under same environmental conditions	Nice to have	Required	Highly desirable	Nice to have	Highly desirable	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Nice to have	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Nice to have	Required	Required
DTM	Required	Nice to have	Required	Required
DEM	Required	Nice to have	Required	Required
Raw point cloud data	Required	Nice to have	Highly desirable	Required
Classified point cloud	Required	Nice to have	Highly desirable	
Edited/cube XYZ		Nice to have	Required	Required
Full waveform	Required	Nice to have	Required	Required
Bathymetric Attributed Grid (BAG)		Nice to have	Required	Required
Breaklines required for standard hydro-flattening	Required	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Required	Required	Required	Required
Ground control/ground truthing	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Nice to have	Nice to have
Acoustic imagery of the seafloor			Required	Required
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Nice to have	Nice to have
Bottom texture			Required	Required
Bottom type			Required	Required
Submerged features			Required	Required
Subbottom characteristics			Required	Required
Geologic and seismic data	Required	Required	Required	Required
Water column properties - Physical			Required	Required
Water column properties - Chemical			Required	Required
Water column properties - Biological			Required	Required
Currents			Required	Nice to have
Tide/wave heights			Required	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Highly desirable	Highly desirable
Routes			Not required	Not required
Offshore cadastral			Not required	Not required
Lease areas			Not required	Not required
Fixed obstructions			Required	Required
Floating observation/navigation systems			Required	Required
Shorelines – current, historic, change rates	Highly desirable	Required	Highly desirable	
Land use/land cover	Highly desirable	Required	Required	Not required
Wetlands	Highly desirable	Required	Required	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Not required
Inland surface water features	Highly desirable	Required	Required	
Bridges/culverts	Highly desirable	Nice to have		
Landmark features	Highly desirable	Required	Required	
Cultural resources	Highly desirable	Required	Required	
Coastal and riverine structures	Nice to have	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	USGS lidar	IfSAR and Lidar	NOAA 5m bathy	NOAA 5m bathy
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	
NCEI	Yes	Yes	Yes	
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes	Yes	
State repositories used	No	No	DoC Marine Portal	
Other			Yes	Yes
Other description			Our server. Sent from NOAA. Accurate and precise nearshore bathymetry and habitat maps are not available.	Our server. Sent from NOAA
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Major	Major
Cost savings/cost reduction	Major	Major	Major	Major

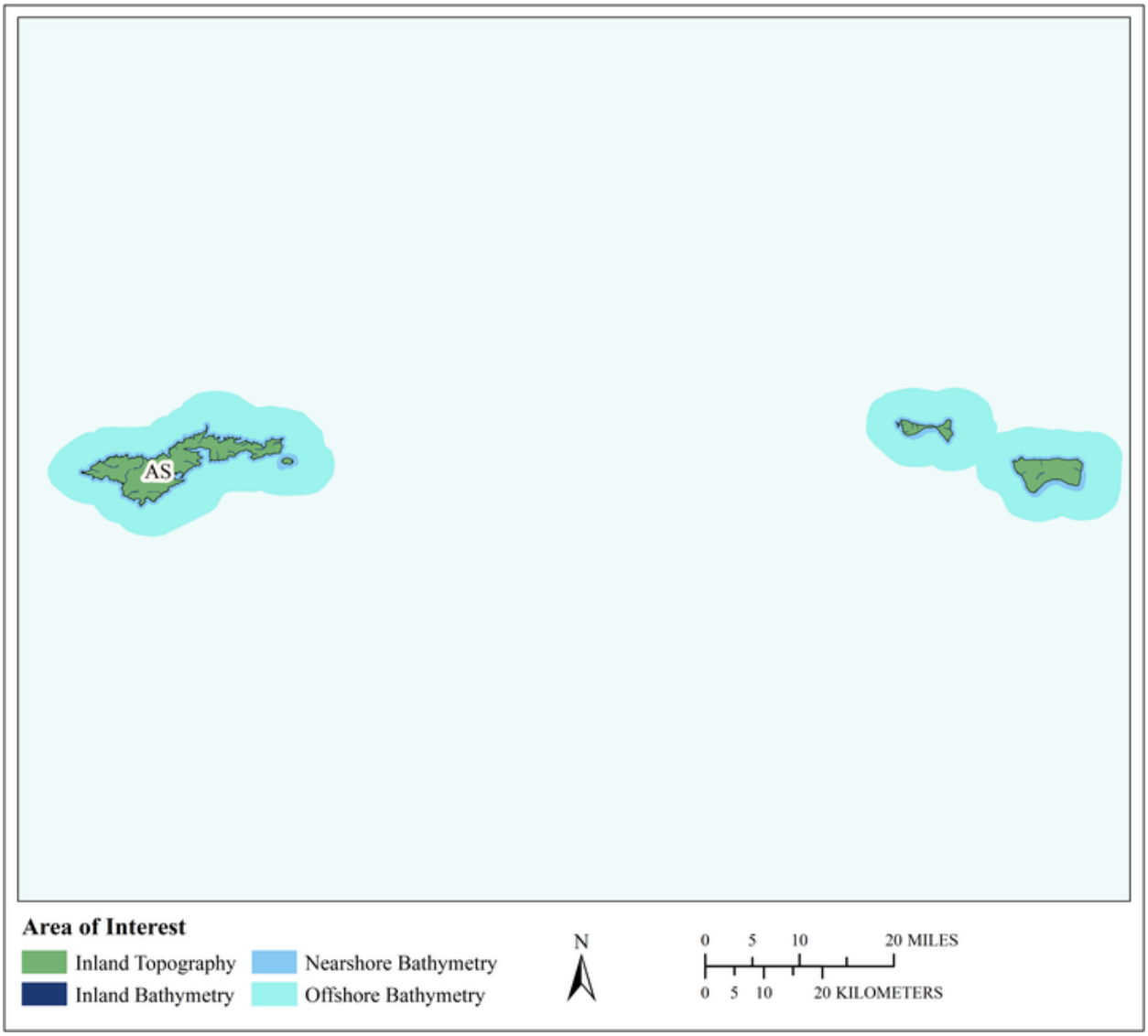
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Cost avoidance	Major	Major	Major	Major
Increased revenues	Moderate	Moderate	Moderate	Moderate
Mission-driven performance improvements	Moderate	Moderate	Moderate	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	Major
Improved response or timeliness	Major	Major	Major	Major
Improved customer experience	Minor	Minor	Minor	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major	Major	Major
Environmental	Major	Major	Major	Major
Public safety, including life and property	Major	Major	Major	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		Major	Unable to provide		Major	Annual dollars saved/realized	$24,120	I don't know	Unable to provide	
Cost savings/cost reduction	I don't know	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Cost avoidance	I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Increased revenues	I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	I don't know	Unable to provide		Major	Unable to provide		Major	Annual percent improvement	93%	I don't know	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Improved customer experience	I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			Major			Major			I don't know		
Environmental	I don't know			Major			Major			I don't know		
Public safety, including life and property	I don't know			Major			Major			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes	Yes	Yes	Yes
Curvature maps	Yes	Yes	Yes	Yes
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps	Yes	Yes	Yes	Yes
Viewshed maps	Yes	Yes	Yes	Yes
Hydrologic Flow Direction Grids	Yes	Yes	Yes	Yes
Hydrologic Flow Accumulation Grids	Yes	Yes	Yes	Yes
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	Yes
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	Yes
Building footprints	Yes	Yes	Yes	Yes
Breaklines for road edge-of-pavement	Yes	Yes	Yes	Yes
Rugosity/Surface Roughness	Yes	Yes	Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Fisheries Management and Aquaculture



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Management of fisheries. Sustainable aquaculture.
MCA Title	Fisheries Management and Aquaculture
MCA ID	60027
Organization Type	State or U.S. Territorial government
Organization Name	Territory of American Samoa
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B	QL0B	Special Order
Update Frequency	2-3 years	6-10 years	6-10 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Nice to have	Nice to have	Required	Nice to have
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Required	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Required
DTM	Required	Highly desirable	Highly desirable	Nice to have
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Nice to have	Highly desirable	Nice to have
Classified point cloud	Highly desirable	Nice to have	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Nice to have
Tide Predictions			Not required	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Highly desirable	Required
Ground control/ground truthing	Required	Highly desirable	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Nice to have	Required
Acoustic imagery of the seafloor			Highly desirable	Required
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Required
Underwater videography			Nice to have	Highly desirable
Bottom texture			Nice to have	Required
Bottom type			Highly desirable	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Highly desirable	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Required
Floating observation/navigation systems			Nice to have	Required
Shorelines – current, historic, change rates	Required	Highly desirable	Highly desirable	
Land use/land cover	Required	Highly desirable	Nice to have	Nice to have
Wetlands	Required	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Highly desirable
Inland surface water features	Required	Required	Nice to have	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Not required	
Coastal and riverine structures	Required	Highly desirable	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	Moderate
Cost savings/cost reduction	Major	Moderate	Major	Minor
Cost avoidance	Moderate	Moderate	Minor	Minor
Increased revenues	Moderate	Moderate	Minor	None
Mission-driven performance improvements	Major	Major	Moderate	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Minor	Moderate

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major	Moderate	Minor
Improved customer experience	Moderate	Major	Minor	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Moderate	Moderate
Environmental	Major	Moderate	Moderate	Minor
Public safety, including life and property	Moderate	Minor	Minor	None

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		None		
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		None		
Increased revenues	Minor	Unable to provide		None			Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Moderate			Moderate		
Environmental	Moderate			Major			Major			Moderate		
Public safety, including life and property	Moderate			Moderate			Minor			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes		Yes	Yes
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Renewable Energy Resources

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Alternate energy development – solar, tidal, wind, wave, and ocean current. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Low head power potential for hydropower.
MCA Title	Renewable Energy Resources
MCA ID	60028
Organization Type	State or U.S. Territorial government
Organization Name	Territory of American Samoa
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	I don't know
Rivers and Streams	
Less than 10 ft	I don't know
10 - 50 ft	I don't know
51 - 100 ft	I don't know
101 - 500 ft	I don't know
501 - 2,500 ft	I don't know
Greater than 2,500 ft	I don't know
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	I don't know
½ - 1 acre	I don't know
1.1 – 2 acres	I don't know
2.1 – 5 acres	I don't know

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	I don't know
Greater than 10 acres	I don't know

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	I don't know	I don't know	
Update Frequency	6-10 years	I don't know	I don't know	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	I don't know	I don't know	
Acceptable Vertical Error	Up to 20 cm	I don't know	I don't know	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					I don't know	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	I don't know	I don't know		I don't know	I don't know
Entire AOI under same environmental conditions	Highly desirable	I don't know	I don't know		I don't know	I don't know
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	I don't know	I don't know		I don't know	I don't know
DEM for entire AOI needs to be seamless	Highly desirable	I don't know	I don't know		I don't know	I don't know
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	I don't know	I don't know	
DTM	Required	I don't know	I don't know	
DEM	Required	I don't know	I don't know	
Raw point cloud data	Highly desirable	I don't know	I don't know	
Classified point cloud	Highly desirable	I don't know	I don't know	
Edited/cube XYZ		I don't know	I don't know	
Full waveform	Nice to have	I don't know	I don't know	
Bathymetric Attributed Grid (BAG)		I don't know	I don't know	
Breaklines required for standard hydro-flattening	Nice to have	I don't know		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			I don't know	
Tide Predictions			I don't know	
Tidal Constituent And Residual Interpolation (TCARI)			I don't know	
Intensity imagery/sidescan imagery	Not required	I don't know	I don't know	
Ground control/ground truthing	Highly desirable	I don't know	I don't know	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			I don't know	
Nautical and/or navigation charts			I don't know	
Acoustic imagery of the seafloor			I don't know	
Aerial and/or satellite imagery	Highly desirable	I don't know	I don't know	
Underwater videography			I don't know	
Bottom texture			I don't know	
Bottom type			I don't know	
Submerged features			I don't know	
Subbottom characteristics			I don't know	
Geologic and seismic data	Not required	I don't know	I don't know	
Water column properties - Physical			I don't know	
Water column properties - Chemical			I don't know	
Water column properties - Biological			I don't know	
Currents			I don't know	
Tide/wave heights			I don't know	
Sea ice conditions			I don't know	
Habitat distribution and classification			I don't know	
Boundaries			I don't know	
Routes			I don't know	
Offshore cadastral			I don't know	
Lease areas			I don't know	
Fixed obstructions			I don't know	
Floating observation/navigation systems			I don't know	
Shorelines – current, historic, change rates	Nice to have	I don't know	I don't know	
Land use/land cover	Highly desirable	I don't know	I don't know	
Wetlands	Nice to have	I don't know	I don't know	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			I don't know	
Inland surface water features	Nice to have	I don't know	I don't know	
Bridges/culverts	Nice to have	I don't know		
Landmark features	Nice to have	I don't know	I don't know	
Cultural resources	Not required	I don't know	I don't know	
Coastal and riverine structures	Nice to have	I don't know	I don't know	
Overhead structures			I don't know	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	I don't know	I don't know	
Cost savings/cost reduction	Moderate	I don't know	I don't know	
Cost avoidance	Moderate	I don't know	I don't know	
Increased revenues	None	I don't know	I don't know	
Mission-driven performance improvements	Minor	I don't know	I don't know	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	I don't know	I don't know	

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor	I don't know	I don't know	
Improved customer experience	Minor	I don't know	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	I don't know	I don't know	
Environmental	Minor	I don't know	I don't know	
Public safety, including life and property	Minor	I don't know	I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost savings/cost reduction	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Increased revenues	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved customer experience	Minor	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			I don't know			I don't know					
Environmental	Minor			I don't know			I don't know					
Public safety, including life and property	None			I don't know			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Cultural Resources Preservation and Management

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Discovery and analysis of underwater archaeological and historical cultural sites. Site protection and preservation planning. Discovery and analysis of Native American and other historical cultural sites and subsistence activities.
MCA Title	Cultural Resources Preservation and Management
MCA ID	60029
Organization Type	State or U.S. Territorial government
Organization Name	Territory of American Samoa
Sub-Agency or Division	American Samoa Historic Preservation Office
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	
Update Frequency	4-5 years	6-10 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Not required	Nice to have		Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	
DTM	Required	Highly desirable	Nice to have	
DEM	Required	Required	Required	
Raw point cloud data	Not required	Not required	Not required	
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Not required	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Nice to have	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	
Ground control/ground truthing	Nice to have	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Required	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Highly desirable	Highly desirable	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Highly desirable	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Highly desirable	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Required	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Required	
Land use/land cover	Nice to have	Highly desirable	Nice to have	
Wetlands	Nice to have	Highly desirable	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Nice to have	Highly desirable	Nice to have	
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Nice to have	Highly desirable	Highly desirable	
Cultural resources	Required	Highly desirable	Required	
Coastal and riverine structures	Nice to have	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	
Cost savings/cost reduction	Moderate	Minor	Minor	
Cost avoidance	Minor	Minor	Minor	
Increased revenues	None	Minor	None	
Mission-driven performance improvements	Moderate	Moderate	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor	None	

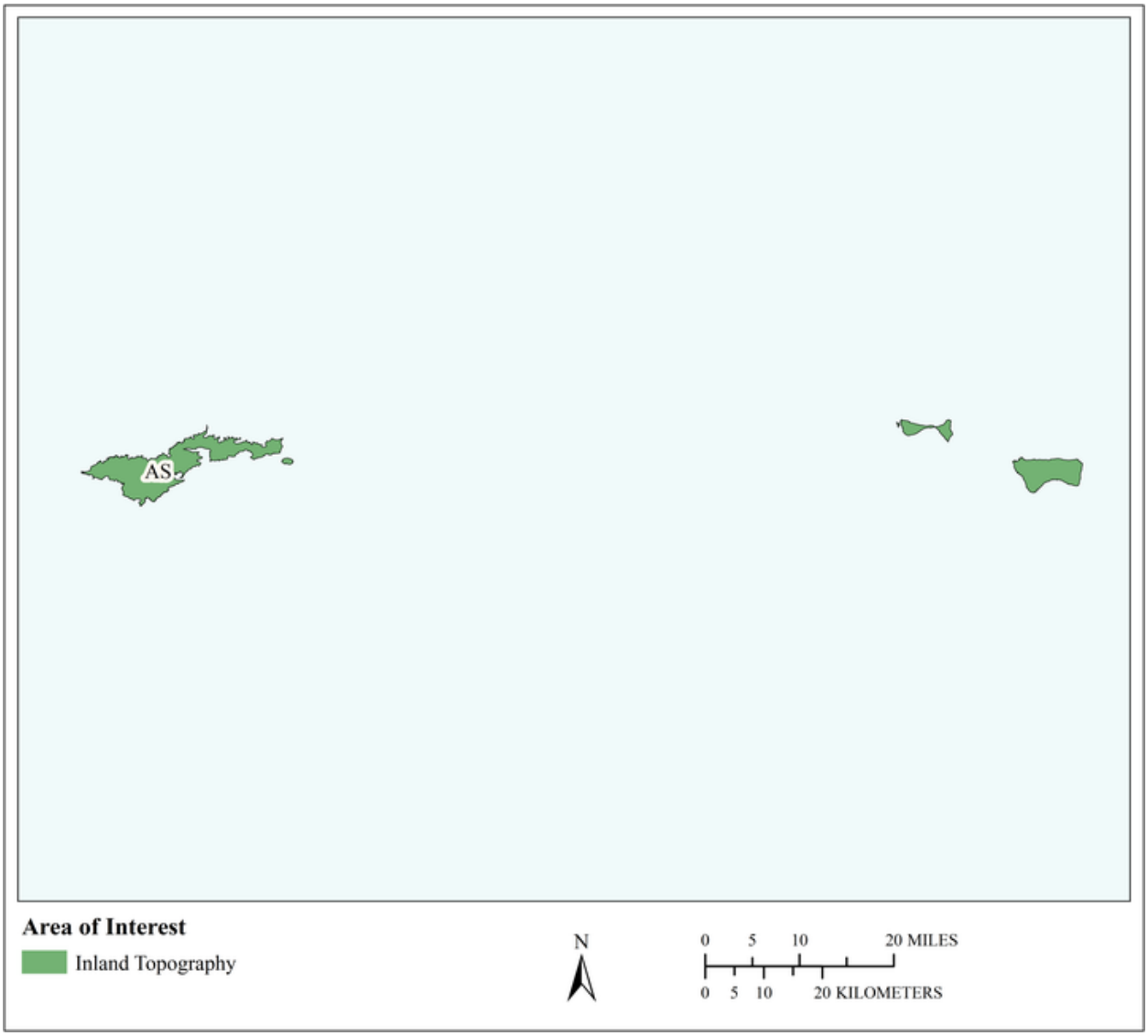
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major	Minor	
Improved customer experience	Moderate	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	Minor	
Environmental	Minor	Moderate	Minor	
Public safety, including life and property	Minor	Moderate	None	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Increased revenues	None			None			None					
Mission-driven performance improvements	Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$14		Annual dollars saved/ realized	$35		Annual dollars saved/ realized	$2			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$12									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Moderate			Minor					
Environmental	Minor			Minor			Moderate					
Public safety, including life and property	Minor			Minor			Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes	Yes	
Hillshades	Yes		Yes	
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Coastal and Flooding Hazard and Landslide and Rockfall Mitigation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Custom description			
Sub Area Requirements	The inhabited islands of Tutuila, Aunu'u, Ofu, Olosega, and Ta'u			

MCA Description	Response
Mission Critical Activity	Coastal hazard, landslide and rockfall mitigation, and flooding hazard.
MCA Title	Coastal and Flooding Hazard and Landslide and Rockfall Mitigation
MCA ID	33077
Organization Type	State or U.S. Territorial government
Organization Name	DEPARTMENT OF PUBLIC WORKS
Sub-Agency or Division	Civil Highways Division
Organization Mission	Provide safe transportation system, public and private institutions, maintenance of government assets.
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 16 - Sea Level Rise and Subsidence
Tertiary Business Use	BU 22 - Infrastructure and Construction Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Roads, buildings

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	Cross sections and/or transects meet needs			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need			
Acceptable Vertical Error	Less than 5 cm			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed				
How far down the beach profile needed	Below MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs	Yes			
Cross section/transect requirement	1) Transect of coastlines, rivers/streams. 2) Road lines 3) Slopes (road and mountain slopes) Longitudinal spacing at 50' - 100' is highly desirable. Vertical accuracy less than a foot (12”) or less than 6” is desirable.			

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform				
Bathymetric Attributed Grid (BAG)				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Required			
Land use/land cover	Required			
Wetlands	Required			
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	LAS from 2012, FIRM Maps, 1962 T-Map,			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	T-Map			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost savings/cost reduction	Minor			
Cost avoidance	Moderate			
Increased revenues	I don't know			
Mission-driven performance improvements	Minor			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor			
Improved response or timeliness	Minor			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$2,894 to $4,342									
Time savings description	Verify actual condition. Days would be saved.											
Cost savings/cost reduction	None											
Cost savings/cost reduction description	Not applicable.											
Cost avoidance	Major	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Sea Level Rise and Subsidence

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Modeling and mapping the effects of sea level rise or subsidence. Population and economic vulnerability assessments. Coastal inundation and infrastructure assessment.
MCA Title	Sea Level Rise and Subsidence
MCA ID	60030
Organization Type	State or U.S. Territorial government
Organization Name	Territory of American Samoa
Sub-Agency or Division	American Samoa Department of Commerce
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 16 - Sea Level Rise and Subsidence
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL1B	QL2B	
Update Frequency	4-5 years	4-5 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Required	Required		Highly desirable	Required
Entire AOI under same environmental conditions	Highly desirable	Required	Required		Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Required		Highly desirable	Required
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have	Highly desirable	
DTM	Required	Required	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Highly desirable	Nice to have	
Classified point cloud	Required	Nice to have	Highly desirable	
Edited/cube XYZ		Not required	Not required	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Not required	Not required	
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Highly desirable	
Ground control/ground truthing	Required	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Required	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Required	Required	Highly desirable	
Wetlands	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Required	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes	Yes	Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Major	
Cost savings/cost reduction	Major	Major	Major	
Cost avoidance	Major	Major	Major	
Increased revenues	None	Minor	Minor	
Mission-driven performance improvements	Major	Major	Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	

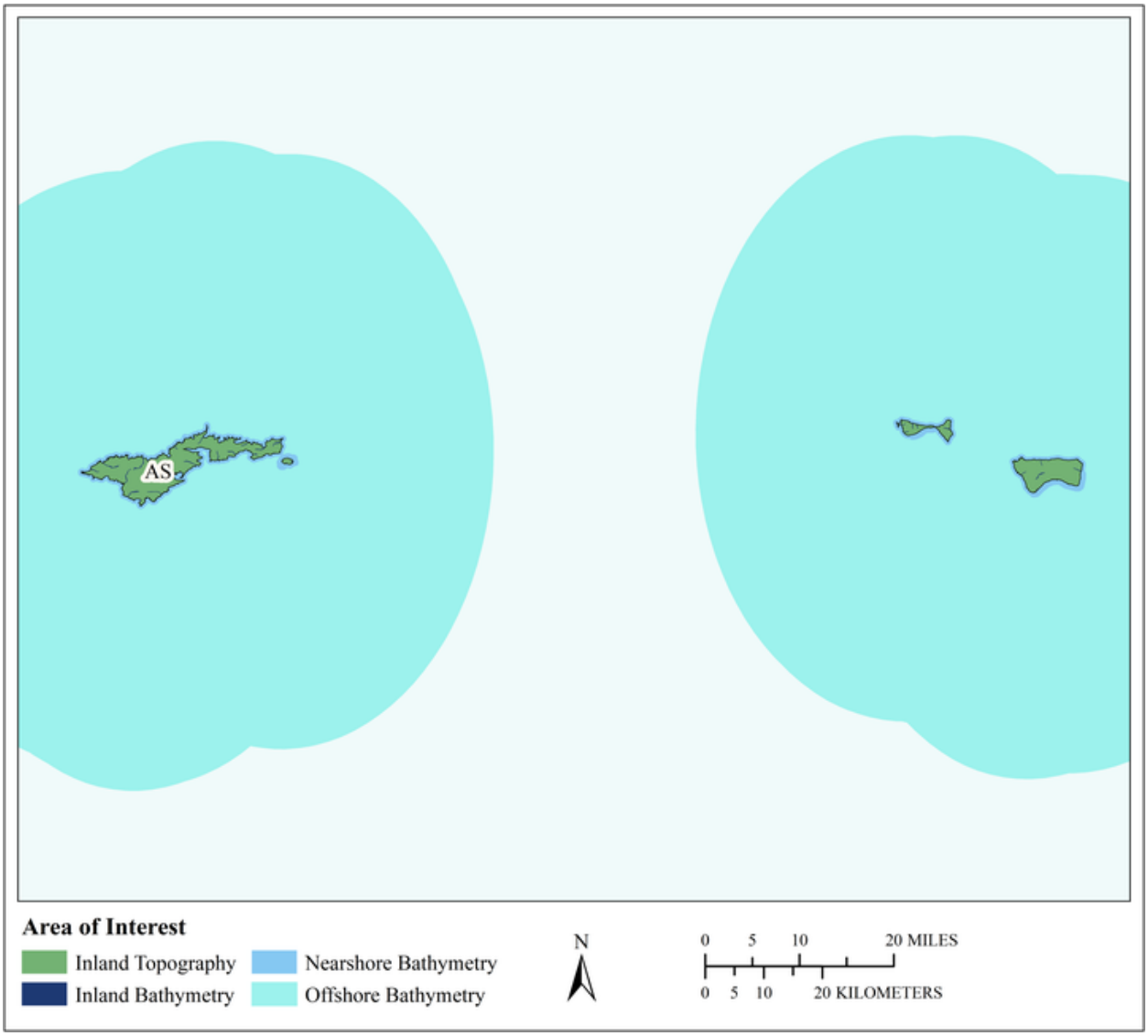
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Minor	Major	
Improved customer experience	Moderate	Moderate	Major	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Major	
Environmental	Moderate	Moderate	Major	
Public safety, including life and property	Major	Moderate	Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Increased revenues	Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$4,227									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Major					
Environmental	Moderate			Major			Major					
Public safety, including life and property	Moderate			Major			Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Emergency Management and Disaster Response



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Custom description
Sub Area Requirements				As much offshore data that can be provided, including Vailulu'u seamount

MCA Description	Response
Mission Critical Activity	Infrastructure and border protection. Coastal search and rescue (incl drone rescue buoy). Population dynamics. Emergency fuel supply and movement. Line-of-sight analysis in urban areas. Disaster response. Flood risk analysis resulting from acts of terrorism. Earthquake and tsunami analysis (especially for Ta'u), high tide run up, monitoring, assessments, outreach, and mitigation programs. Landslides from wet weather and storms are major concern. Coord with DPW (MCA 33077), DOC (MCA 21567), and Coral Reefs (MCA 21509)
MCA Title	Emergency Management and Disaster Response
MCA ID	33084
Organization Type	State or U.S. Territorial government
Organization Name	ASDHS
Sub-Agency or Division	
Organization Mission	Organization Mission: The mission of the American Samoa Department of Homeland Security is to be the single, Territory-wide focal point for coordinating the Territory's efforts to prevent threats and protect the lives and property of all people living in American Samoa during emergencies or disaster events.
Program Name	NTHMP (National Tsunami Hazard Mitigation Program) EMPG (Emergency Management Performance Grant) NEHRP (National Earthquake Hazard Reduction Program) HMEP (Hazardous Materials Emergency Program) SHSGP (State Homeland Security Grant Program) LETPA (Law Enforcement Terrorism Prevention Activity) SLIGP (State and Local Implementation Program) - FirstNet
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	We require as much mapping as possible. Land features for landslides, near shore for search and rescue operations, and everything else for terrorism activities. Earthquake mapping of tectonic plates, for example the Tonga Trench.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Other	Required
Other description	Floodplains
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B	QL2B	Order 2
Update Frequency	2-3 years	2-3 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	Up to 1 meter	Up to 2 meters	The best horizontal accuracy achievable for the vertical accuracy I need
Acceptable Vertical Error	Up to 40 cm	Up to 40 cm	Up to 40 cm	Up to 10 meters
How far onshore needed			1 kilometer inland	
How far down the beach profile needed	To MHHW		To MHHW	
Tide correction requirement			MHW	MHW
Cross sections and/or transects meet needs	Partial	Partial	Partial	Partial
Cross section/transect requirement	Typical accuracy that is provided to Emergency Management entities.	Typical accuracy as required by Emergency Management organizations.	Typical accuracy that is needed by coastal Emergency Management Organizations, with earthquake / tsunami threats and risks.	Typical accuracy as required by coastal Emergency Management organization.

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable

Hydrologic Processing Required	Response
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Highly desirable

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Other	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Other description						
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Other	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Other description						
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Required	Required
DTM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	Required

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Highly desirable	Highly desirable	Highly desirable
Full waveform	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Other	Highly desirable		Highly desirable	Highly desirable
Other description				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Highly desirable	Highly desirable
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Water column properties - Physical			Highly desirable	Highly desirable
Water column properties - Chemical			Highly desirable	Highly desirable
Water column properties - Biological			Highly desirable	Highly desirable
Currents			Required	Required
Tide/wave heights			Required	Required
Sea ice conditions			Highly desirable	Highly desirable
Habitat distribution and classification			Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Boundaries			Highly desirable	Highly desirable
Routes			Highly desirable	Highly desirable
Offshore cadastral			Highly desirable	Highly desirable
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Estuaries			Required	Required
Inland surface water features	Highly desirable	Highly desirable	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Required	Required	Required	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Currently we are limited by the data that are provided by the mapping office of the American Samoa Government, Department of Commerce, and other sources.	Rely on data available (or not) at Department of Commerce.	We use what is available from Department of Commerce.	Limited by whatever data are provided by the Department of Commerce.
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes			
NCEI	Yes			
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	The Department of Commerce Repository.	Department of Commerce		
Other				Yes
Other description				State Repository
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Major	Major
Cost savings/cost reduction	Major	Moderate	Major	Major
Cost avoidance	Major	Moderate	Major	Major
Increased revenues	Moderate	Moderate	Moderate	Major
Mission-driven performance improvements	Major	Moderate	Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Moderate	Major
Improved response or timeliness	Major	Moderate	Major	Major
Improved customer experience	Major	Moderate	Major	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Major	Major
Environmental	Major	Moderate	Major	Major
Public safety, including life and property	Major	Moderate	Major	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Other operational benefits	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,368		Annual dollars saved/ realized	$667		Annual dollars saved/ realized	$9			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Other customer service benefits	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$41		Annual dollars saved/ realized	$42						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major			Major		
Environmental	Moderate			Major			Major			Major		
Public safety, including life and property	Major			Major			Major			Major		
Other												
Other benefits	Major			Major			Major					
Other description	Saving lives and protecting property in times of disaster and acts of terrorism.			Saving lives and protecting property after earthquakes and tsunamis. Also improving Marine Search and Rescue operations.			Saving lives and protecting property in these area of interest.					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes	Yes	Yes	Yes
Curvature maps	Yes	Yes	Yes	Yes
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps	Yes	Yes	Yes	Yes
Viewshed maps	Yes	Yes	Yes	Yes
Hydrologic Flow Direction Grids	Yes	Yes	Yes	Yes
Hydrologic Flow Accumulation Grids	Yes	Yes	Yes	Yes
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	Yes
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	Yes
Building footprints	Yes	Yes	Yes	Yes
Breaklines for road edge-of-pavement	Yes	Yes	Yes	Yes
Rugosity/Surface Roughness	Yes	Yes	Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Land Navigation and Safety

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Road and railroad route selection and maintenance. Slope analysis for autonomous cars. GPS navigation visualization.
MCA Title	Land Navigation and Safety
MCA ID	60031
Organization Type	State or U.S. Territorial government
Organization Name	Territory of American Samoa
Sub-Agency or Division	Department of Public Works
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 19 - Land Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL0B	QL0B	
Update Frequency	2-3 years	2-3 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable		Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Highly desirable	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	
Classified point cloud	Highly desirable	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Highly desirable	
Full waveform	Nice to have	Nice to have	Highly desirable	
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	
Ground control/ground truthing	Required	Required	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Highly desirable	Highly desirable	Highly desirable	
Water column properties - Physical			Highly desirable	
Water column properties - Chemical			Highly desirable	
Water column properties - Biological			Highly desirable	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Highly desirable	
Boundaries			Highly desirable	
Routes			Highly desirable	
Offshore cadastral			Highly desirable	
Lease areas			Highly desirable	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Nice to have	Required	Highly desirable	
Land use/land cover	Highly desirable	Required	Highly desirable	
Wetlands	Required	Required	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Highly desirable	Highly desirable	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Minor	
Cost savings/cost reduction	Major	Minor	Minor	
Cost avoidance	Moderate	Minor	Minor	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	None	

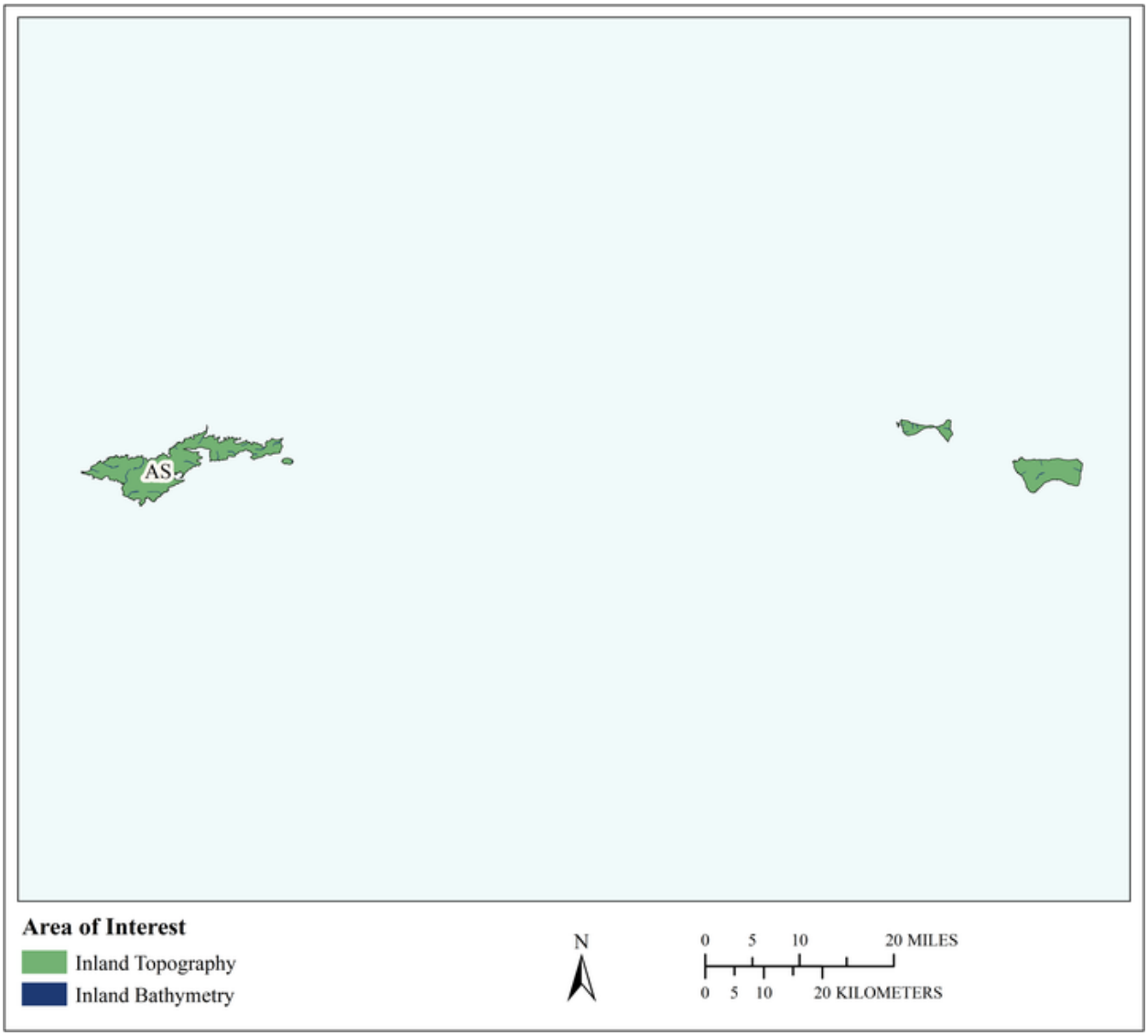
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	None	
Improved customer experience	Major	Minor	None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	None	
Environmental	Moderate	Moderate	Moderate	
Public safety, including life and property	Major	Minor	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		None					
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,040		Annual dollars saved/ realized	$44						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$83		Annual dollars saved/ realized	$0						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			None					
Environmental	Major			Moderate			Moderate					
Public safety, including life and property	Major			Moderate			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps	Yes		Yes	
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes		Yes	
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Underground Location of Infrastructure



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Custom description	Custom description		
Sub Area Requirements	Manu'a Group and Tutuila	Manu'a Group and Tutuila		

MCA Description	Response
Mission Critical Activity	Underground Locating/Toning. Precision locating and placement of existing and new utility infrastructure related to telecom.
MCA Title	Underground Location of Infrastructure
MCA ID	22526
Organization Type	State or U.S. Territorial government
Organization Name	American Samoa Telecommunications Authority (ASTCA)
Sub-Agency or Division	
Organization Mission	Provide affordable communication services to the public
Program Name	American Samoa Telecommunications Authority (ASTCA)
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 28 - Telecommunications
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Power poles, roads, sidewalks

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI	Tops of trees only needed within 30 feet of roads			
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter		
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed	To MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required			Not required	
Entire AOI under same environmental conditions	Nice to have	Nice to have			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Nice to have			Nice to have	
DEM for entire AOI needs to be seamless	Nice to have	Nice to have			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Not required		
DTM	Not required	Not required		
DEM	Required	Required		
Raw point cloud data	Not required	Not required		
Classified point cloud	Required	Required		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Not required		
Ground control/ground truthing	Not required	Not required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Highly desirable		
Land use/land cover	Not required	Not required		
Wetlands	Not required	Not required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Not required	Not required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Required	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Not currently used	Not currently used		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None	None		
Cost savings/cost reduction	None	None		
Cost avoidance	None	None		
Increased revenues	None	None		
Mission-driven performance improvements	None	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None	None		

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	None	None		
Improved customer experience	None	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	None		
Environmental	None	None		
Public safety, including life and property	None	None		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Moderate	Unable to provide							
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide							
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements description	Should help program better meet FCC telecom requirements.			Should help program better meet FCC telecom requirements.								
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	I don't know	Unable to provide		I don't know	Unable to provide							
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know								
Environmental	I don't know			I don't know								
Public safety, including life and property	I don't know			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes	Yes		
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness				
Other (please specify)	Yes			
Other description	Note: cross sections would mainly apply to roads and culverts			

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Urban and Regional Planning

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Land development and zoning. Municipal mapping of building footprints and elevations. Port resilience planning. Parks and transportation planning. Virtual city creation. Urban ecology planning.
MCA Title	Urban and Regional Planning
MCA ID	60032
Organization Type	State or U.S. Territorial government
Organization Name	Territory of American Samoa
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL2B	
Update Frequency	4-5 years	6-10 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Required	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Required	Nice to have	Highly desirable	
Classified point cloud	Required	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Required	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Nice to have	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Minor	
Cost savings/cost reduction	Major	Minor	Minor	
Cost avoidance	Major	Minor	Minor	
Increased revenues	Minor	Minor	None	
Mission-driven performance improvements	Major	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Minor	

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	Minor	
Improved customer experience	Major	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	
Environmental	Major	Minor	Minor	
Public safety, including life and property	Major	Minor	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$21,603		Annual dollars saved/ realized	$879		Annual dollars saved/ realized	$187			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$2,494		Annual dollars saved/ realized	$1,113		Annual dollars saved/ realized	$198			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate					
Environmental	Major			Moderate			Moderate					
Public safety, including life and property	Major			Major			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	
Hillshades	Yes		Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Telecommunications

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Telecommunication tower site selection. Design of radio and radar systems. Interference analysis. Path profiles. Undersea telecommunication route selection and deployment.
MCA Title	Telecommunications
MCA ID	60033
Organization Type	State or U.S. Territorial government
Organization Name	Territory of American Samoa
Sub-Agency or Division	American Samoa Telecommunications Authority
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 28 - Telecommunications
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B	QL2B	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required	Highly desirable		Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Not required	Highly desirable		Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have	Highly desirable	
DTM	Highly desirable	Nice to have	Highly desirable	
DEM	Highly desirable	Nice to have	Highly desirable	
Raw point cloud data	Highly desirable	Nice to have	Highly desirable	
Classified point cloud	Required	Nice to have	Highly desirable	
Edited/cube XYZ		Nice to have	Highly desirable	
Full waveform	Highly desirable	Nice to have	Highly desirable	
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Highly desirable	Not required	Highly desirable	
Ground control/ground truthing	Highly desirable	Nice to have	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	
Underwater videography			Highly desirable	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Nice to have	Highly desirable	Nice to have	
Water column properties - Physical			Highly desirable	
Water column properties - Chemical			Highly desirable	
Water column properties - Biological			Highly desirable	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Highly desirable	
Habitat distribution and classification			Highly desirable	
Boundaries			Highly desirable	
Routes			Highly desirable	
Offshore cadastral			Highly desirable	
Lease areas			Highly desirable	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Required	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Highly desirable	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Required	Highly desirable	Highly desirable	
Cultural resources	Required	Highly desirable	Highly desirable	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI		Yes		
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	I don't know	
Cost savings/cost reduction	Major	Major	I don't know	
Cost avoidance	Major	Major	I don't know	
Increased revenues	None	None	I don't know	
Mission-driven performance improvements	Major	Major	I don't know	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	I don't know	

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major	Major	I don't know	
Improved customer experience	Major	Major	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	I don't know	
Environmental	Minor	Minor	I don't know	
Public safety, including life and property	Major	Major	I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know			I don't know					
Environmental	I don't know			I don't know			I don't know					
Public safety, including life and property	I don't know			Major			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

Arizona

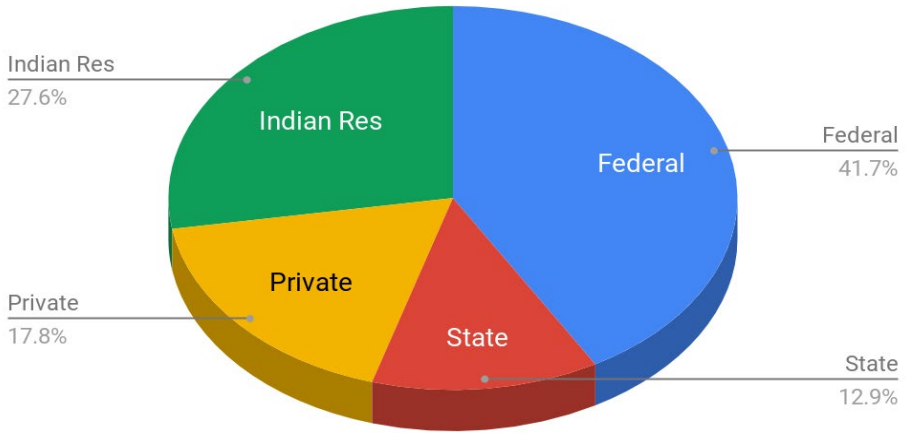
Current status of elevation data for Arizona

Arizona has a goal of statewide lidar data by 2023 (~72,943,734 acres). To that end, the Arizona Geographic Information Council (AGIC) has formed a Lidar Workgroup under the AGIC Data Committee to help facilitate partnerships across federal, state, regional, and local government entities, as well as private industry stakeholders. The Lidar Workgroup hosts multiple lidar events each year. Spring events typically focus on networking, partnerships, and the 3DEP program, and fall events focus on technology and the applied uses of lidar and lidar derivatives. The Lidar Workgroup has also developed a statewide lidar acquisition plan which provides general guidance on how Arizona can meet the 2023 goal.

There have been several Arizona lidar projects since 2012 generating Quality Level 2 (QL2) and QL1 lidar. Contributions have primarily come from federal sources: Federal Emergency Management Agency (FEMA), U.S. Department of Agriculture Natural Resources Conservation Service (USDA NRCS), U.S. Forest Service (USFS), and U.S. Geological Survey (USGS 3DEP Program). Urban lidar for the Tucson region was coordinated by Pima Association of Governments (PAG) and 3DEP. Phoenix metro area lidar was acquired by a consortium of local government entities led by Maricopa County in 2014. In 2019, local stakeholders coordinated to propose recollection of the Phoenix Metro area at QL1. USGS awarded the project for approximately 5,033 square miles covering the metro area and into Pinal County. 2021 BAA projects are also being planned, with potential to acquire all of Pima County and a large portion of Southern Yavapai County.

The distribution of land ownership in Arizona has been a challenge to statewide lidar acquisition. Approximate breakdown of ownership is 42% federal land, 27% Indian reservation, 13% state land, and 18% private land (Figure 1). The federal ownership is further divided. Forty percent is BLM, 37% is USFS, 9% is NPS, 9% is military, and 6% is USFWS. After the 2019 acquisitions are completed, only 26.3% (~19,192,638 acres) of the state will have lidar at QL2 or better.

Figure 1. Arizona Land Ownership



To illustrate this disparity, the chart in Figure 2 compares total acres owned by an agency or organization (red) to acres of lidar collected for the same entity (blue). There has been very little acquisition on tribal lands even though it is 27.6% of the state. Figure 3 shows the general breakdown by ownership of the remaining acreage to be acquired in the state, with almost 70% of the land being tribal or federal property. The disproportionate difference between federal and Indian reservation and state and private lands in Arizona creates significant barriers to creating local funding partnerships. As a result, additional funding from federal agencies is critical in completing continuous lidar coverage of Arizona.

Figure 2. LiDAR Acres by Ownership Compared to Total Land Ownership

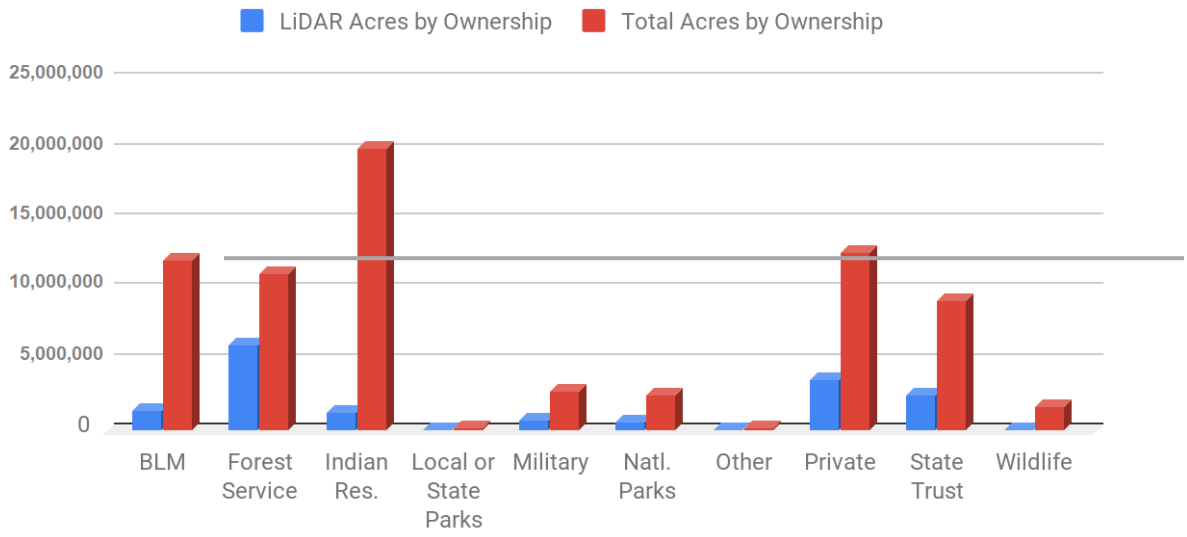
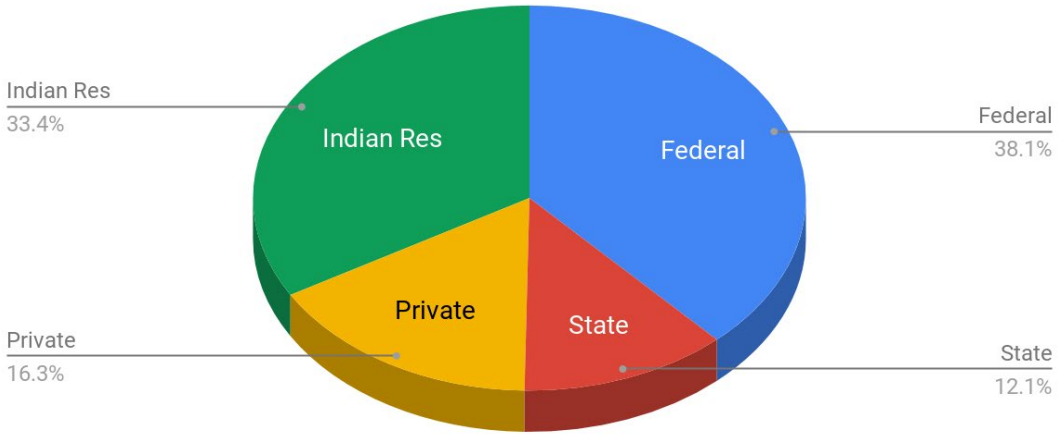


Figure 3.Percent of land without LiDAR by 2020 by Ownership



Importance of elevation data to Arizona

The State of Arizona has a variety of requirements for high-quality elevation data. QL2 or higher lidar is utilized for Mission Critical Activities (MCAs) at all levels of government, academia, and private organizations. All entities surveyed indicated significant cost savings related to utilizing lidar as a resource. Use case examples identified include:

- Dam inundation zone risk management;
- Cultural resources protection;
- Wildfire risk assessment and modeling;
- Post wildfire analysis;
- Geologic hazards mapping and assessments;
- Transportation planning, management, & mitigation;
- Flood control mapping and mitigation;
- Vegetation classification;
- Bridge maintenance and assessment;
- Asset inventory;
- Development; and
- Air, water, land quality monitoring.

Enhanced elevation data could enable Arizona to more effectively implement natural resources management practices such as grade stabilization, dam safety, habitat easements, pipelines, terracing, and wetland restoration while providing additional cost savings to the public. Statewide lidar data would allow public and private organizations to expand their use of lidar for planning and site-level engineering and reduce field work for land management and conservation projects. Lidar data provide high-quality terrain information as input for more accurate and less expensive hydrologic and hydraulic modeling for flood studies. Lidar data can also aid the identification of vulnerable properties within a floodplain, facilitating better floodplain-management decisions and education of the public on true flood risks. Lidar data can be used to prioritize areas in the state where tactical analysis, community interaction and education, or mitigation treatments might be necessary to reduce risk from wildfires and post-fire debris flows. High-resolution elevation data better inform fire behavior modeling, response, vegetation loads, and post-fire assessment for slope instability. This leads to improved public safety.

High-level summary of elevation data requirements

Arizona has a highly variable landscape with significant relief changes, mountains, forests, deserts, valley floors, and the Grand Canyon. For much of the terrain in Arizona, QL2 lidar would minimally meet the needs of the state. However, QL1 lidar is highly desired as it provides a more detailed dataset allowing for greater analysis when planning for wildfires, timber operations, and road improvements. For some critical infrastructure and hazard assessments, QL1 is the minimum data quality standard required. In the northern forested areas of the state, the USFS requires QL1 and additional specifications outside of the *USGS Lidar Base Specification* that include a ≥50% swath overlap and a scan angle ≤±20° of nadir. QL1B topobathy lidar is needed for the Arizona Department of Emergency and Military Affairs for mapping of sub-aqueous hazardous faults that may cause flooding impacting populated areas. Other agencies surveyed indicated that QL1B topobathy lidar would be highly desired for the Lower Colorado River and associated reservoirs as well as land-use and environmental planning, geologic research, etc.

High-level summary of benefits that would come from higher resolution elevation data

Catastrophic wildland fire is on the rise in our nation, bringing with it loss of life and property damage. Arizona, with a fire adaptive ecosystem, is highly susceptible to these fires and lidar can play a significant role in planning mitigating steps to lessen the impact and help restore the landscape. High resolution elevation data would allow for modeling of the forest ecosystems by understanding the forest structure and identify the forest fuel types. Lidar would also play a role during the fires with saving lives, both in search and rescue and planning escape routes for wildland firefighters. After the fires, lidar can help model the impacts of flooding and landslides. It can help determine what communities will be in danger from the aftereffects of a fire. One recent example of the impact of lidar during and after a fire was the Museum Fire just outside of Flagstaff. During the fire, lidar helped the incident team understand fire behavior and plan out the attack. Post-fire, it helped the city of Flagstaff plan for debris flow and flooding impacts, allowing the city to place barricades to protect homes.

Most of the benefits cited by participants listed major qualitative benefits in several areas: (1) reduced hours/time spent for field work, (2) hours saved in reduced data manipulation, and (3) greatly reduced costs of no longer needing to collect data for their own jurisdictions. Four MCAs cited a need for inland bathymetry so the need for this dataset is evident.

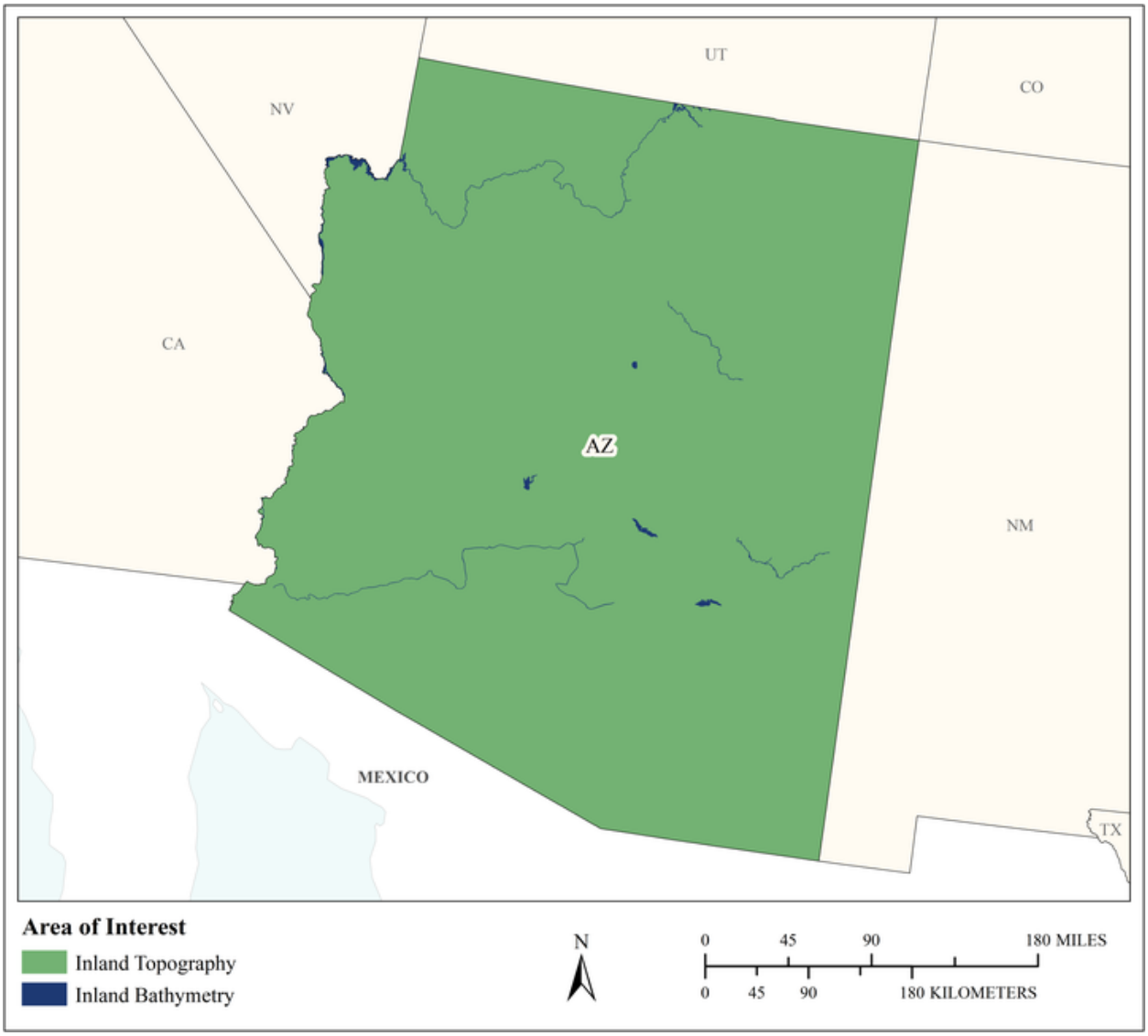
The State of Arizona has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	State of Arizona	60034	Water Supply and Quality	Inland Topo	QL2	4-5 years	$632,080	$169,305	Moderate	Major	Moderate
				Inland Bathy	QL1B	6-10 years	$2,734,434	$285,759	Moderate	Major	Moderate
BU 02 – Riverine Ecosystem Management	State of Arizona	60035	Riverine Ecosystem Management	Inland Topo	QL1 HD	6-10 years	$174,490	$17,429	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$92,886	$6,549	Major	Major	Major
BU 04 – Forest Resource Management	State of Arizona	60036	Forest Resources Management	Inland Topo	QL1	2-3 years	$450,729	$653,386	Major	Major	Major
BU 05 – Rangeland Management	State of Arizona	60037	Rangeland Management	Inland Topo	QL2	Annually	Unable to quantify	Unable to quantify	Minor	Major	I don't know
BU 06 – Natural Resource Management	State of Arizona	60038	Natural Resources Conservation	Inland Topo	QL1 HD	4-5 years	$4,471,372	$16,420,243	Major	Major	Major
BU 07 – Wildlife and Habitat Management	Arizona Game and Fish Department	21929	Wildlife, Habitat, and Public Safety	Inland Topo	QL2	4-5 years	$31,175	$156,000	Moderate	Moderate	Minor
				Inland Bathy	QL4B	4-5 years	$21,030	$20,000	Moderate	Moderate	Moderate
BU 10 – Geologic Assessment	Arizona Geological Survey, University of Arizona	22064	Geologic Mapping and Geologic Hazards	Inland Topo	QL1	(a) Annually (b) 2-3 years	$150,000	Unable to quantify	Moderate	Minor	Major
BU 15 – Flood Risk Management	Combined county response	32958	Flood Risk Management and Infrastructure Improvement	Inland Topo	(a) QL0 (b) QL1	(a) 2-3 years (b) 4-5 years	$3,082,166	$102,268	Major	Major	Major
				Inland Bathy	QL1B	4-5 years	$348,099	$158,148	Moderate	Moderate	Moderate
BU 17 – Wildfire Management	Arizona Department of Emergency and Military Affairs	1116	Emergency Preparedness, Response, and Recovery	Inland Topo	QL2	Annually	$120,000	Unable to quantify	Major	Major	Major
				Inland Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Major

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 18 – Homeland Security	State of Arizona	60039	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management	Inland Topo	QL2	4-5 years	$3,362,989	$59,439	Major	Moderate	Major
BU 22 – Infrastructure Management	Arizona Dept. of Transportation (ADOT)	1112	Transportation Planning and Pre-design	Inland Topo	Cross sections and/or transects meet needs	6-10 years	$5,123,085	$15,076,208	Minor	Moderate	Major
BU 23 – Urban and Regional Planning	Arizona State Land Department	1196	Trust Lands Management	Inland Topo	QL2	4-5 years	$26,281	$4,522	None	None	None
				Inland Bathy	Cross sections and/or transects meet needs	4-5 years	$3,206	Unable to quantify	None	None	None
BU 23 – Urban and Regional Planning	Pima Association of Governments	32963	Regional Planning	Inland Topo	QL2	2-3 years	$24,472	$1,206	Moderate	Major	Major
BU 26 – Education and Basic Research	Arizona State University Library	22427	Geospatial and Cartographic Data Dissemination	Inland Topo	QL1 HD	4-5 years	$599,078	$1,431,971	Major	Major	Major
				Inland Bathy	QL4B	Annually	$156,665	Unable to quantify	Major	Major	Major

MCA Title: Water Supply and Quality



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Fate and transport of contaminants. Pollution risk mitigation. Runoff and sedimentation analyses. Point- or non-point source pollution modeling. Management of contaminants and marine debris - point, non-point, vessel, and atmospheric pollution; spills; trash.
MCA Title	Water Supply and Quality
MCA ID	60034
Organization Type	State or U.S. Territorial government
Organization Name	State of Arizona
Sub-Agency or Division	Arizona Department of Environmental Quality
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B		
Update Frequency	4-5 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Required			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Highly desirable	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	Major	Minor		
Increased revenues	Minor	None		
Mission-driven performance improvements	Major	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		

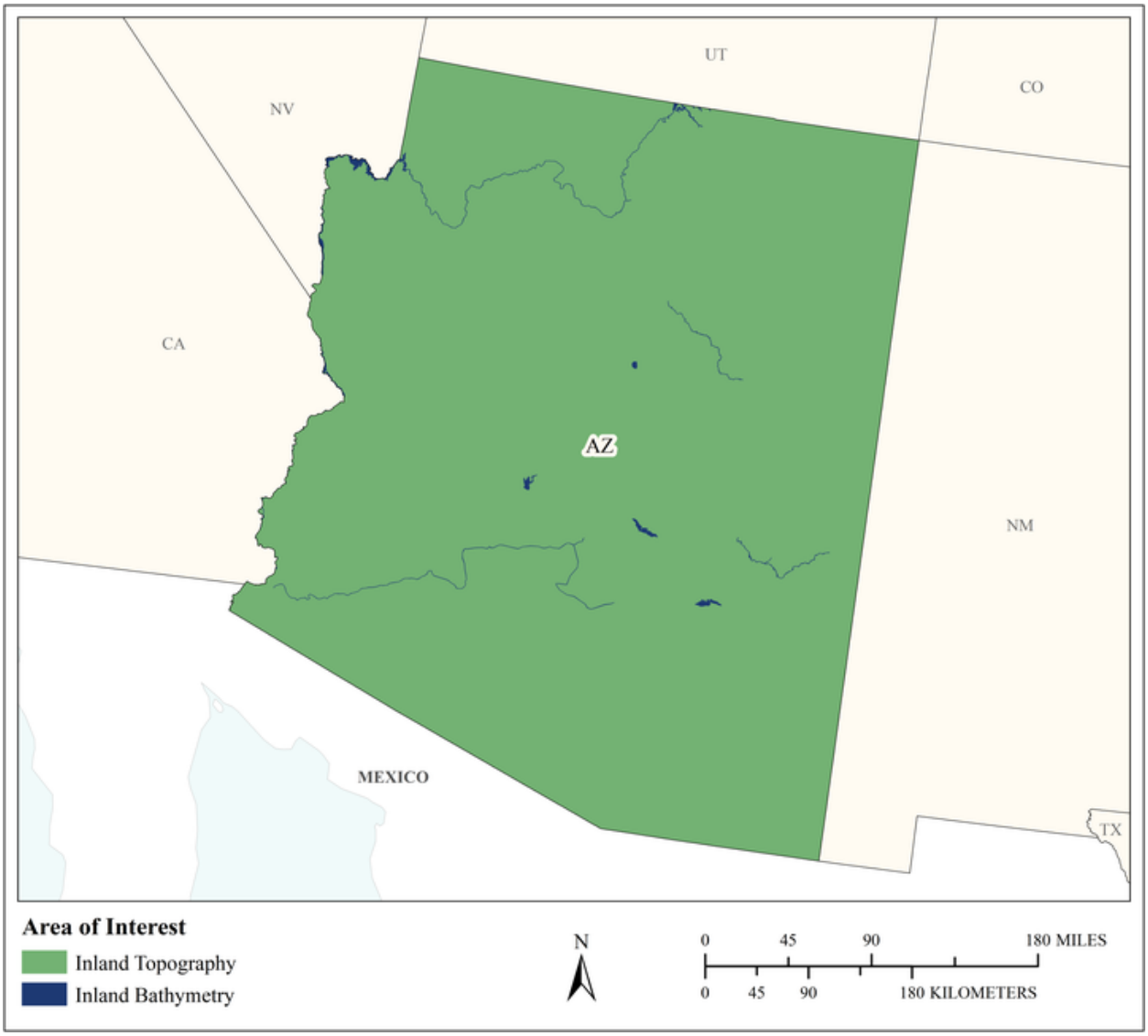
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor		
Improved customer experience	Major	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor		
Environmental	Major	Moderate		
Public safety, including life and property	Major	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$632,080		Annual dollars saved/ realized	$2,734,434						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide							
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$169,305		Annual dollars saved/ realized	$285,759						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate								
Environmental	Major			Major								
Public safety, including life and property	Moderate			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Riverine Ecosystem Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Stream channel analysis and mapping. Stream bank erosion analysis. Aquatic and terrestrial species habitat management. Environmental management.
MCA Title	Riverine Ecosystem Management
MCA ID	60035
Organization Type	State or U.S. Territorial government
Organization Name	State of Arizona
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B		
Update Frequency	6-10 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Required			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Required	Highly desirable		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Highly desirable	Nice to have		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Moderate	Minor		
Cost avoidance	Moderate	None		
Increased revenues	None	None		
Mission-driven performance improvements	Major	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		

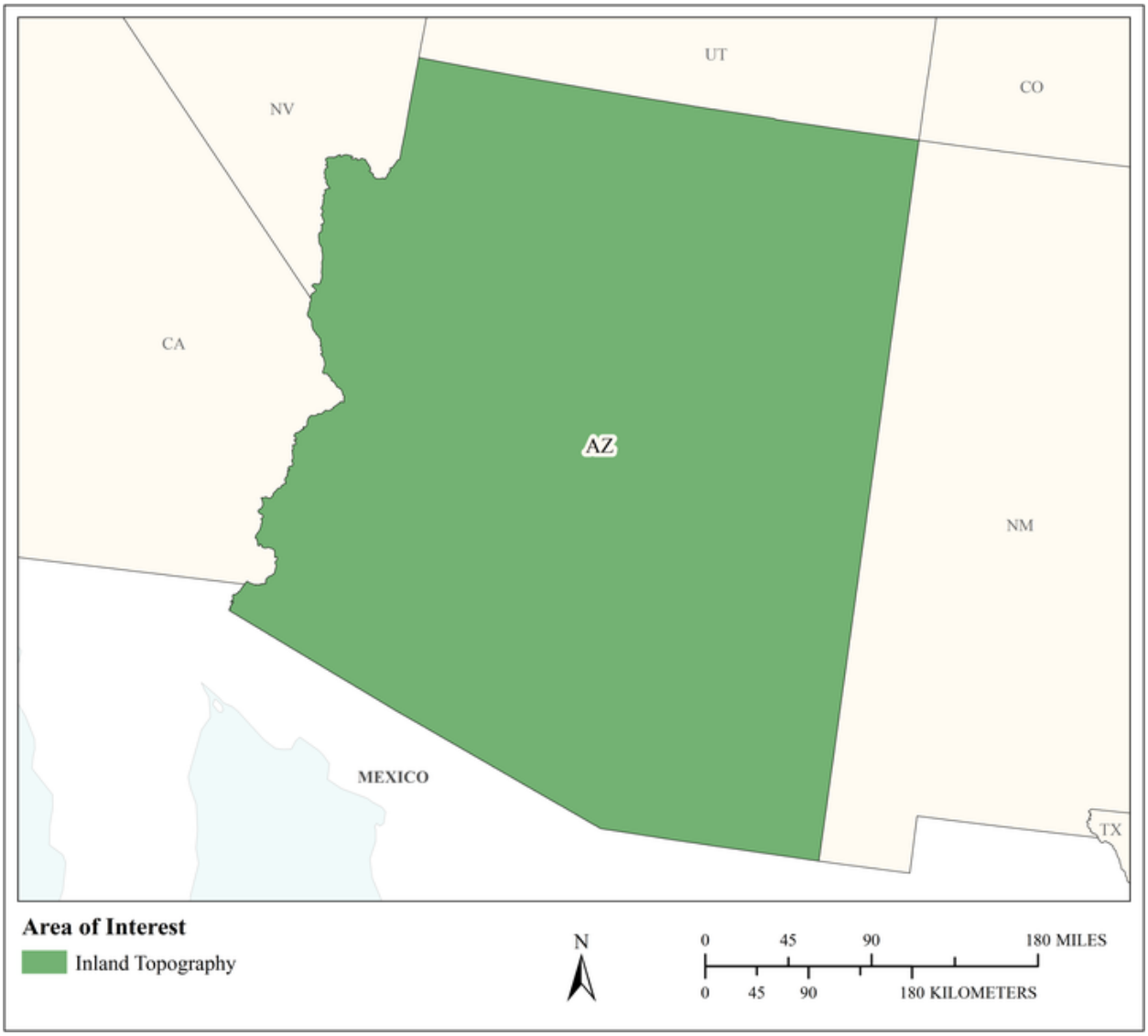
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Moderate		
Improved customer experience	Major	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate		
Environmental	Major	Major		
Public safety, including life and property	Major	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$174,490		Annual dollars saved/ realized	$92,886						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$17,429		Annual dollars saved/ realized	$6,549						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Major			Major								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Forest Resources Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Forest health assessment. Determination of standing inventory of forest resources. Prescribed burn planning. Analysis of carbon stocks for trade. Harvest systems planning.
MCA Title	Forest Resources Management
MCA ID	60036
Organization Type	State or U.S. Territorial government
Organization Name	State of Arizona
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Highly desirable			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

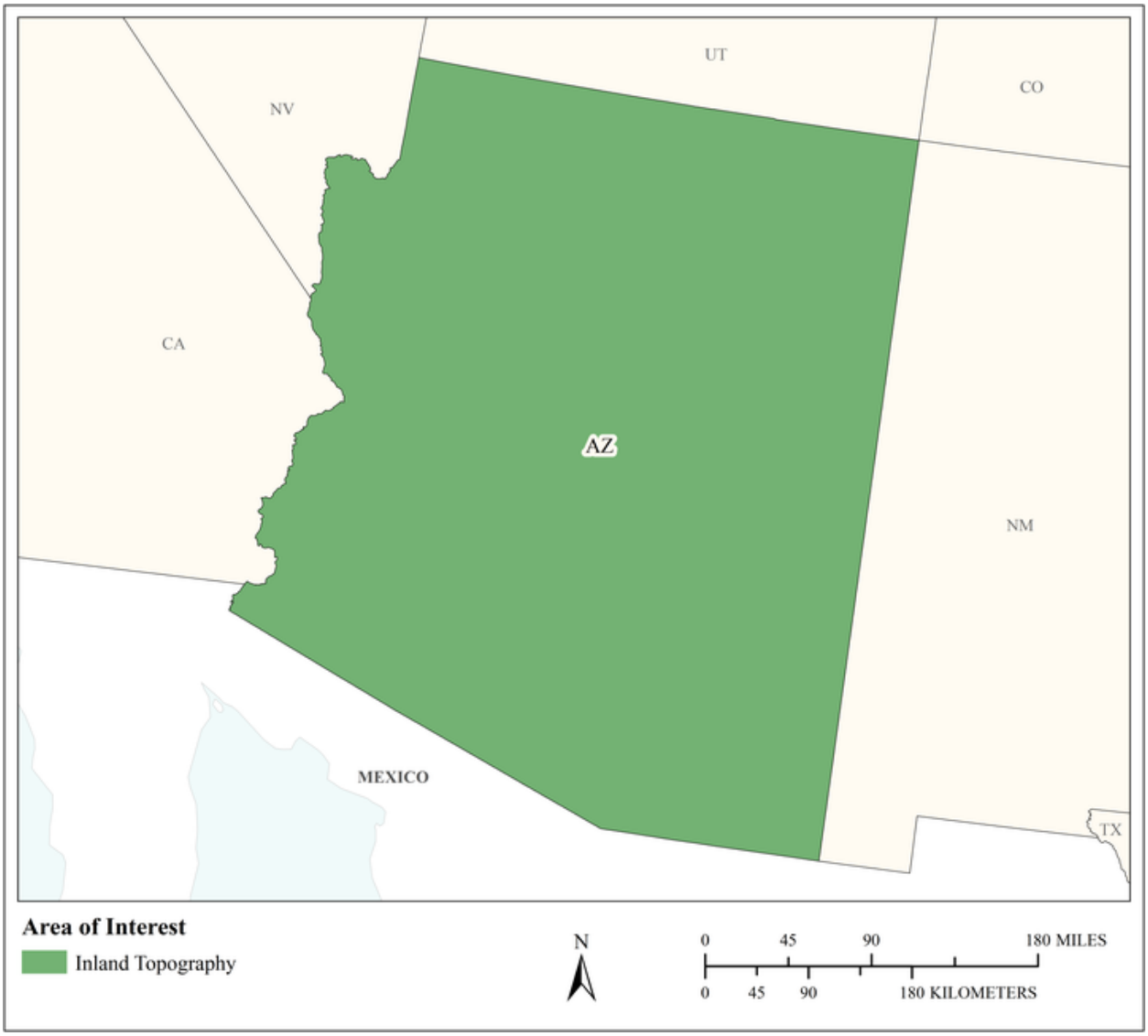
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$450,729									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$653,386									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Rangeland Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Assessment of rangeland health. Mapping for soil erosion potential due to grazing.
MCA Title	Rangeland Management
MCA ID	60037
Organization Type	State or U.S. Territorial government
Organization Name	State of Arizona
Sub-Agency or Division	Arizona State Land Department
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 05 - Rangeland Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Highly desirable			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Not required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None			
Cost savings/cost reduction	None			
Cost avoidance	None			
Increased revenues	None			
Mission-driven performance improvements	None			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None			

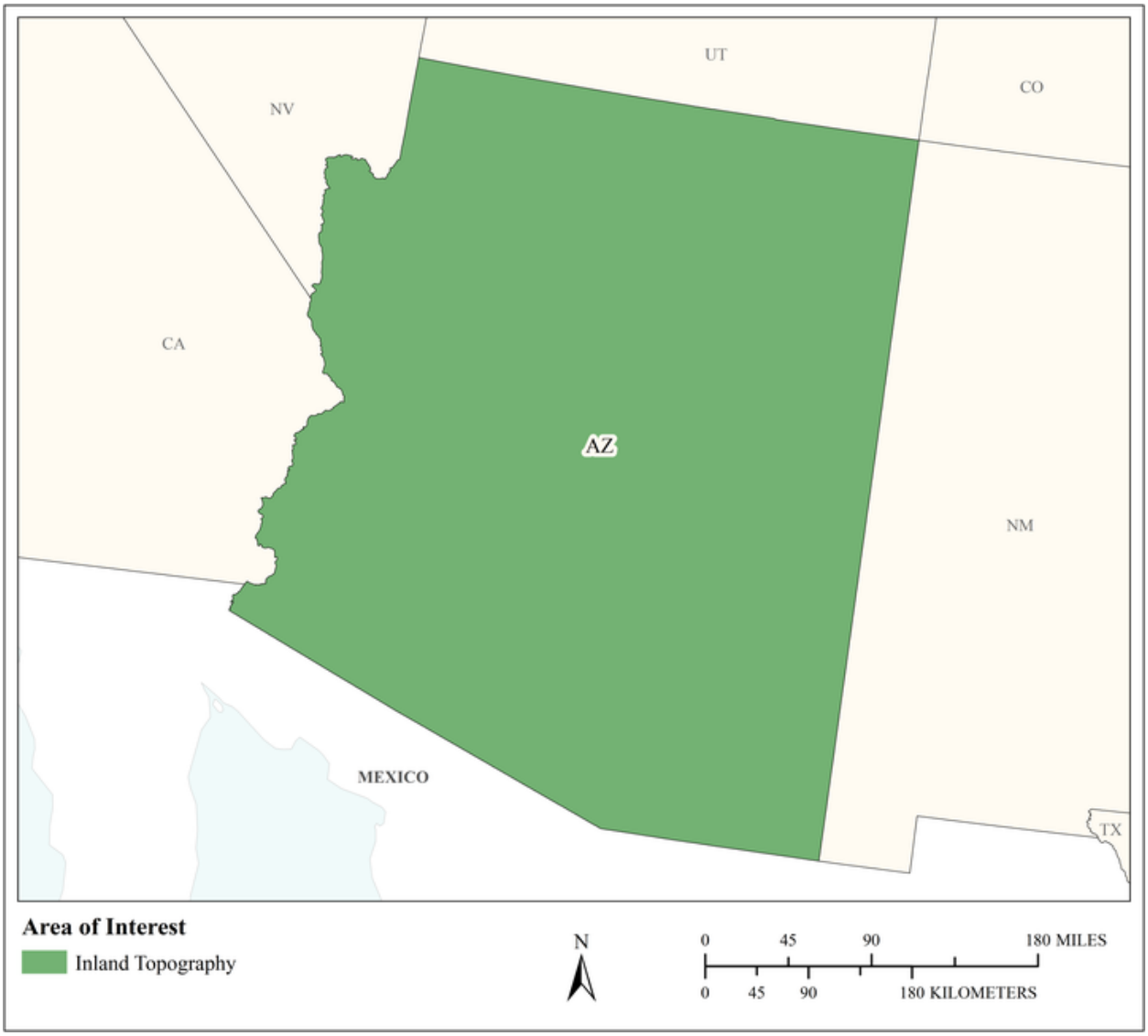
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	None			
Improved customer experience	None			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	None			
Public safety, including life and property	None			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	None											
Cost avoidance	Minor	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Natural Resources Conservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation engineering. Soils and wetlands mapping and characterization. Modeling of biological and ecological systems. Erosion control. Rainfall penetration studies, impervious surfaces. Assessment of blue carbon stocks.
MCA Title	Natural Resources Conservation
MCA ID	60038
Organization Type	State or U.S. Territorial government
Organization Name	State of Arizona
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

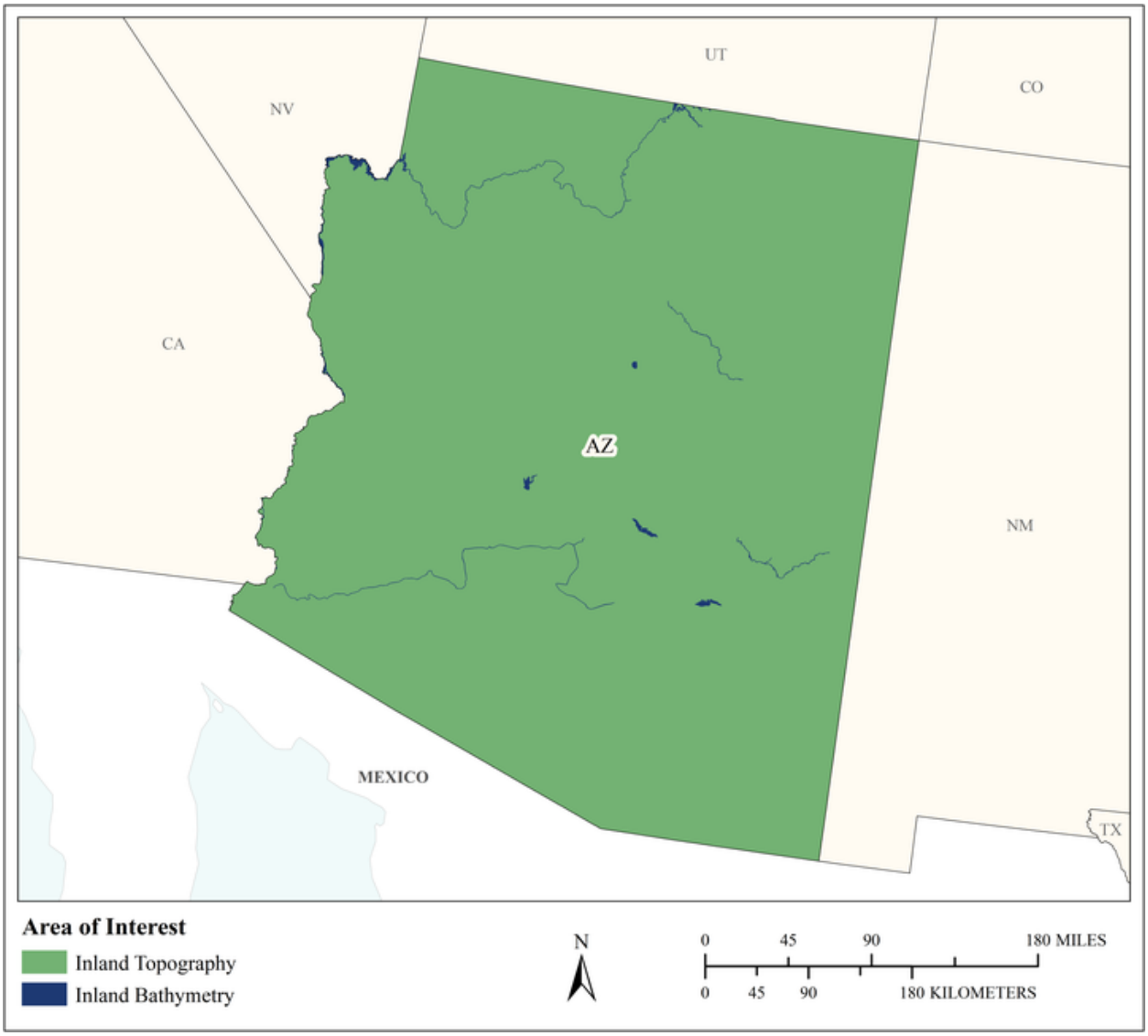
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$4,471,372									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$16,420,243									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Wildlife, Habitat, and Public Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation Engineering, Dam Inundation Zone Risk Management, Critical Habitat Conservation, Conservation Planning, Fisheries Management, Cultural Resources Protection, In-flight Hazard Risk Management, Recreational Facilities Planning Management, Unit Boundary Management
MCA Title	Wildlife, Habitat, and Public Safety
MCA ID	21929
Organization Type	State Conservation Agency
Organization Name	Arizona Game and Fish Department
Sub-Agency or Division	
Organization Mission	Arizona's wildlife is near and dear to the hearts of those who enjoy the Arizona outdoors. Our passion at the Arizona Game and Fish Department is to conserve and protect Arizona's wonderful wildlife so we can all appreciate the everyday magic of it. To ensure Arizona's wildlife will be around for future generations to enjoy, we follow the North American Model of Wildlife Conservation—developed, in large part, by the forward-thinking early conservationists who understood the need to conserve wildlife and their habitats. As the world's most successful conservation model, it helps to sustain wildlife species and habitats through well-founded science and active management. We enjoy Arizona's wildlife. And we're sure you do too. So, we're working to keep it a reality for all of us through wise use of our Wildlife Restoration funding. The Arizona Game and Fish Department provides benefits for both Arizona's wildlife and those who appreciate it. Some of our ongoing efforts include creating safe passage for bighorn sheep and elk that bypass highways, reestablishing the California condor and Gould's turkey populations in Arizona, and determining suitable relocation habitats for Sonoran pronghorn. Above all else, we're working to keep the great outdoors great. http://www.gameandfishfacts.com/mission
Program Name	Wildlife and Wildlife Habitat Conservation Fisheries and Fisheries Habitat Management Law Enforcement Information and Education
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	BU 09 - Fisheries Management and Aquaculture
Tertiary Business Use	BU 27 - Recreation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)

General Geographic Area and Size	
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Habitat types, Forest and shrubland canopies, River/stream channels, Wash channels, Underwater structures

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL4B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI	If a major flooding/wash scouring event occurs, then the update frequency for those areas may be modified. Interest in QL1 for habitat restoration.			
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 10 cm	Up to 50 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Highly desirable	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Nice to have		
Classified point cloud	Highly desirable	Nice to have		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Not required		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Nice to have	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Highly desirable		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	DEMs largely, although these are beginning to become limited relative to the types and abilities of technologies that we are using.	None or department created		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	AGIC's AZGEO			
Other		Yes		
Other description		Dept. survey		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None	None		

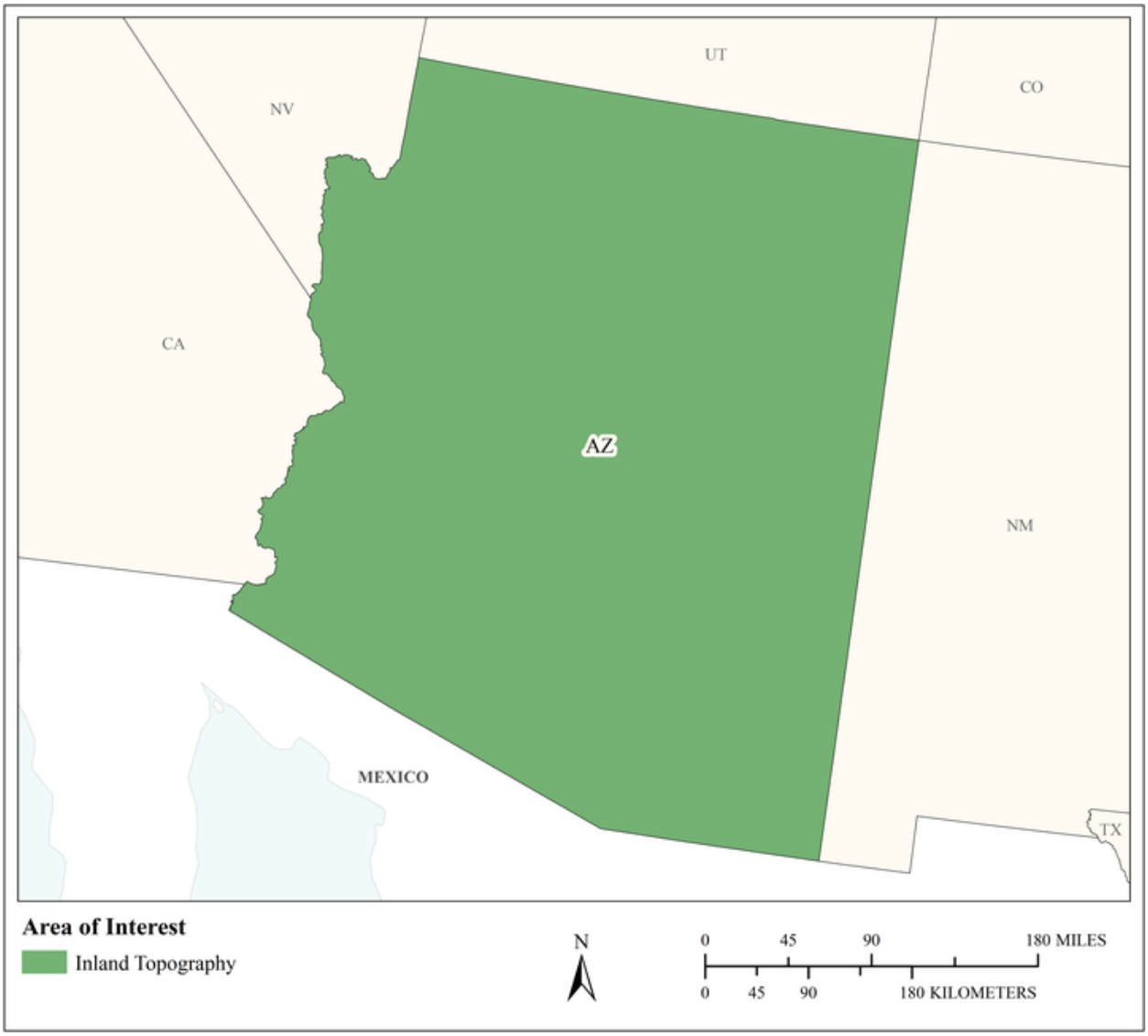
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Cost savings/cost reduction	Minor	None		
Cost avoidance	None	None		
Increased revenues	None	None		
Mission-driven performance improvements	Minor	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	Minor		
Improved response or timeliness	None	None		
Improved customer experience	Minor	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor		
Environmental	Moderate	Minor		
Public safety, including life and property	Minor	None		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$19,175	Moderate	Annual dollars saved/realized	$6,030						
Time savings description	Modeling efforts would be more accurate and precise, leading to reduction in modeling/adjustment needs. Highly variable depending upon project evaluation and information demands.			From time spent doing bathy survey analysis. From time spent doing bathy surveys.								
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Annual dollars saved/realized	$5,000						
Cost savings/cost reduction description				From time spent doing bathy surveys.								
Cost avoidance	Moderate	Unable to provide		Moderate	Annual dollars saved/realized	$5,000						
Cost avoidance description				Data processing and bathy creation.								
Increased revenues	Moderate	Annual dollars saved/realized	$12,000	Moderate	Annual dollars saved/realized	$5,000						
Increased revenues description	Couched in hopes of providing marketable consumer applications.			Consumer applications.								
Mission-driven performance improvements	Moderate	Unable to provide		Minor	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Annual dollars saved/realized	$24,000	Moderate	Annual dollars saved/realized	$5,000						
Value added to products or services description	Couched in hopes of providing marketable consumer applications.			Consumer applications.								
Improved response or timeliness	Moderate	Annual dollars saved/realized	$132,000	Moderate	Unable to provide							
Improved response or timeliness description	Couched in hopes of providing marketable consumer applications.											
Improved customer experience	Moderate	Unable to provide		Moderate	Annual dollars saved/realized	$15,000						
Improved customer experience description				Consumer applications.								
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate								
Education or outreach description	Engaging educators and providing more education opportunities.			More opportunity for engagement								
Environmental	Moderate			Moderate								
Environmental description	Better manager the public's wildlife resources.			Better planning								
Public safety, including life and property	Minor			Moderate								
Public safety, including life and property description				Better planning and alerts								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes	Yes		
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Geologic Mapping and Geologic Hazards



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Area split by varying quality level or update frequency			
Sub Area Requirements	Arizona			

MCA Description	Response
Mission Critical Activity	Bedrock and surficial geologic mapping, geologic hazards mapping and assessments. Lidar data are used for geomorphic mapping, to identify active alluvial surfaces, identify faults, and for post-fire analysis to understand flood and debris flows, find fissures, and for landslide mapping.
MCA Title	Geologic Mapping and Geologic Hazards
MCA ID	22064
Organization Type	Academic or Not-for-Profit
Organization Name	Arizona Geological Survey, University of Arizona
Sub-Agency or Division	
Organization Mission	Mission of the Arizona Geological Survey: 1. Serve as a primary source of geologic information in this state to enhance public understanding of the state's geologic character, geologic hazards and limitations and mineral resources. 2. Inform, advise and assist the public in matters concerning the geological processes, materials and landscapes and the development and use of the mineral resources of this state. 3. Encourage the wise use of the lands and mineral resources of this state toward its development. 4. Provide technical advice and assistance in geology to other state and local governmental agencies engaged in projects in which the geologic setting, character or mineral resources of the state are involved. 5. Provide technical advice and assistance in geology to industry toward the wise development and use of the mineral and land resources of this state.
Program Name	Geologic and Economic Resources, Environmental Geology
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 11 - Geologic Resource Mining and Extraction
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	7.5' quads
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Faults traces, channels, rock outcrops, mass-wasting scarps and deposits, tail ends of earth fissures, log-jams in channels.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Update Frequency	(a) Annually (b) 2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI	Maricopa, Pinal, Pima, and Cochise Counties with earth fissures would need more frequent updating (annually) than undeveloped/non-ag desert lands (2-3 years).			
Acceptable Horizontal Error	Up to 80 cm			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required					
Entire AOI under same environmental conditions	Not required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required			
DTM	Nice to have			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Nice to have			
Wetlands	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Not required			
Landmark features	Nice to have			
Cultural resources	Not required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Generally we use 10m DEMs as the best available data. We currently have 2 Statemap projects using lidar data; QL2 and QL1. For hazard assessments QL1 is the minimum quality we can use. When we need higher, we use our drone and SfM to create our own DEMs.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	ALRIS-Arizona Land Information System			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other	Yes			
Other description	Lidar obtained by local or county governments, Or by the USFS			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Minor			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			
Other Current Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other	Major			
Other description	For example, QL1 lidar was critical for a recent pre-wildfire post-fire flooding and debris flow hazards assessment we recently conducted with JE Fuller for Coconino County. This work has led to multiple projects to reduce wildfire hazards and mitigate potential geologic hazards.			

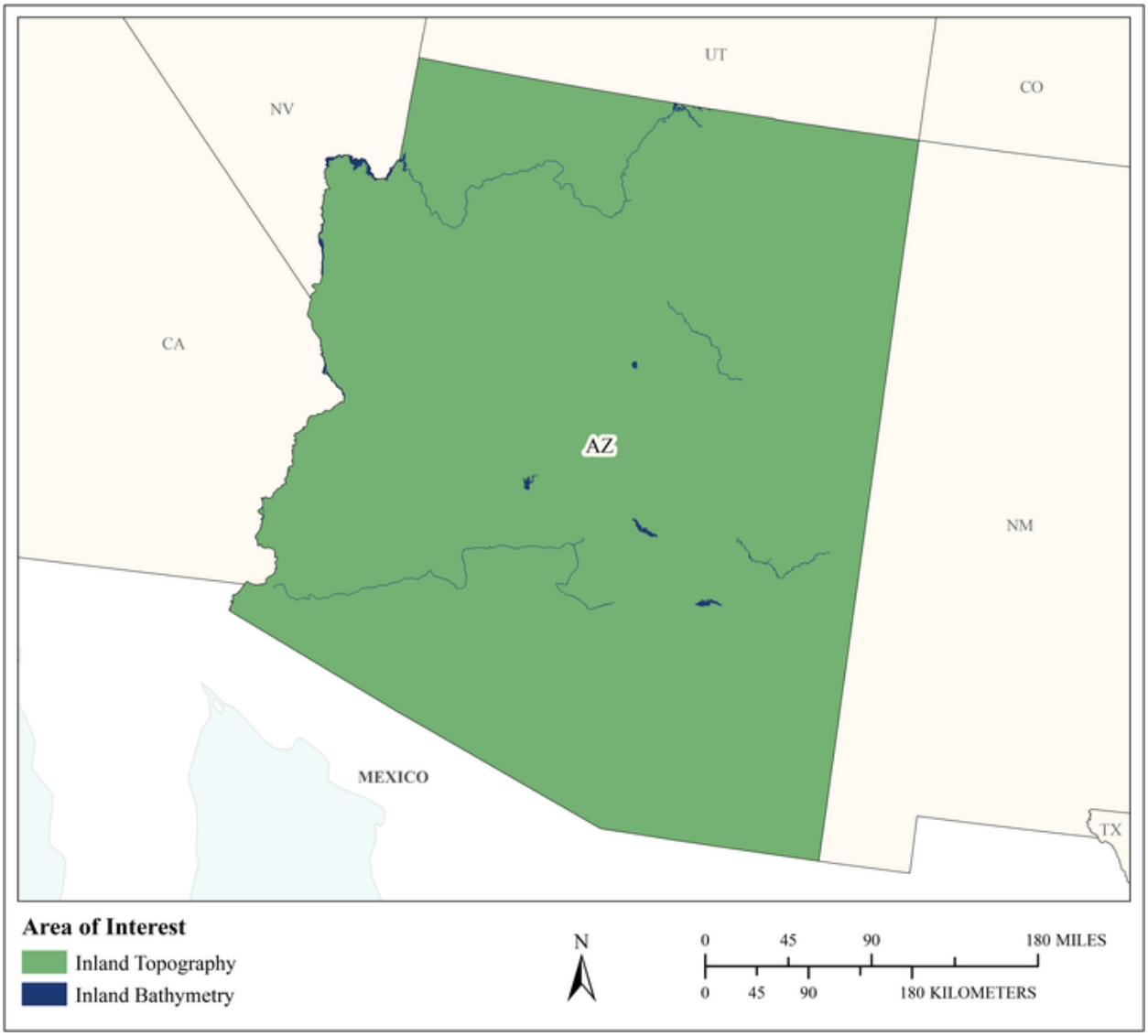
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Time savings description	This usually isn't an issue for us. For every mapper, the amount of hours saved varies and it's hard to estimate. The topography provided by high-resolution data significantly helps us identify accurate contacts between surficial and bedrock units which then reduced the amount of time needed in the field for mapping and checking.											
Cost savings/cost reduction	Major	Annual dollars saved/realized	$150,000									
Cost savings/cost reduction description	Coconino county $75,000 lidar for post fire areas couldn't have done without. Yavapai county set aside flood funding for lidar. $60K . Developing better post fire debris flow inundation models for AZ and NM. MUST have lidar data. 10m DEMs not useful. Testing in specific areas that have data. Data costs ~60k per study area. 2016 Pinalenos QL2 cost $120K vs 2018 - Pinalenose data cost ~100K (2016 vs 2018 lidar to be used to compare volumes, channel loss. (Post fire)) Assume data lifespan of 2 years.											
Cost avoidance	I don't know	Unable to provide										
Cost avoidance description	If we have point cloud data we do end up processing and creating derivative products that we don't do with 10m DEMs so it's a cost to us. The derivative products, however, help create a better map product so the time required is worth it.											
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Mission-driven performance improvements description	Allows us to produce better maps and provide better information to our stakeholders. Allows us to provide better guidance for decision makers.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Value added to products or services description	High resolution data allows us to better define hazards and hazard zones.											
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Environmental	Minor			
Public safety, including life and property	Major			

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Flood Risk Management and Infrastructure Improvement



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Area split by varying quality level or update frequency	One or more states, territories, or counties		
Sub Area Requirements	Arizona			

MCA Description	Response
Mission Critical Activity	Flood risk management and infrastructure improvement. Emergency management, flood inundation safety analyses. Floodplain mapping and floodwater flow modeling, including H&H modeling, planning, and existing conditions analysis. Wastewater conveyance mapping and modeling. Road design and construction. Elevation data are used for visualization and planning for projects (note: construction still requires field work). Elevation data are needed for NFIP flood mapping program activities, H&H analysis, dam repair or new dam construction, levees, and dam breach modeling. Elevation data are also needed for emergency management activities such as sniper analysis, to help manage urban events, identify shelter in place locations, for 3D analysis, line of sight analysis, and evacuation plans. Also for tree canopy information. Additional Business Uses applicable to this activity include BU 23- Urban and Regional Planning, BU 18 – Homeland Security, and BU 26 – Education K-12 and Beyond.
MCA Title	Flood Risk Management and Infrastructure Improvement
MCA ID	32958
Organization Type	Regional, County, City, or other local government
Organization Name	Combined county response
Sub-Agency or Division	
Organization Mission	Floodplain mapping, floodwater flow modeling, wastewater conveyance mapping and modeling, road design and construction, visualization planning for projects. County GIS services. County resource management to enhance residents' lives..
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 01 - Water Supply and Quality
Tertiary Business Use	BU 22 - Infrastructure and Construction Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.

General Geographic Area and Size	
Description of smallest 3D features	Structures including box culverts, wing walls, etc. Poles, manhole covers, edge of pavement, curb and gutter, traffic signs, guardrails, pavement striping, utility boxes. Building footprints and buildings.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	(a) QL0 (b) QL1	QL1B		
Update Frequency	(a) 2-3 years (b) 4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI	Urban areas QL0 2-3 years vs. rural areas QL1 4-5 years			
Acceptable Horizontal Error	Up to 1 meter	The best horizontal accuracy achievable for the vertical accuracy I need		
Acceptable Vertical Error	Up to 10 cm	Up to 20 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial	Partial		
Cross section/transect requirement	2-5 foot spacing	2- 5 foot spacing		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
Other	Required	Required			Required	
Other description	DEM's of Sections with 100' Overlap				Sectional overlap of data for at least 100'	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Required		
Classified point cloud	Highly desirable	Highly desirable		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Highly desirable		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Required	Required		
Wetlands	Required	Required		
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Required	Required		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	10m USGS Data, QL2 lidar, survey grade lidar at 0.5 meters of small areas. County acquisitions 2010, 2012, 2014, 2016, various QLs (2016 data .67m point spacing, vertical accuracy less than 10 cm)	USGS 10m DEM Data		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI	Yes			
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	USGS, FEMA, survey consultants collecting data for county projects, consultants performing analysis for developments, local incorporated agencies (City of Sierra Vista who obtained DEM data from the Dept of Defense), International Boundary and Water Commission)			
Other	Yes			
Other description	USGS, FEMA, Survey consultants collecting data for county projects, Consultants performing analysis for developments, Local incorporated agencies (City of Sierra Vista who obtained DEM data from the Dept of Defense), International Boundary and Water Commission). Data purchased over the years.			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Major		
Increased revenues	Moderate	Major		
Mission-driven performance improvements	Moderate	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major		
Improved customer experience	Major	Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate		
Environmental	Moderate	Moderate		
Public safety, including life and property	Moderate	Major		

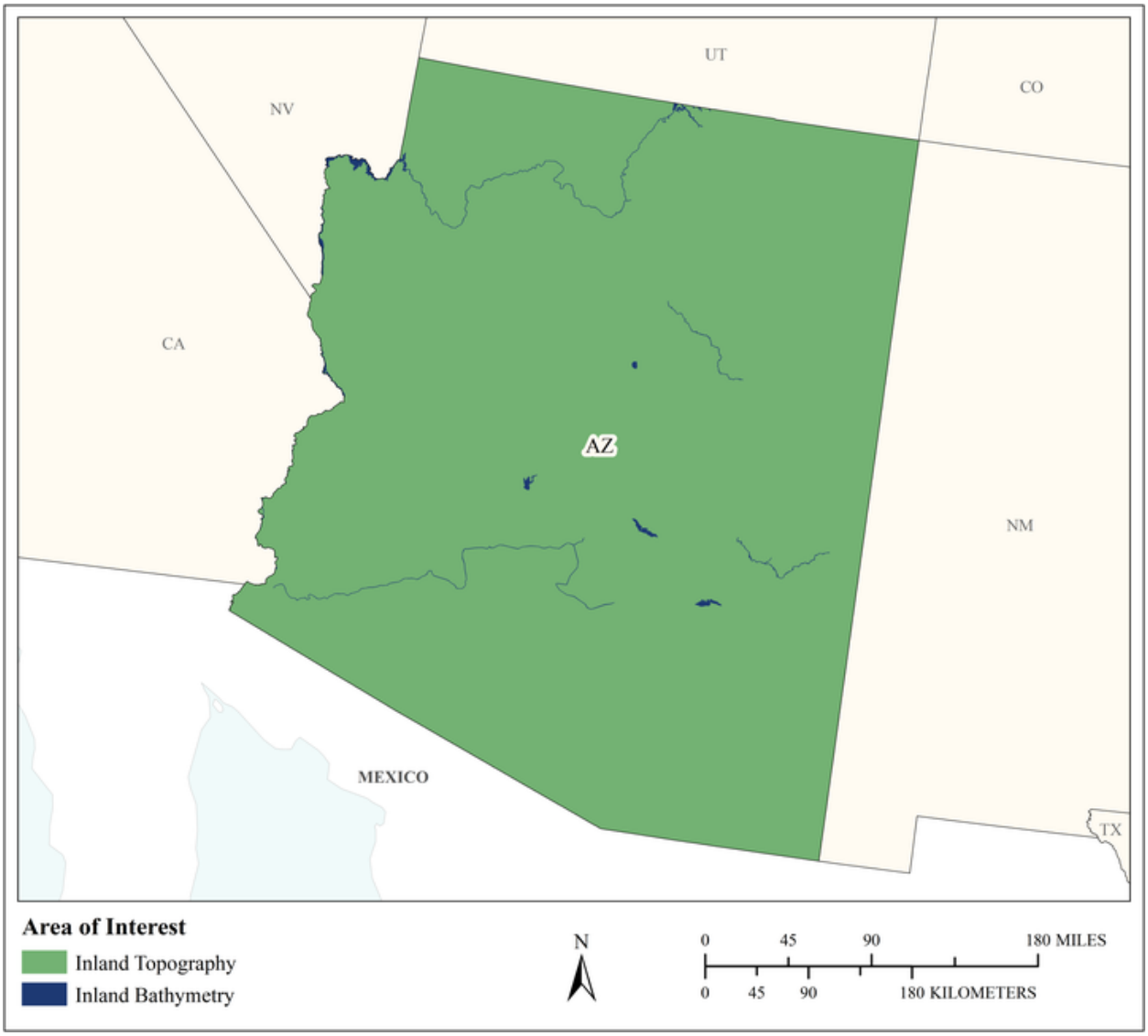
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$162,086	Moderate	Annual dollars saved/realized	$52,099						
Time savings description	The County has never had data that did not need verification due to elevation data that differed from survey datum. Calculated based on current hours spent by GIS team changing this data. This will help with the design of projects (Highway Operations and Floodplain). Calculated based on current hours spent setting up each project.											
Cost savings/cost reduction	Major	Annual dollars saved/realized	$2,456,080	Moderate	Annual dollars saved/realized	$104,000						
Cost savings/cost reduction description	Could save costs for aerial imagery and lidar acquisitions.											
Cost avoidance	Major	Annual dollars saved/realized	$144,000	Moderate	Annual dollars saved/realized	$192,000						
Cost avoidance description	Prevent citizens from building in hazard areas or elevating above a determined water surface elevation.											
Increased revenues	Major	Annual dollars saved/realized	$320,000	None								
Increased revenues description	Potential sites for the recharging of storm-water into aquifers. Locating of fissures or land subsidence areas that has the potential to re-direct the direction of storm-water.											
Mission-driven performance improvements	Major	Annual percent improvement	27%	Moderate	Annual percent improvement	10%						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Annual dollars saved/realized	$80,000						
Value added to products or services description	Better Mapping resulting in better information given to Citizens. Better Accuracy and Mapping for Citizens.											
Improved response or timeliness	Major	Annual dollars saved/realized	$52,099	Moderate	Annual dollars saved/realized	$52,099						
Improved response or timeliness description	If a spill were to occur, this data would show the direction of contaminant travel for first responders.											
Improved customer experience	Major	Unable to provide		Moderate	Annual dollars saved/realized	$26,050						
Other customer service benefits	Major	Annual dollars saved/realized	$50,170									
Other customer service benefits description	Mapping floodplain areas with determined discharges and resulting water surface elevations would help reduce the community costs for constructing building pads.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate								
Education or outreach description	Giving examples and educating children to make them more aware of keeping our waterways cleaner. The young generation can then inform their parents of the importance of keeping.			Better and more accurate data to provide to the public								
Environmental	Major			Moderate								

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Environmental description	Defined elevation data determines the direction of storm-water accurately (sediment). Sediment can't be specifically determined using USGS 10 meter DEM data. Allows us to see entire area instead of just the flood areas.	Better and more accurate data for design considerations which may affect environmental areas		
Public safety, including life and property	Major	Moderate		
Public safety, including life and property description	Defined elevation data determines the direction of storm-water accurately. This information would help in determining the direction of potential hazards (sewage spills for hazardous material clean-up). We allow all neighboring jurisdictions the ability to share the same accurate data and save millions of dollars for public safety from data acquisition and development. Public safety uses of elevation data include sniper analysis, urban events, identify shelter in place locations, 3D analysis, line of sight, evacuation plans, tree canopy information.	Better and more accurate data to provide to the public		
Other				
Other benefits	Major			

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Emergency Preparedness, Response, and Recovery



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	In Arizona, the two primary disasters that require a specified mission-critical activity are fires & floods. Determination of forest fuel and fire susceptibility. Fire behavior modeling to support wildfire suppression activities. Wildland/urban interface building identification. Post-fire analysis to determine landslide-prone areas. Elevation data are needed for assessment of potential for flood after fire. Tree canopy, forest density, chapparal, understory, etc. are also needed for fire modeling. Building heights would also be used jointly with the National Guard. The primary responsibility of the Division of Emergency Management is disasters such as flood and fire.
MCA Title	Emergency Preparedness, Response, and Recovery
MCA ID	1116
Organization Type	State or U.S. Territorial government
Organization Name	Arizona Department of Emergency and Military Affairs
Sub-Agency or Division	
Organization Mission	The Division of Emergency Management coordinates the State of Arizona's emergency preparedness, response and recovery efforts in order to reduce the impact of emergencies and disaster on people and property in the Whole Community.
Program Name	Division of Emergency Management
Total Annual Program Budget	
Primary Business Use	BU 17 - Wildfire Management, Planning, and Response
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 22 - Infrastructure and Construction Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	I am interested in seeing 3D data that pertains to buildings. Bottom surface. Depth of water in rivers, bodies of water.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B		
Update Frequency	Annually	2-3 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter		
Acceptable Vertical Error	Up to 20 cm	Up to 20 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Required			Required	
Entire AOI under same environmental conditions	Required	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Required			Required	
DEM for entire AOI needs to be seamless	Highly desirable	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Required	Required		
Classified point cloud	Required	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Required	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required	Nice to have		
Ground control/ground truthing	Required	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required	Required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Not required		
Land use/land cover	Required	Required		
Wetlands	Not required	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Required	Required		
Cultural resources	Required	Required		
Coastal and riverine structures	Required	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Best available from USGS, elsewhere	Best available from USGS, NOAA, elsewhere		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast		Yes		
NCEI	Yes	Yes		
Open Topography				
NOAA nautical charts				
USACE navigation charts		Yes		
USGS Inland Waters server		Yes		
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Major		
Increased revenues	Major	Major		
Mission-driven performance improvements	Major	Major		

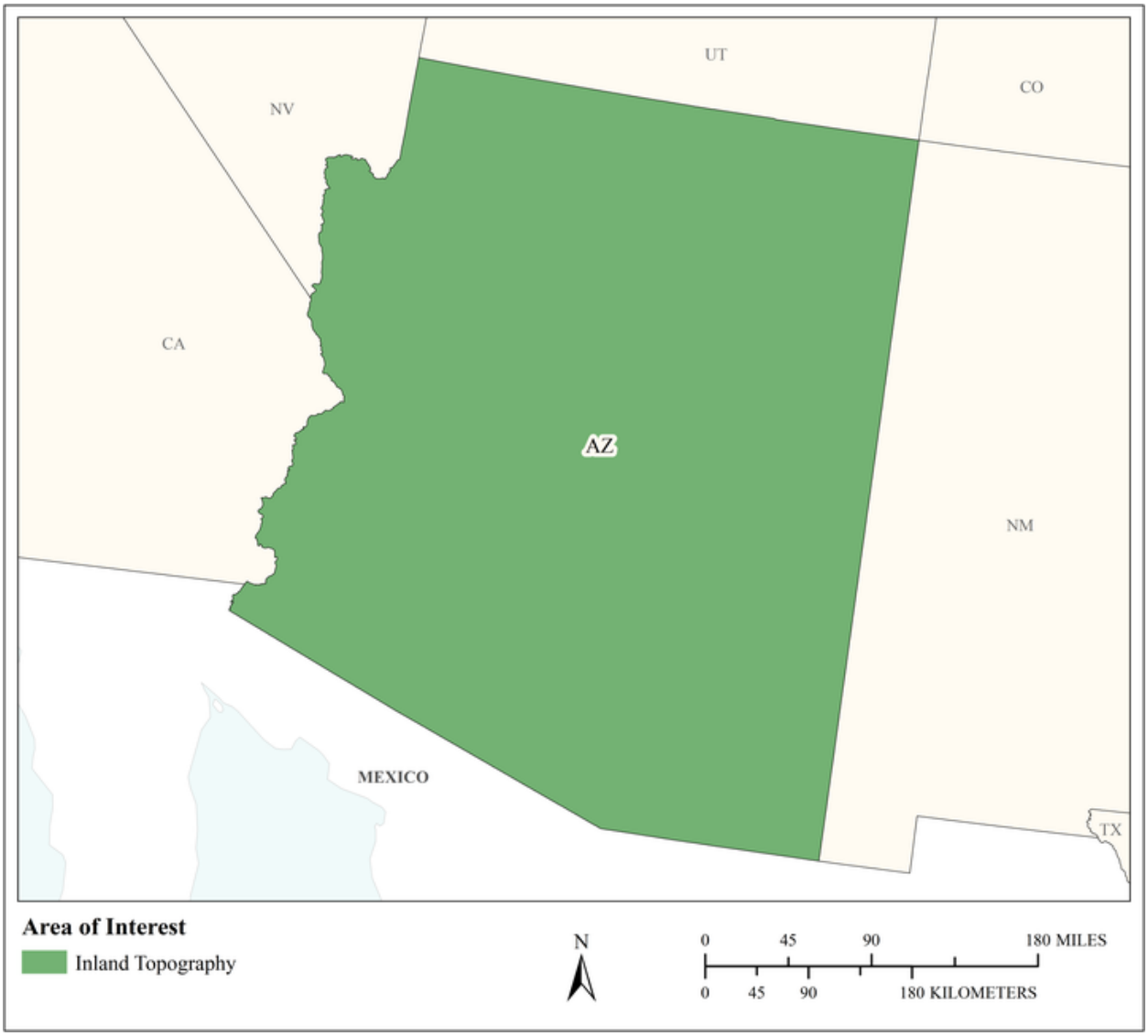
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		
Improved response or timeliness	Major	Major		
Improved customer experience	Major	Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major		
Environmental	Major	Major		
Public safety, including life and property	Major	Major		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Annual dollars saved/realized	$120,000	Major	Unable to provide							
Cost savings/cost reduction description	Avg 2 fire declarations per yer on FEMA's disaster declaration list (1990 – 2018) * $60K/per site.											
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Major	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Major			Major								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours				
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement		Yes		
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Homeland Security, Law Enforcement, Disaster Response, and Emergency Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Infrastructure and border protection. Coastal search and rescue. Population dynamics. Emergency fuel supply and movement. Line of sight analysis in urban areas. Disaster response. Flood risk analysis resulting from acts of terrorism.
MCA Title	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
MCA ID	60039
Organization Type	State or U.S. Territorial government
Organization Name	State of Arizona
Sub-Agency or Division	Arizona Department of Emergency and Military Affairs
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

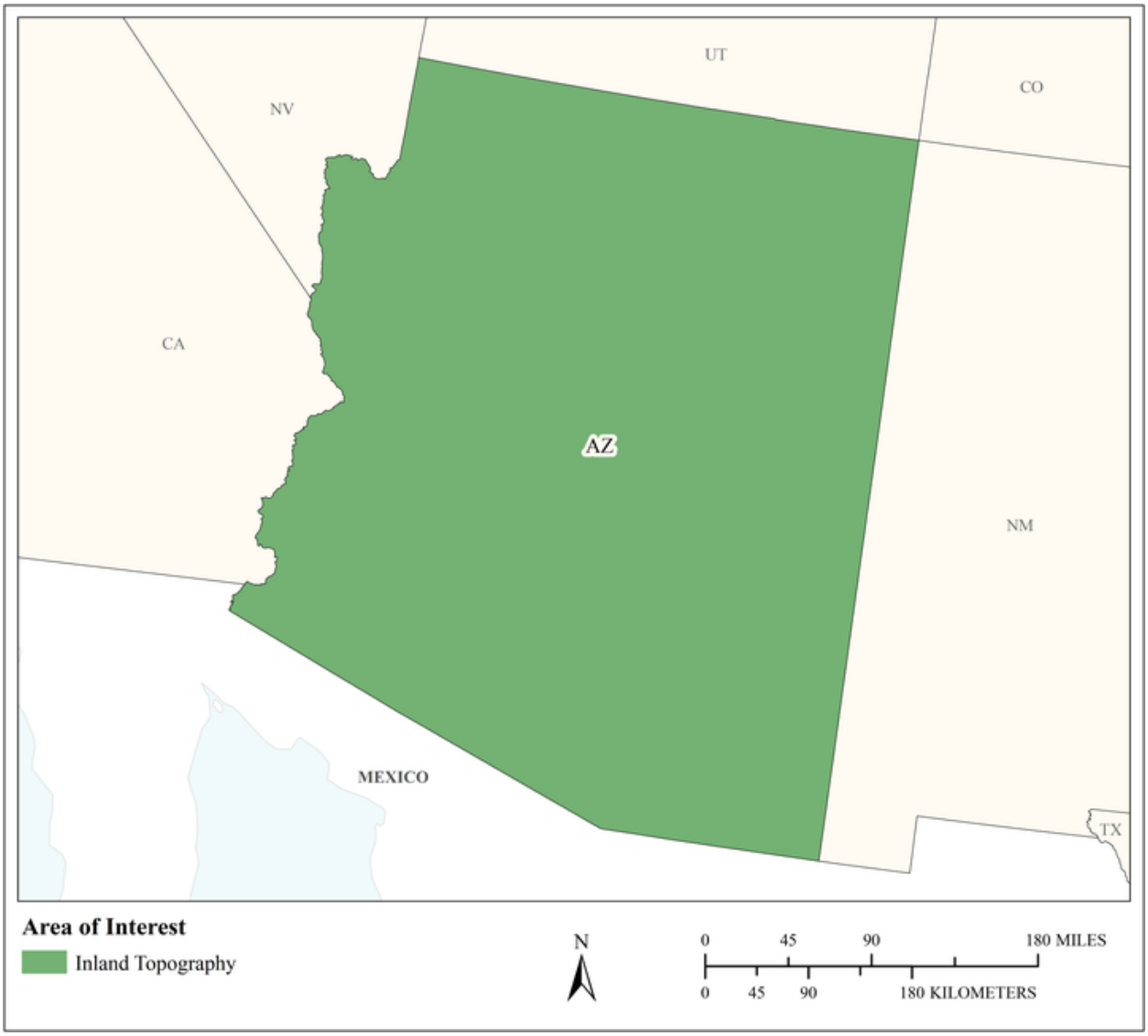
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Minor			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$3,362,989									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$59,439									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Moderate											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Transportation Planning and Pre-design



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	The Arizona Department of Transportation (ADOT) is a multimodal transportation agency serving one of the fastest-growing areas of the country. A major component of the organization is the Motor Vehicle Division, which provides title, registration and driver-license services to the general public throughout the state of Arizona. ADOT is also responsible for planning, building and operating a complex highway system in addition to building and maintaining bridges and the Grand Canyon Airport. Elevation data are used for project planning; field surveys are done for pre-design and cut and fill. Cut and fill is the most expensive and requires highly accurate data before construction starts. Elevation data are also needed for asset inventory; condition assessments to validate feature locations including signs, overpass height above roads, lane width, median width, widening feasibility assessments especially in urban areas. The data are also needed for drainage planning for new and reconstruction projects such as culverts, stormwater management, etc, The department is responsible for one airport – the Grand Canyon airport – for which the department only manages the financials. Subsidence is an issue in parts of state (up to 2 meters in some areas). Elevation data are needed for assessments of ground instability and post–event storm planning, and management of landslides and post-wildfire mud flows, etc. The department drives the roads with GPS and terrestrial lidar.
MCA Title	Transportation Planning and Pre-design
MCA ID	1112
Organization Type	State or U.S. Territorial government
Organization Name	Arizona Dept. of Transportation (ADOT)
Sub-Agency or Division	
Organization Mission	Provide a Safe and efficient roadway network that serve the citizens of Arizona

Program Name	The agency's strategic plan establishes the framework in support of our vision to become the most reliable transportation system in the nation. The plan provides guidance to all of our teams as they develop their unit level work plans and will help to ensure that our day-to-day operations are aligned with our agency's mission, vision, and goals. Issue 1: Deliver Value to the Customer – ADOT is committed to delivering its mission with a customer focus. To do that we need to see our business through our customer's eyes. Supporting Strategies: •Give customers easy access to important information •Employ new technology and products that save customers time and money •Identify problems before they occur •Incorporate customer feedback into agency improvement efforts. Issue 2. Maximize Resources – ADOT is committed to running its business as efficiently and effectively as possible. To do that we need to pursue innovations and organizational efficiencies that will save money and lead to investing more in the transportation system. Supporting Strategies: •Take care of what we have •Optimize our existing systems •Deliver projects on-time and on-budget •Promote agency efficiency on a continuing basis Issue 3. Build a Culture of Highly Engaged Employees – ADOT is committed to creating the kind of environment that allows every employee to give their best every day. To do that we need to transform engagement from just an "annual Human resources Measure" to a more holistic, integrated, and real-time approach to driving employee commitment and passion. Supporting Strategies: •Align learning and talent management strategies with AMS •Promote programs that reward innovation and creativity •Strengthen interagency connections (One ADOT) •Turn insights from employee surveys into action Issue 4. Improve Transportation Safety – ADOT is committed to providing a safe traveling environment for our citizens, visitors and employees. To do that we need to reduce fatalities, severe injuries and crashes on our entire transportation network. Supporting Strategies: •Apply appropriate engineering principles and practices to promote safety •Clear accidents faster •Promote safe behaviors by all transportation users •Improve the quality of transportation safety data
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have

What Needs to be Measured in 3D	Response
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Transportation corridor assets and detailed topology

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	Cross sections and/or transects meet needs			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI	Major transportation corridors need greater detail. Interstates and National Highways = minimum. Urban buffer is narrower than rural, varies by terrain and location			
Acceptable Horizontal Error	Less than 20 cm			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs	Yes			
Cross section/transect requirement	< 30 centimeter vertical and at least 1 meter sampling			

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Nice to have					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	No lidar data are currently used; not enough detail from terrestrial collections; use photogrammetry data now (1m accuracy). Contract for asset inventory now via photogrammetry. There is a survey grade lidar pilot in one area (cm accuracy).			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				

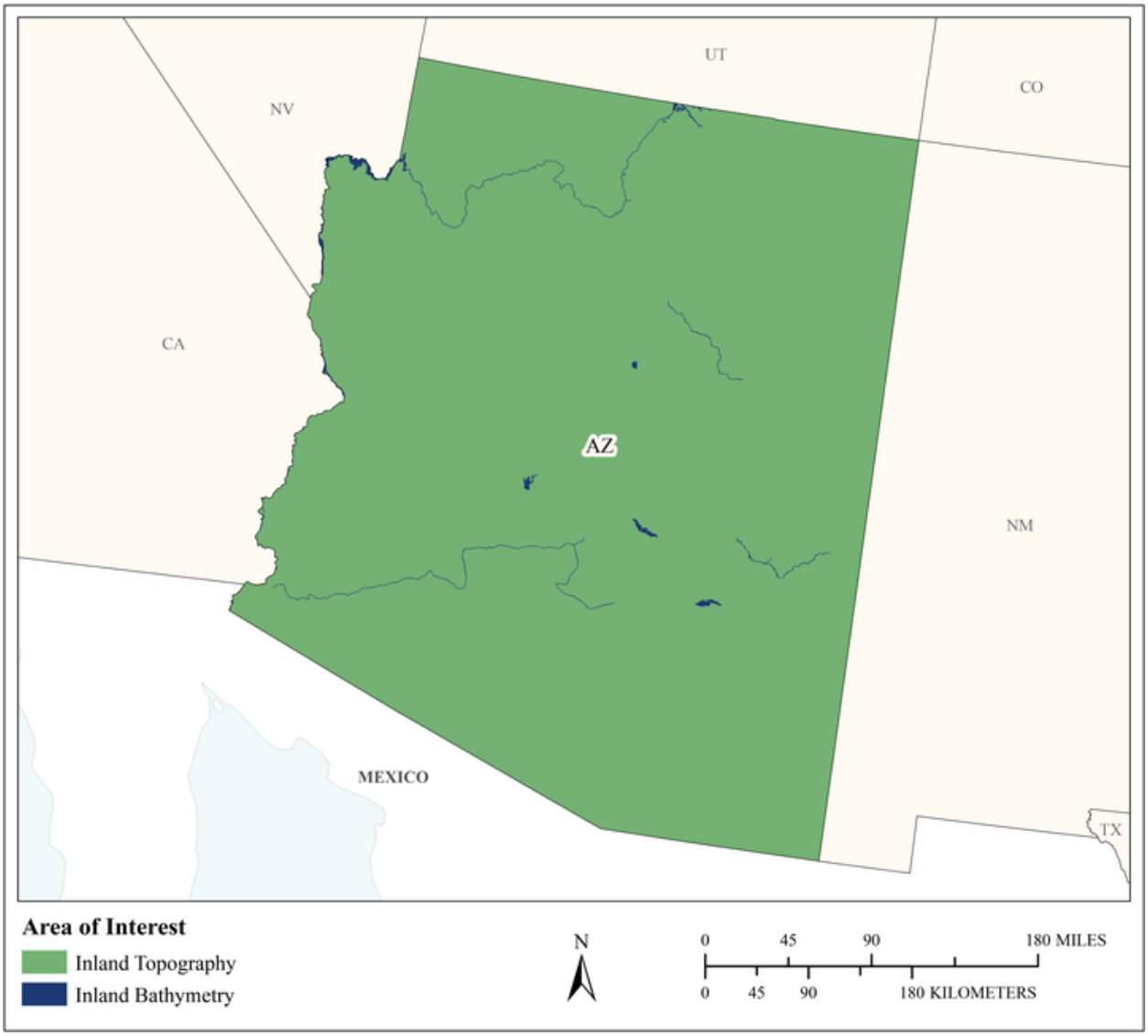
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Major			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Moderate			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$5,123,085									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$15,076,208									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Moderate											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Trust Lands Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Trust Land Management. Trust lands are state owned (covering 14% of the state), monies go to K-12 schools. Elevation data are needed for archaeology, minerals, planning, and development. Also sovereign lands are managed (not owned) but include areas that were underwater when the state was formed. For these areas, change must be assessed over time.
MCA Title	Trust Lands Management
MCA ID	1196
Organization Type	State or U.S. Territorial government
Organization Name	Arizona State Land Department
Sub-Agency or Division	
Organization Mission	We manage 9.2 million acres of Trust Land for our beneficiaries, mostly the public schools.
Program Name	Land Development
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Tertiary Business Use	BU 16 - Sea Level Rise and Subsidence

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Trees

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have

Inland Bathy Feature Size Requirements	Response
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	Cross sections and/or transects meet needs		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	The best horizontal accuracy achievable for the vertical accuracy I need		
Acceptable Vertical Error	Up to 20 cm	Up to 1 meter		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs		Yes		
Cross section/transect requirement		Not sure, best available		

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Highly desirable	
Entire AOI under same environmental conditions	Nice to have	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Nice to have			Nice to have	
DEM for entire AOI needs to be seamless	Highly desirable	Nice to have			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Not required		
DTM	Highly desirable	Nice to have		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Highly desirable	Highly desirable		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Not required		
Bathymetric Attributed Grid (BAG)		Not required		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Not required	Not required		
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Not required		
Ground control/ground truthing	Nice to have	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required	Not required		
Land use/land cover	Required	Highly desirable		
Wetlands	Nice to have	Nice to have		
Estuaries				
Inland surface water features	Highly desirable	Nice to have		
Bridges/culverts	Nice to have	Not required		
Landmark features	Highly desirable	Nice to have		
Cultural resources	Highly desirable	Nice to have		
Coastal and riverine structures	Not required	Not required		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We are currently using 10m DEMs and contours whenever we can get them.	None		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	Local network			
Data that meet my needs are not available		Yes		

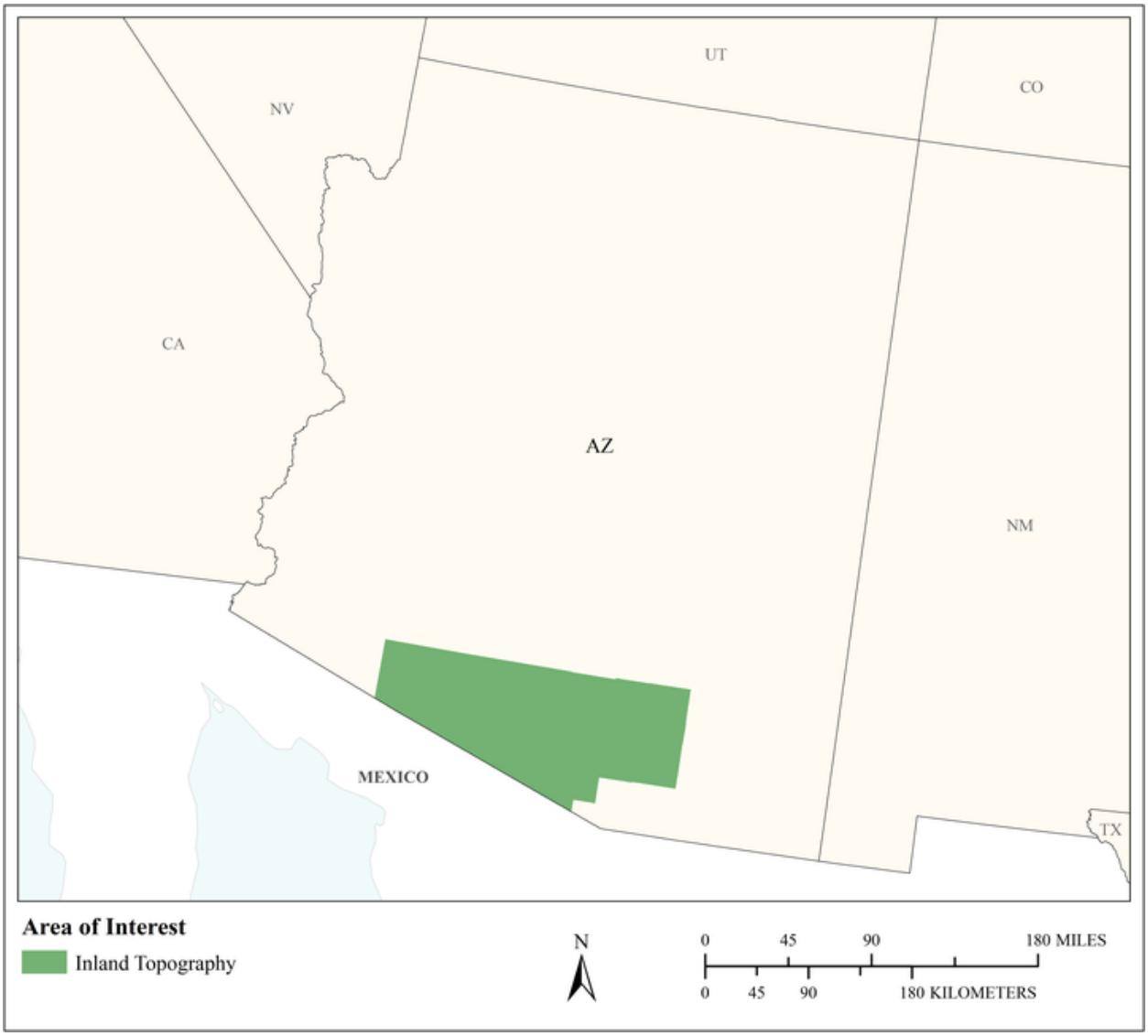
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Inland bathy data not available		
Cost savings/cost reduction	Moderate	Inland bathy data not available		
Cost avoidance	Minor	Inland bathy data not available		
Increased revenues	Moderate	Inland bathy data not available		
Mission-driven performance improvements	Major	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Inland bathy data not available		
Improved response or timeliness	Minor	Inland bathy data not available		
Improved customer experience	Moderate	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	Inland bathy data not available		
Environmental	Minor	Inland bathy data not available		
Public safety, including life and property	Minor	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$15,075	Minor	Annual dollars saved/realized	$1,206						
Time savings description	Lots of elevation and slope modelling. Possibly fewer field visits.			Navigable Streams Study.								
Cost savings/cost reduction	Minor	Annual dollars saved/realized	$5,000	Minor	Annual dollars saved/realized	$2,000						
Cost savings/cost reduction description	Wouldn't have to buy data for a specific area.			Contracting.								
Cost avoidance	Moderate	Annual dollars saved/realized	$5,000	None								
Cost avoidance description	Time spent manipulating data.											
Increased revenues	None			None								
Mission-driven performance improvements	Moderate	Annual percent improvement	25%	Minor	Annual percent improvement	12%						
Other operational benefits	Minor	Annual dollars saved/realized	$1,206									
Other operational benefits description												
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Annual dollars saved/realized	$3,166	I don't know	Unable to provide							
Value added to products or services description	Maps with elevation, slope or contours. Solar studies.											
Improved response or timeliness	Minor	Annual dollars saved/realized	$302	None								
Improved customer experience	Minor	Annual dollars saved/realized	$1,055	None								
Improved customer experience description	Web maps. Better maps.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			None								
Environmental	None			None								
Public safety, including life and property	None			None								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Regional Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements	Pima County, AZ			

MCA Description	Response
Mission Critical Activity	Assessment, support, and recommendations for regional well-being and economic development to member jurisdictions. Encompasses transportation planning, sustainability planning, educational activities, and general data development and aggregation in support of regional planning programs and activities.
MCA Title	Regional Planning
MCA ID	32963
Organization Type	Regional, County, City, or other local government
Organization Name	Pima Association of Governments
Sub-Agency or Division	
Organization Mission	Facilitate the coordination, cooperation, data development, information sharing, and sound decision-making related to issues that cross regional jurisdictional boundaries of a County, five cities/towns, and two Native American reservations.
Program Name	Transportation Planning (Regional Transportation Authority)
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 19 - Land Navigation and Safety
Tertiary Business Use	BU 27 - Recreation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Shrub/cacti. Shallow swales

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI	Urban areas require more frequent data (2-3 years) vs rural regions (4-5)			
Acceptable Horizontal Error	Up to 1 meter			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Highly desirable			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Highly desirable			
Wetlands	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Not required			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL2 Aerial LiDAR (2015) covering most of eastern Pima County.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	Data held on premises			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None			
Cost savings/cost reduction	None			
Cost avoidance	Major			
Increased revenues	Minor			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Minor			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

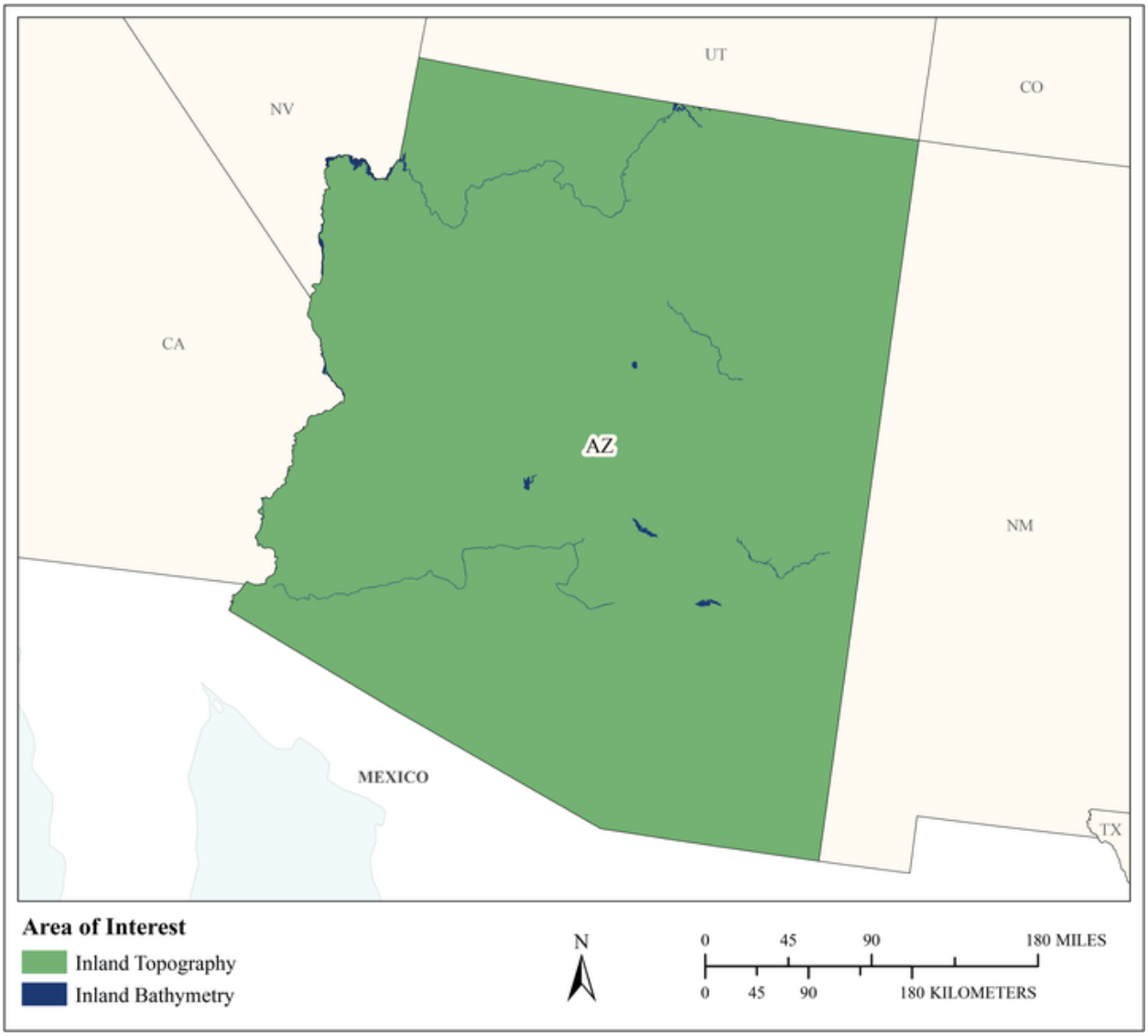
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$14,472									
Time savings description	Pima Association of Governments does not directly conduct in-situ activities. Stakeholders do, however. Coordination for funding and contracting of data estimated at 3 weeks of man hours. Estimate a weeks' worth of work saved by less data wrangling. Estimate 6 weeks' worth of man hours saved annually from better/more-efficient mapping.											
Cost savings/cost reduction	Moderate	Unable to provide										
Cost savings/cost reduction description	Pima Association of Governments does not directly conduct in-situ activities. Stakeholders do, however.											
Cost avoidance	Moderate	Annual dollars saved/realized	$10,000									
Cost avoidance description	Estimation of event and natural hazard reduction would be conducting by stakeholders of PAG. Existing data products were purchased having been pre-processed.											
Increased revenues	Moderate	Unable to provide										
Increased revenues description	Pima Association of Governments does not directly conduct in-situ activities. Stakeholders do, however. Pima Association of Governments and associated programs are primarily taxpayer funded and not for profit.											
Mission-driven performance improvements	Major	Annual percent improvement	17%									
Mission-driven performance improvements description	Better data allows for more accurate assessment characterization on derivation of new tools/products. Better data provides better planning and assessment information to stakeholders.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Value added to products or services description	Developing of new products provides the Pima County community with greater resources and better information, but not at an additional financial benefit to PAG.											
Improved response or timeliness	Minor	Unable to provide										
Improved response or timeliness description	PAG stakeholders would derive benefit this benefit, but not PAG directly. PAG does provide data to both private and public entities, but infrequently.											
Improved customer experience	Major	Annual dollars saved/realized	$1,206									

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Improved customer experience description	Community benefit from services, tools, and apps would not realize a greater financial benefit to PAG. If the 3D data were stored in a public repository, PAG would avoid IT costs of storage maintenance, upkeep, and redundancy. Better quality data.											
Other customer service benefits	Minor	Unable to provide										
Other customer service benefits description												
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Education or outreach description	Better data is more information leads to fuller education											
Environmental	Major											
Environmental description	Being able to assess state and state of change of environmental conditions through terrain assessment is critical to understanding health and impact on environments											
Public safety, including life and property	Major											
Public safety, including life and property description	Better characterization of landforms and processes provides continuous benefits to persons and property on that land in cost reduction, avoidance, and disaster mitigation											
Other												
Other benefits	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Geospatial and Cartographic Data Dissemination



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Nice to have		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Geospatial and cartographic data dissemination, management, production, and analysis. The State Library is an end user and redistributes elevation and other data to the academic and research community. The library supports academic research needs. The Phoenix metro area is the highest priority. High density elevation data are needed to evaluate vegetative health, tree crowns and canopies, and biogeophysical processes and pattern recognition.
MCA Title	Geospatial and Cartographic Data Dissemination
MCA ID	22427
Organization Type	Academic or Not-for-Profit
Organization Name	Arizona State University Library
Sub-Agency or Division	
Organization Mission	Deliver high-quality resources to all ASU users – whatever they need, wherever they are – in support of academic excellence and accessibility. Collaborate with faculty and students in a culture of "inquiry entrepreneurship" – defined by active learning and original research – and through innovative partnerships and professionalism. Inspire and engage the ASU community and the world through creative design that enhances the local impact and social embeddedness of library services, programs and expertise.
Program Name	ASU Library Map and Geospatial Hub
Total Annual Program Budget	
Primary Business Use	BU 26 - Education K12 and Beyond, Basic Research
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Trees, cacti, utilities, river and lake shorelines and bottoms

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL4B		
Update Frequency	4-5 years	Annually		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	Less than 50 cm		
Acceptable Vertical Error	Up to 20 cm	Up to 50 cm		
How far onshore needed				
How far down the beach profile needed	To MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable			Nice to have	
Entire AOI under same environmental conditions	Nice to have	Highly desirable			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Nice to have	
DEM for entire AOI needs to be seamless	Required	Required			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	I don't know			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Highly desirable	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Required	Required		
Edited/cube XYZ		Highly desirable		
Full waveform	Required	Required		
Bathymetric Attributed Grid (BAG)		Required		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		
Estuaries				
Inland surface water features	Highly desirable	Required		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Highly desirable	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	NED, GTOPO SRTM, ASTER GDEM, 2014 3DEP DEM	Not much available or in use currently		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes		
NCEI	Yes			
Open Topography	Yes			
NOAA nautical charts		Yes		
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Cost avoidance	Major	Major		
Increased revenues	Moderate	I don't know		
Mission-driven performance improvements	Major	I don't know		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		
Improved response or timeliness	Major	Major		
Improved customer experience	Major	Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major		
Environmental	Major	Major		
Public safety, including life and property	Major	Major		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$599,078		Annual dollars saved/ realized	$156,665						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,431,971									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Major			Major								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

Arkansas

With five distinct but overlapping physiographic regions, Arkansas contains a diverse elevation landscape. The state's lowest elevation forms the riparian boundary shared by Ashley and Union Counties of Arkansas and Morehouse and Union Parishes of Louisiana. This low point situated on the Ouachita River is about 55 feet above sea level and in contrast the state's highest landmark of Mount Magazine is at 2,753 feet. Nearly a quarter of the state lies in the fertile and relatively flat Mississippi River delta that is home to agricultural activities that help feed the world. The state has high population growth in the Ozarks of northwest Arkansas. In the center of the state we have modest population growth and the intersection where the Delta meets the Ozarks and the folded Ouachita Mountains. The state relies on high-quality elevation data for issues associated with water utilities, transportation, and other infrastructure as well as storm water and floodplain management. In addition to these there are wildlife and other natural resource management activities all demanding current and high-quality terrain data. Our goal in the study was to identify state stakeholders who could represent these diverse needs. Together these stakeholders identified the following Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data.

Current status of elevation data for Arkansas

Arkansas has statewide lidar coverage resulting from a large coordination effort among state, local, and federal agencies working in partnership with the Arkansas Geographic Information Systems Office. Since 2015 over 45,000 square miles of lidar has been collected in the state. Many agencies were involved in the funding and coordination of these projects, including Northwest Arkansas Regional Planning Commission (NWARPC), Arkansas Game and Fish Commission, Pulaski Area GIS (PAGIS), Natural Resources Conservation Service, Federal Emergency Management Agency, USGS, U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, and U.S. Forest Service. The partnerships resulted in data that meet Quality Level 2 (QL2) requirements of the 3D Elevation Program (3DEP).

Importance of elevation data to Arkansas

The Arkansas Game and Fish Commission uses topographic and bathymetric elevation data for conservation and preservation of various species of fish and wildlife, including monitoring of rivers, lakes, and channels for boating. It is used to maintain infrastructure of dams and associated pumps, lifts, etc. and to monitor sedimentation on the upstream side of dam structures. The Arkansas Geological Survey uses elevation data to perform geologic assessments and hazard mitigation, including identification of outcrop, road cuts, and surficial exposure of units. The Arkansas Department of Environmental Quality (ADEQ) uses elevation data for geologic resource mining and extraction, geologic assessment and hazard mitigation, and cultural resources preservation and management. The Arkansas Natural Resources Commission (ANRC) has generated statewide DEMs from QL2 lidar data to support flood risk modeling and mapping of riverine, bayou, and low-lying areas. The data is also being used to assess dam and levee safety, and for emergency management. Agencies and engineering companies use elevation data for hydrologic and hydraulic modeling and to derive storm water management structures such as channeling structures, ditches, ramps, silt ponds, foundations, risers, hardened surfaces, embankments, weirs, and levees. The Arkansas Department of Transportation (ARDOT) uses elevation data for infrastructure and construction management, including bridge location and design. Regional Planning Commissions use elevation data for transportation and land use planning. City and local governments city and county government use elevation data for development planning, public health, public safety, police & fire, infrastructure maintenance, drinking water system management, wastewater collection and treatment, transportation network design, and recreation facility management.

High-level summary of elevation data requirements

Arkansas has diverse requirements for elevation data quality and update frequency. Arkansas Game and Fish Commission requires topographic elevation updates at QL2 every 2-3 years and bathymetric data updates 4-5 years. In riverine and wildlife management habitat areas a QL1 product or better and annual coverage is desired. The engineering community conducting hydrology and hydraulic studies require QL0 data every 2-3 years. ARDOT requires QL2 topographic elevation data every 2-3 years and QL2B Inland bathymetric data every 6-10 years. The NWARPC requires QL2 topographic elevation data every 4-5 years and inland bathymetric data every 4-5 years. PAGIS requires QL1 topographic elevation data every 6-10 years and inland bathymetric data every 6-10 years. ADEQ and the Arkansas Geological Survey require QL0 elevation data updated annually. For flood risk re-assessment with significant population growth or development ANRC requires QL2 elevation updated every 6-10 years.

High-level summary of benefits that would come from higher resolution elevation data

With increased frequency and higher quality elevation data, agencies would see major benefits in the form of time and cost savings, operations, and improved customer service. Agencies would generally be able to provide information to constituents more quickly, without implementing costly and labor-intensive field studies. Public health and safety would benefit with improved data for oversite and regulation of water supply programs and permitting. Improved bathymetric data will benefit recreational programs with more accurate maps for hiking, fishing, identification of shoals, shallow areas, and river and lake bottom hazards. The emergency response sector will benefit from improved data through enhanced visualization of flood-prone areas, higher quality models, forecasts, analysis of flood impacts and timing within urban and natural landscapes. Improved elevation data will allow natural resource management agencies to evaluate scenarios for water retention for agriculture versus flood control for loss of property.

Additional comments

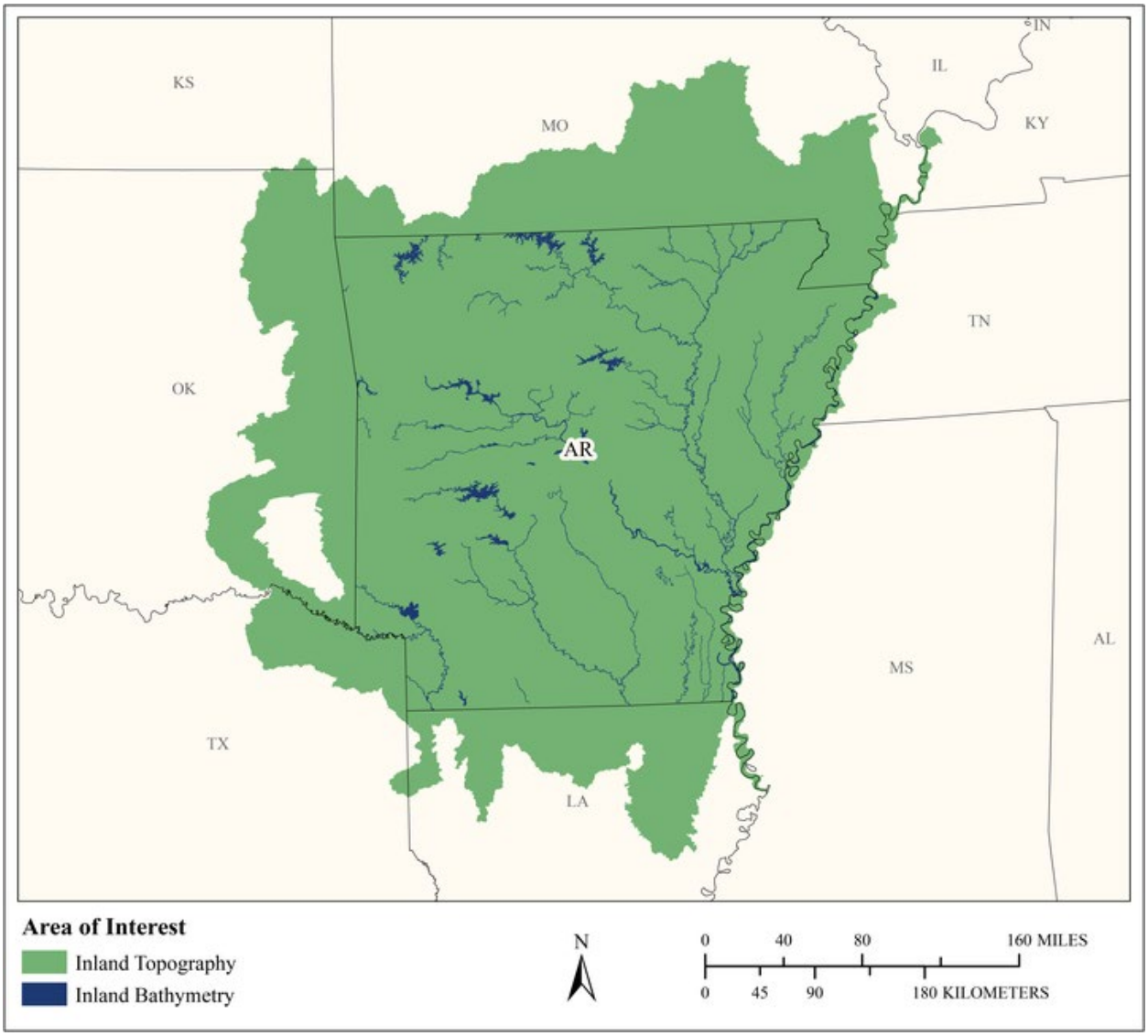
In 2018, the Arkansas GIS Office conducted a survey of constituents to learn more about their elevation data access needs. The results guided the GIS Office and on how to balance the high cost of elevation data storage versus access, and the data formats needed by users. Forty-nine percent of respondents need access to elevation data on a monthly basis, and 32% require access on a daily basis in their role. Thirty percent of respondents indicated the project size that best fit their need was at a county level, followed by 20% which that stated their project size represents the entire state. Seventy-three percent of respondents preferred downloadable data over data as a service and 53% stated they needed the data immediately or within one hour. Preferred products are DEMs and contours. The Arkansas GIS Office offers a statewide seamless 1-meter DEM and DEM downloads, and directs users to The National Map for lidar point cloud data.

The State of Arkansas has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 07 – Wildlife and Habitat Management	Arkansas Game and Fish Commission	1462	Conservation and Preservation of Fish and Wildlife	Inland Topo	QL2	2-3 years	$51,567	Unable to quantify	Minor	Moderate	Moderate
				Inland Bathy	I don't know	4-5 years	Unable to quantify	Unable to quantify	Minor	Moderate	Major
BU 10 – Geologic Assessment	Arkansas Geological Survey	1260	Geology	Inland Topo	QL0 HD	As frequently as possible	Unable to quantify	Unable to quantify	Moderate	None	None
BU 11 – Geologic Resource Extraction	Arkansas Department of Environmental Quality	1435	Geologic Resource Mining and Extraction	Inland Topo	QL0 HD	Annually	Unable to quantify	Unable to quantify	Moderate	Moderate	I don't know
BU 15 – Flood Risk Management	Arkansas Natural Resources Commission	22537	Flood Risk Modeling, Mapping, and Mitigation	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Major	Moderate	Major
BU 22 – Infrastructure Management	Civil Engineering Associates	1361	Engineering Consulting for Municipal Infrastructure	Inland Topo	QL0 HD	2-3 years	Unable to quantify	Unable to quantify	Minor	Moderate	Minor
BU 22 – Infrastructure Management	Arkansas Department of Transportation	1443	Route Selection and Design for Transportation Planning	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Minor	Moderate	Moderate
				Inland Bathy	QL2B	6-10 years	Unable to quantify	Unable to quantify	Minor	Moderate	Moderate
BU 23 – Urban and Regional Planning	Northwest Arkansas Regional Planning Commission	1081	Transportation and Land Use Planning	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Inland Bathy	I don't know	6-10 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 23 – Urban and Regional Planning	Pulaski Area GIS (PAgis), Little Rock, Arkansas	1402	County and Regional Geospatial Data Coordination	Inland Topo	QL1 HD	6-10 years	$298,340	Unable to quantify	None	Moderate	Moderate
				Inland Bathy	QL1B	>10 years	Unable to quantify	Unable to quantify	Minor	Minor	Minor
BU 23 – Urban and Regional Planning	Arkansas GIS Office	21724	Statewide Geospatial Data Coordination	Inland Topo	QL2	>10 years	$8,640	$5,668	None	None	None

MCA Title: Conservation and Preservation of Fish and Wildlife



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more Hydrologic Units (HUC8s)	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation and preservation of various species of fish and wildlife. Inland bathymetry is needed for channelization for boating. Also to evaluate dams on state-owned lakes for pumps and lifts, to see the health of the structure, and identify if sedimentation against the dam is a problem that needs to be mitigated. The commission also evaluates areas upstream of dams that would flood timber – too much water kills timber, areas are only flooded during duck hunting season, and the dam is used to drain the timbered areas after the season is over. Bathymetry data are also needed for fish habitat management.
MCA Title	Conservation and Preservation of Fish and Wildlife
MCA ID	1462
Organization Type	State or U.S. Territorial government
Organization Name	Arkansas Game and Fish Commission
Sub-Agency or Division	
Organization Mission	The Arkansas Game and Fish Commission's mission is to conserve and enhance Arkansas's fish and wildlife and their habitats while promoting sustainable use, public understanding and support.
Program Name	Wildlife Management and Fisheries Divisions
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	BU 09 - Fisheries Management and Aquaculture
Tertiary Business Use	BU 04 - Forest Resources Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Water control structures, approximately 3 feet diameter and 2 to 3 feet high. River and lake bottoms for fisheries, channels for boating.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	I don't know		
Update Frequency	2-3 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI	Higher level and greater frequency for Riverine and Wildlife Management habitat areas. Population growth will dictate needs.			
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need		
Acceptable Vertical Error	Up to 10 cm	Up to 50 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Required			Highly desirable	
Entire AOI under same environmental conditions	Required	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable		
DTM	Highly desirable	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Highly desirable	Nice to have		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Highly desirable		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Highly desirable		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required	Highly desirable		
Land use/land cover	Required	Highly desirable		
Wetlands	Required	Highly desirable		
Estuaries				
Inland surface water features	Required	Highly desirable		
Bridges/culverts	Required	Highly desirable		
Landmark features	Nice to have	Highly desirable		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Required	Not required		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We have various years within last 6 years ranging from QL2 to QL3	Various dates and data sets acquired within last 10 years.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	Arkansas GIS Office and in-house Arkansas Game and Fish Commission	Arkansas GIS Office		
Other		Yes		
Other description		Internal datasets		

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Major		
Increased revenues	None	Major		
Mission-driven performance improvements	Moderate	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Major		
Improved response or timeliness	Major	Major		
Improved customer experience	Minor	Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor		
Environmental	Moderate	Major		
Public safety, including life and property	Minor	Major		

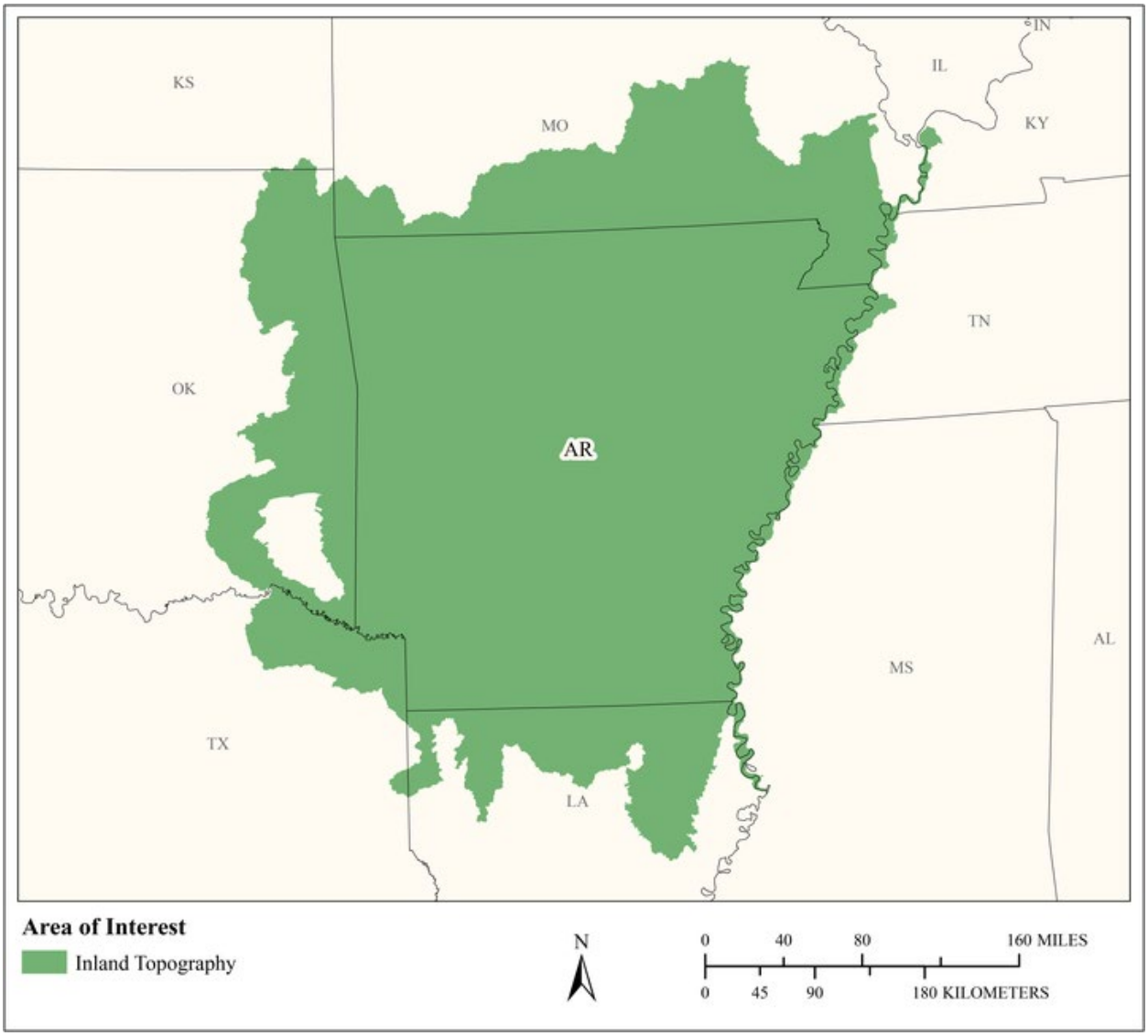
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$1,568	Major	Unable to provide							
Time savings description	Time saved on bathymetry collection from cheap, slow and inefficient collection methods. Dependent upon projects that we do not control. Time saved on modeling with better data. More accurate data may mean less data manipulation or combining data.			This is not really an issue. Requests are on a as needed basis and depends on other sections when need arises. These type of operations would be performed on an as needed basis by others. Current methods of inspection/visits fall within a separate section of agency. Planning would be performed by other divisions, therefore we can't estimate man hours saved.								
Cost savings/cost reduction	Moderate	Annual dollars saved/realized	$50,000	Moderate	Unable to provide							
Cost savings/cost reduction description	Previous methods would include hiring contractors or consultants to ground truth. Previous projects costs were around 100,000, not sure what future costs would be. Assume 2-3 year shelf life.			We would not be able to do this on our own due to lack of funding.								
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Cost avoidance description	Savings based on not having to do this process ourselves, based on employee salary and duration of work. Savings would be based on employee's salary doing the work and length of project.			Having someone do the processing who is familiar would reduce data errors that would be introduced due to lack of expertise. We would not normally run scenarios prior to events. Could prevent loss of life due to boating accidents or injury due to lack of bottom hazard information. We would be unable to do this on our own because of lack of funding.								
Increased revenues	Moderate	Unable to provide		Major	Unable to provide							
Increased revenues description	If we have the data, we will try to integrate it into products and applications when possible for public consumption. Can be used in future studies to increase yields.			A great opportunity to provide to public through new application with data included. Could help with estimate for aquaculture projects.								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements description	Better data would provide more reliable information for management decisions.			Intangible benefits very hard to calculate.								
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Value added to products or services description	More accurate and up to date products. Better flood zone delineation improves safety.			Our fishing license buyers are going to love any additional data we can provide and it could increase our sales and their success.								
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Improved response or timeliness description	Always better if data is more reliable and more up to date. More accurate and up to date data can help enhance reports tied to permitting and other regulatory processes. More recent data would allow to see how impacts changed landscape, therefore helping to restore it. Helpful in modeling flood prone zones on Wildlife Management Areas - closures can be estimated more closely. More accurately reflect timing of events while responding or for planning response.			We will definitely create new services to serve data to public and others. Identification of shoals, sand bars and shallow areas will all provide extra safety to public users. Little or no data exists currently, so having data will help. Anglers are begging for this data and will use it to improve success. Example SAR efforts after boating accidents or drownings.								
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide							
Improved customer experience description	If we have access to a bigger and better data then we have more opportunity to create new and improved products and services. If data can be provided in one location, it would be extremely helpful. We have a tremendous need for 3D data clearing house. Most people don't really know or care about the data behind the products. They just don't think about it.			It is always great to have data in one place, streamlined for faster and easier access. Most customers just assume data is reliable almost to a fault, so this would be minimal. We will create new tools and service for public and other's to consume data.								
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor								
Education or outreach description	It's easier to show others a representation of the habitat and environment if data behind it is better quality.			These benefits would be minor, but there would be some.								
Environmental	Moderate			Moderate								
Environmental description	If data model includes more accurate data, there will be an overall benefit due to having better representation of areas.			Additional reliable and accurate data will enhance these benefits.								
Public safety, including life and property	Moderate			Major								
Public safety, including life and property description	For flooding, this data can more closely model what is on the ground during events.			This type of data is extremely important to boaters and anglers								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes	Yes		
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geology



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more Hydrologic Units (HUC8s)			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Geology
MCA Title	Geology
MCA ID	1260
Organization Type	State or U.S. Territorial government
Organization Name	Arkansas Geological Survey
Sub-Agency or Division	
Organization Mission	Our mission is to serve the people of Arkansas by providing geological information in order to develop and enable effective management of the State's mineral, fossil fuel and water resources while protecting the environment. We look forward to working with the public, industry and government in accomplishing our mission goals.
Program Name	Geology
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Earth displacement
Description of smallest 3D features	Earth displacement used for searching for landslides and faulting. We use it in geologic mapping.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD			
Update Frequency	As frequently as possible			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 10 cm			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Nice to have			
Wetlands	Nice to have			
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Currently using 5 meter DEM and Hill Shading. Also 1 meter where it is available.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI	Yes			
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	GeoStor for Arkansas			
Other	Yes			
Other description	In house if we have it downloaded			

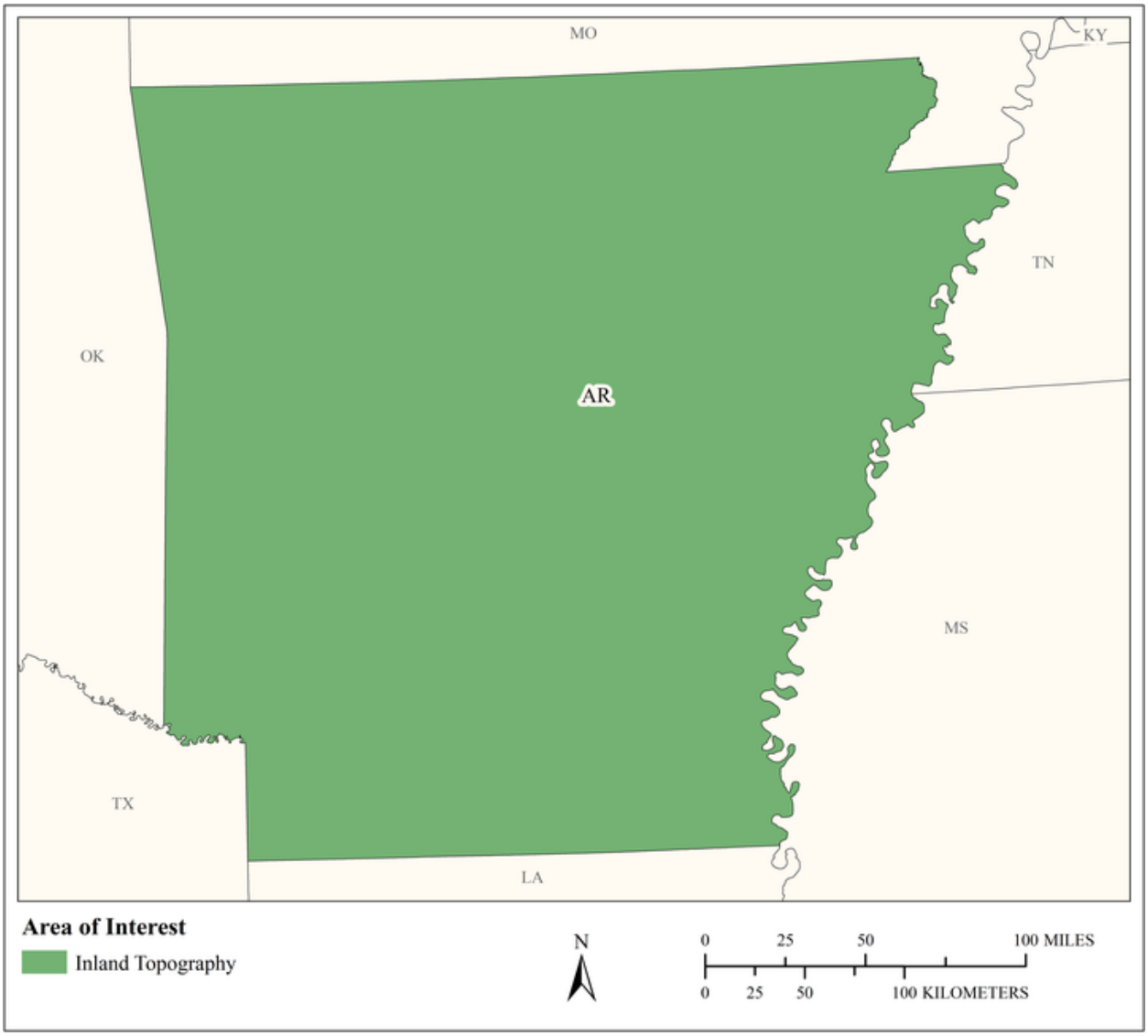
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	None			
Cost avoidance	None			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	None			
Public safety, including life and property	None			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	None											
Cost avoidance	Minor	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	Moderate	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Value added to products or services description	Build more accurate flood maps for damage estimates.											
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	None											
Public safety, including life and property	None											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic Resource Mining and Extraction



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Geologic Resource Mining and Extraction
MCA Title	Geologic Resource Mining and Extraction
MCA ID	1435
Organization Type	State or U.S. Territorial government
Organization Name	Arkansas Department of Environmental Quality
Sub-Agency or Division	
Organization Mission	We protect, enhance and restore the natural environment for the well-being of all Arkansans.
Program Name	Mining Program, Office of Land Resources
Total Annual Program Budget	
Primary Business Use	BU 11 - Geologic Resource Mining and Extraction
Secondary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Tertiary Business Use	BU 14 - Cultural Resources Preservation and Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Large features

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm			
Acceptable Vertical Error	Less than 5 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Not required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Not required			
Cultural resources	Highly desirable			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Currently using only 2D topographic datasets.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	GeoStor - an online data extraction and repository for the State of Arkansas.			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know			
Cost savings/cost reduction	I don't know			
Cost avoidance	I don't know			
Increased revenues	I don't know			

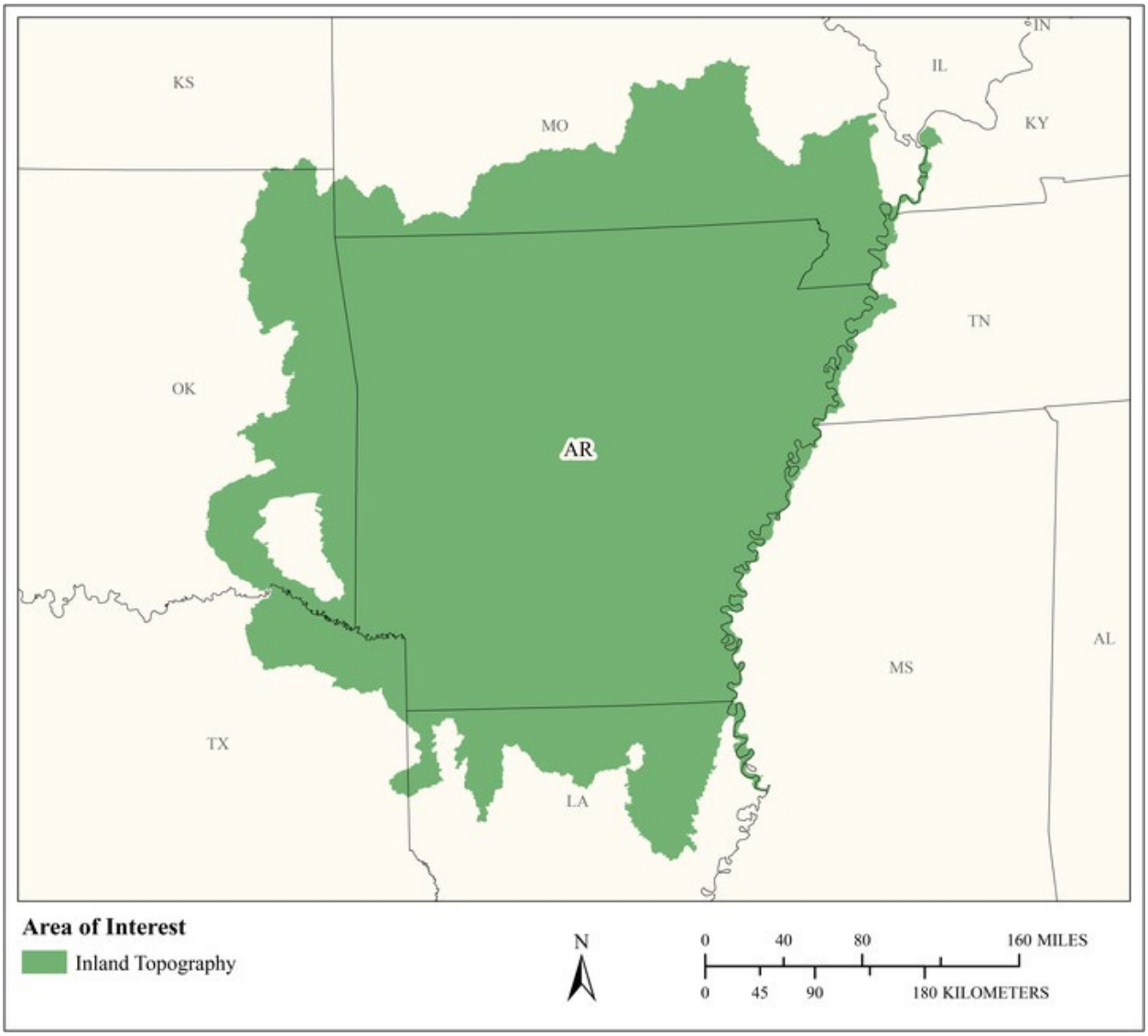
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Mission-driven performance improvements	I don't know			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know			
Improved response or timeliness	I don't know			
Improved customer experience	I don't know			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know			
Environmental	I don't know			
Public safety, including life and property	I don't know			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	None											
Cost avoidance	None											
Increased revenues	None											
Mission-driven performance improvements	Moderate	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	None											
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Other customer service benefits	Minor	Unable to provide										
Other customer service benefits description												
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Moderate											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Flood Risk Modeling, Mapping, and Mitigation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more Hydrologic Units (HUC8s)			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	BU 15 – Flood Risk Modeling, Mapping, and Mitigation ANRC has generated statewide DEMs from QL2 lidar data to support flood risk modeling and mapping of riverine, bayou, and low-lying areas. The data is also being used to assess dam and levee safety. Emergency management. In the future, the DEM may be incorporated into real-time inundation mapping. Elevation data are needed for H&H modeling; bathymetry is needed for flood pool modeling.
MCA Title	Flood Risk Modeling, Mapping, and Mitigation
MCA ID	22537
Organization Type	State or U.S. Territorial government
Organization Name	Arkansas Natural Resources Commission
Sub-Agency or Division	
Organization Mission	To efficiently and responsibly manage and protect our water and land resources for the sustainability, health, safety and economic benefit of the State of Arkansas.
Program Name	Floodplain Management and Dam Safety
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	The footprint of homes, buildings, roads, dams, levees, and other similar structures

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	6-10 years			
Event type(s)				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI	Flood risk re-assessment focuses on areas with significant development and/or population growth. It is those areas which require the 6-10 year frequency. Other areas would be on an as-needed basis.			
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Address it on a case-by-case-basis					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required			
DTM	Required			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Not required			
Bridges/culverts	Nice to have			
Landmark features	Not required			
Cultural resources	Not required			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Raw and Classified Points, Bare Earth DEM, breaklines, QL2 2011-2017			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Arkansas GIS Office			
Other	Yes			
Other description	FEMA, USGS, And storage at the ANRC office on hard drives			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			

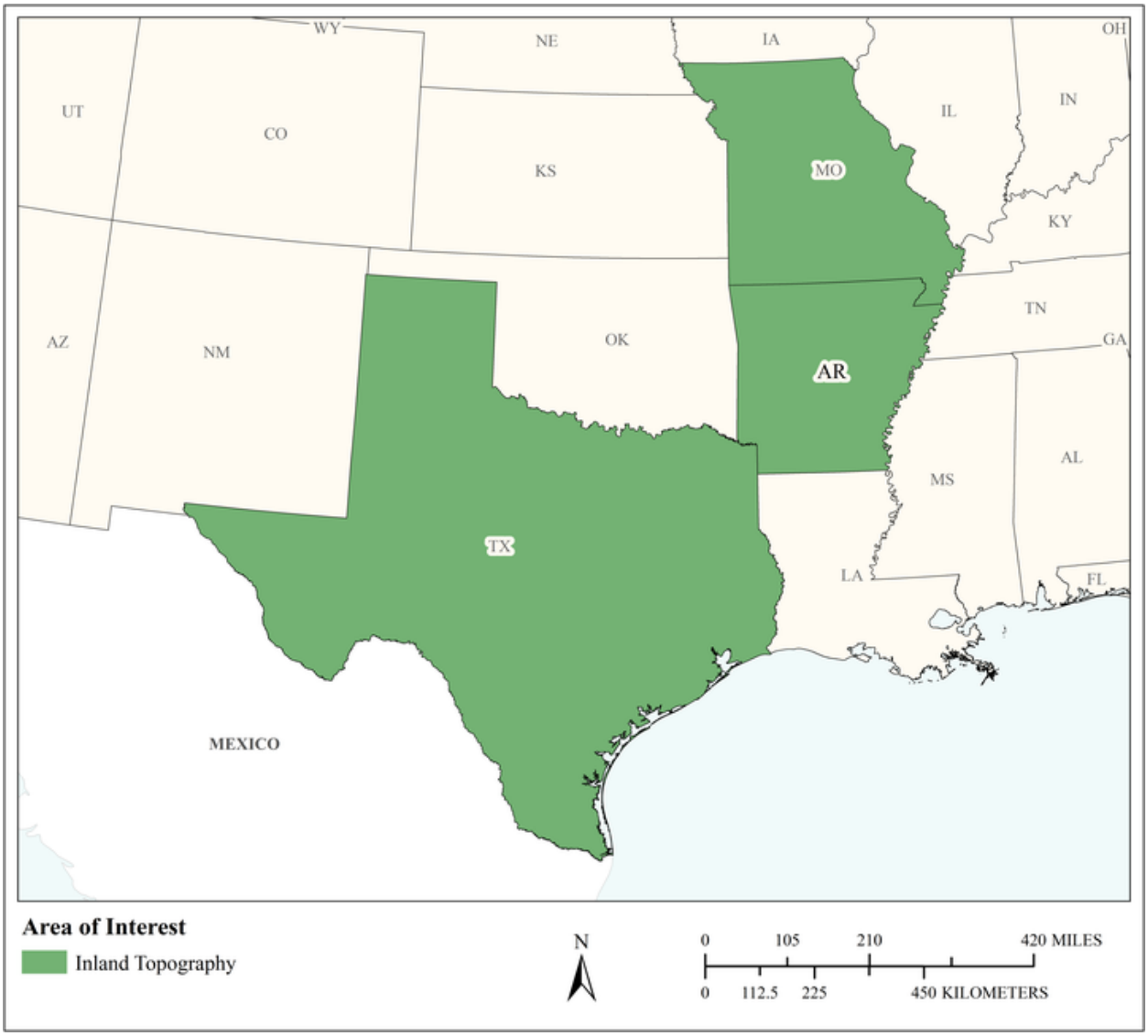
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Moderate			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Annual percent improvement	75%									
Mission-driven performance improvements description	We will be able to provide information to constituents more quickly without implementing a cost and labor intensive engineering study or approximate determination. Many communities will now be able to minimize flood risk to constituents via the.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Moderate											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours				
Hillshades				
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Engineering Consulting for Municipal Infrastructure



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Hydrology and Hydraulic Study and Mapping, Transportation design, and Municipal consulting. Inland bathymetry for channels, ditches, fill ponds, foundations, and risers are needed for stormwater management and flood control. Field survey data are needed for final design work. QL2 lidar is good for planning only.
MCA Title	Engineering Consulting for Municipal Infrastructure
MCA ID	1361
Organization Type	Private or Commercial
Organization Name	Civil Engineering Associates
Sub-Agency or Division	
Organization Mission	Provide Municipal Infrastructure solutions to their problems. This includes water and wastewater collection and distribution, solid waste, transportations, and hydrology and hydraulics.
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 01 - Water Supply and Quality

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Surface level storm water management structures, including, channeling structures, ditches, ramps, silt ponds, foundations, risers, hardened surfaces, embankments, weirs, levees, etc.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Vertical Error	Less than 5 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial			
Cross section/transect requirement	Typical required accuracy is less than 5cm. Cross section are usually done in the planning stage and a more detailed survey is performed using traditional methods.			

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Required			
Landmark features	Nice to have			
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL2 state data DEMs and contours			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Arkansas GIS Office			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Moderate			
Mission-driven performance improvements	I don't know			

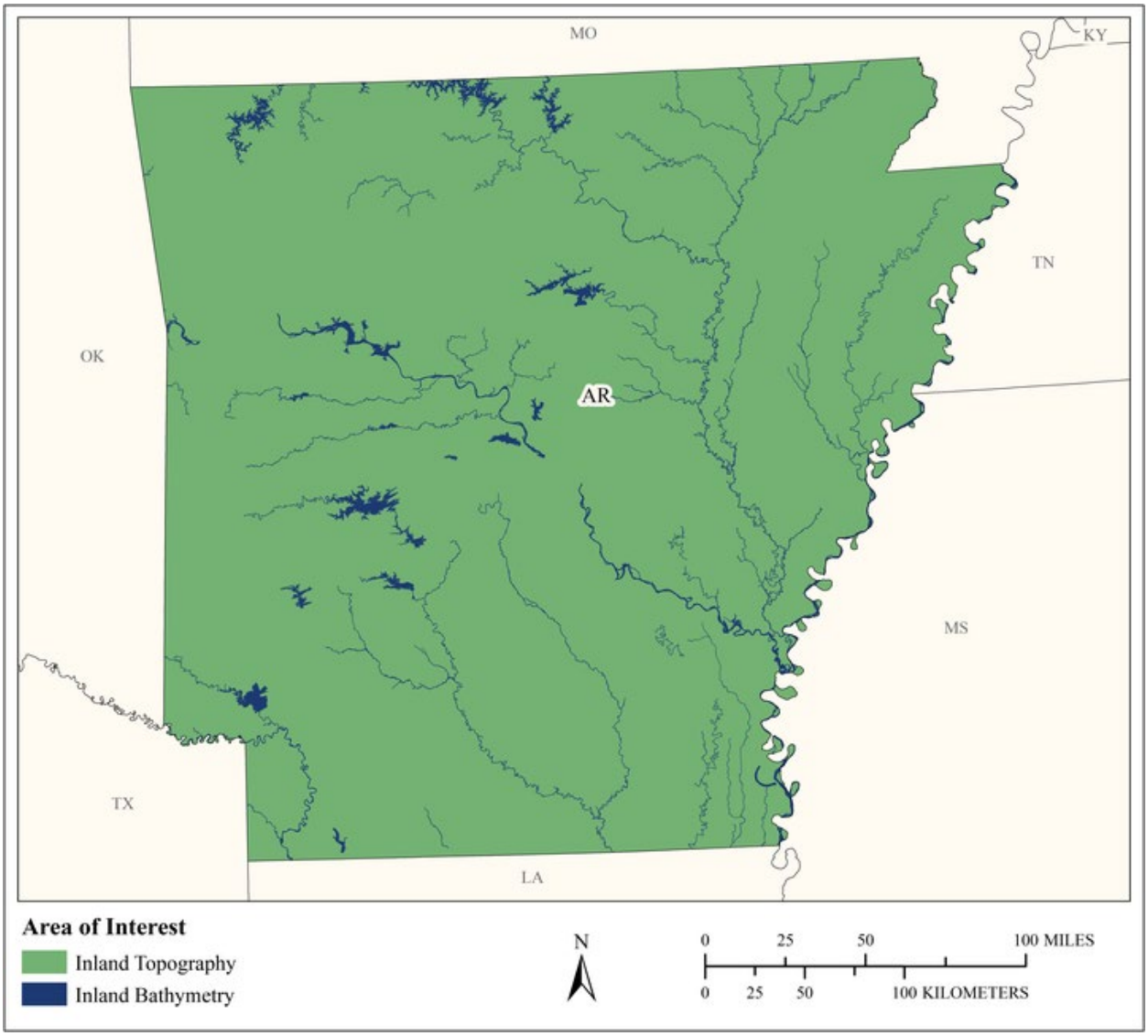
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	None											
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Moderate											
Public safety, including life and property	Minor											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Route Selection and Design for Transportation Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Transportation planning-route selection and design. Elevation data are needed for H&H models for watersheds to ensure bridge height and deck are adequately sized. Inland bathymetry (channel depth, etc.) is needed for engineering construction. DOT may hire boat surveys to collect bathymetry as needed for projects. Inland bathymetry is only needed for perennial streams (highest two orders of stream classification in NHD). Inland bathymetry is needed for bridge construction
MCA Title	Route Selection and Design for Transportation Planning
MCA ID	1443
Organization Type	State or U.S. Territorial government
Organization Name	Arkansas Department of Transportation
Sub-Agency or Division	
Organization Mission	Provide safe and efficient transportation system for users.
Program Name	Highway construction and maintenance.
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 19 - Land Navigation and Safety
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Large features, culverts, bridges,

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have

Inland Bathy Feature Size Requirements	Response
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B		
Update Frequency	6-10 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	The best horizontal accuracy achievable for the vertical accuracy I need		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have		
DTM	Required	Required		
DEM	Highly desirable	Required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Highly desirable	Highly desirable		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Highly desirable	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		
Estuaries				
Inland surface water features	Highly desirable	Highly desirable		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Highly desirable	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL2 LiDAR where available. Otherwise NED.	Bathymetry acquired site specific by ARDOT.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Arkansas GIS Office			
Other		Yes		
Other description		In house		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	None		

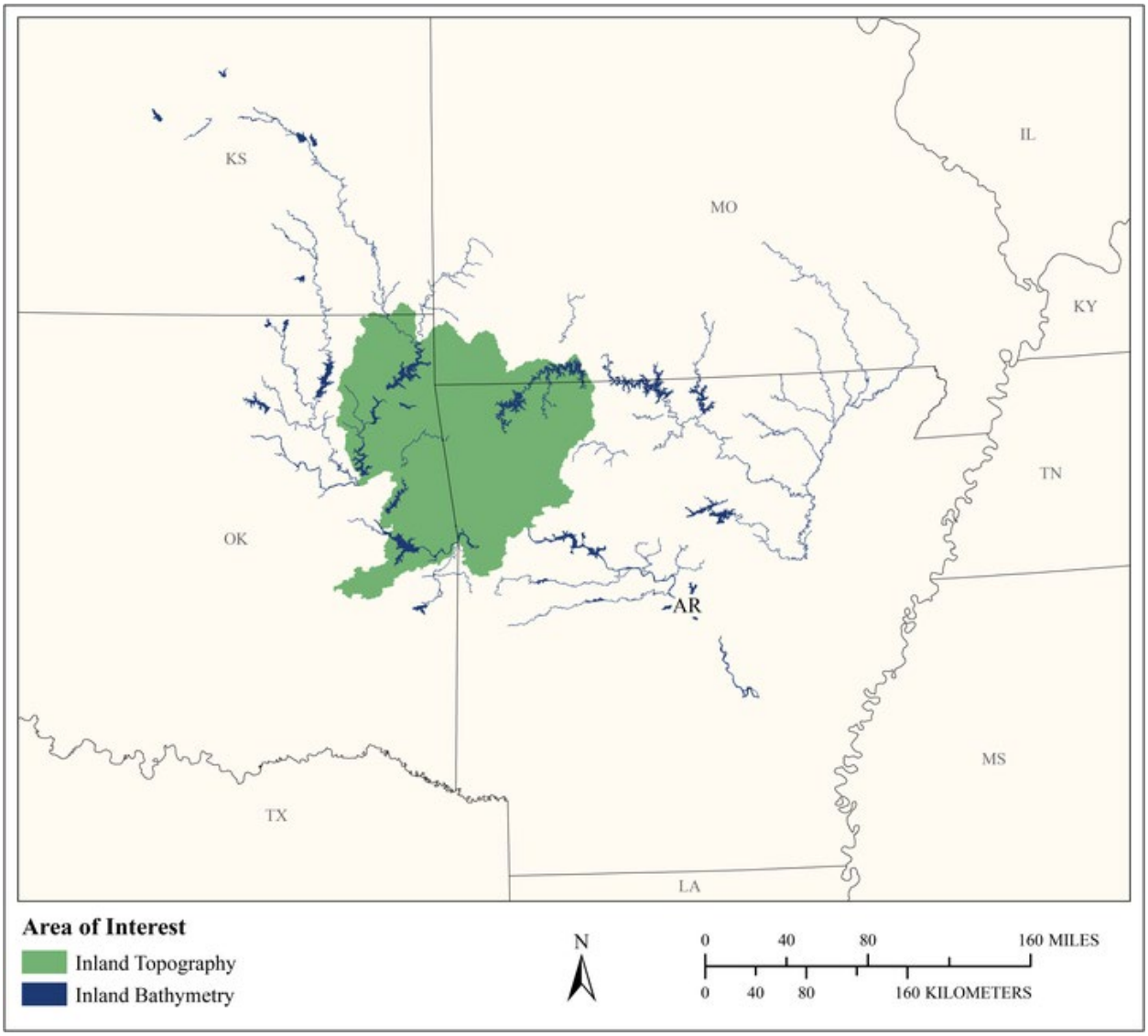
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Cost savings/cost reduction	Minor	Minor		
Cost avoidance	Minor	Minor		
Increased revenues	I don't know	None		
Mission-driven performance improvements	Minor	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	None		
Improved response or timeliness	Moderate	Minor		
Improved customer experience	Moderate	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	None		
Environmental	Minor	Minor		
Public safety, including life and property	Minor	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Moderate	Unable to provide							
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Minor	Unable to provide		Minor	Unable to provide							
Increased revenues	None			None								
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		None								
Improved response or timeliness	Moderate	Unable to provide		Minor	Unable to provide							
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor								
Environmental	Moderate			Moderate								
Public safety, including life and property	Moderate			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Transportation and Land Use Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Nice to have		
Geographic Area Requirements	Respondent provided own shapefile, KML, or geodatabase	One or more Hydrologic Units (HUC4s)		
Sub Area Requirements	NWAMPA 8 Digit Sub-Basin			

MCA Description	Response
Mission Critical Activity	NWARPC is focusing on transportation and land use planning. Transportation planning is done to characterize movement, not for engineering design. AR DOT builds the roads, NWARPC models the movement along the highways. NWARPC also advises smaller jurisdictions re: land use planning in flood prone areas.
MCA Title	Transportation and Land Use Planning
MCA ID	1081
Organization Type	Regional, County, City, or other local government
Organization Name	Northwest Arkansas Regional Planning Commission
Sub-Agency or Division	
Organization Mission	NWARPC's vision and goals are to provide a comprehensive intermodal transportation system which most efficiently serves the human and economic needs of the metropolitan area and Northwest Arkansas region and to help develop and maintain a safe, reliable, and efficient transportation system for the movement of people and goods throughout the area in order to enhance and sustain a high level of economic vitality, community livability and quality of life.
Program Name	Transportation planning.
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Our planning partners include jurisdictional road departments who use curb, road line and similar data features in their day to day operations.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	I don't know		
Update Frequency	4-5 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	The best horizontal accuracy achievable for the vertical accuracy I need		
Acceptable Vertical Error	I don't know	I don't know		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required			Highly desirable	
Entire AOI under same environmental conditions	Required	Not required			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Required	Required		
Classified point cloud	Required	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Not required		
Bathymetric Attributed Grid (BAG)		Nice to have		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Nice to have		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Required	Required		
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Required	Required		
Cultural resources	Required	Required		
Coastal and riverine structures	Nice to have	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Derivative products of lidar data collected at an aggregate nominal pulse spacing (ANPS) of 0.7 meters. Lidar data, and derivative products produced in compliance with "U.S. Geological Survey National Geospatial Program Lidar Base Specification Version 1.2". In addition to the Specification Requirements, the product meets NEEA QL2.	None currently used		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				

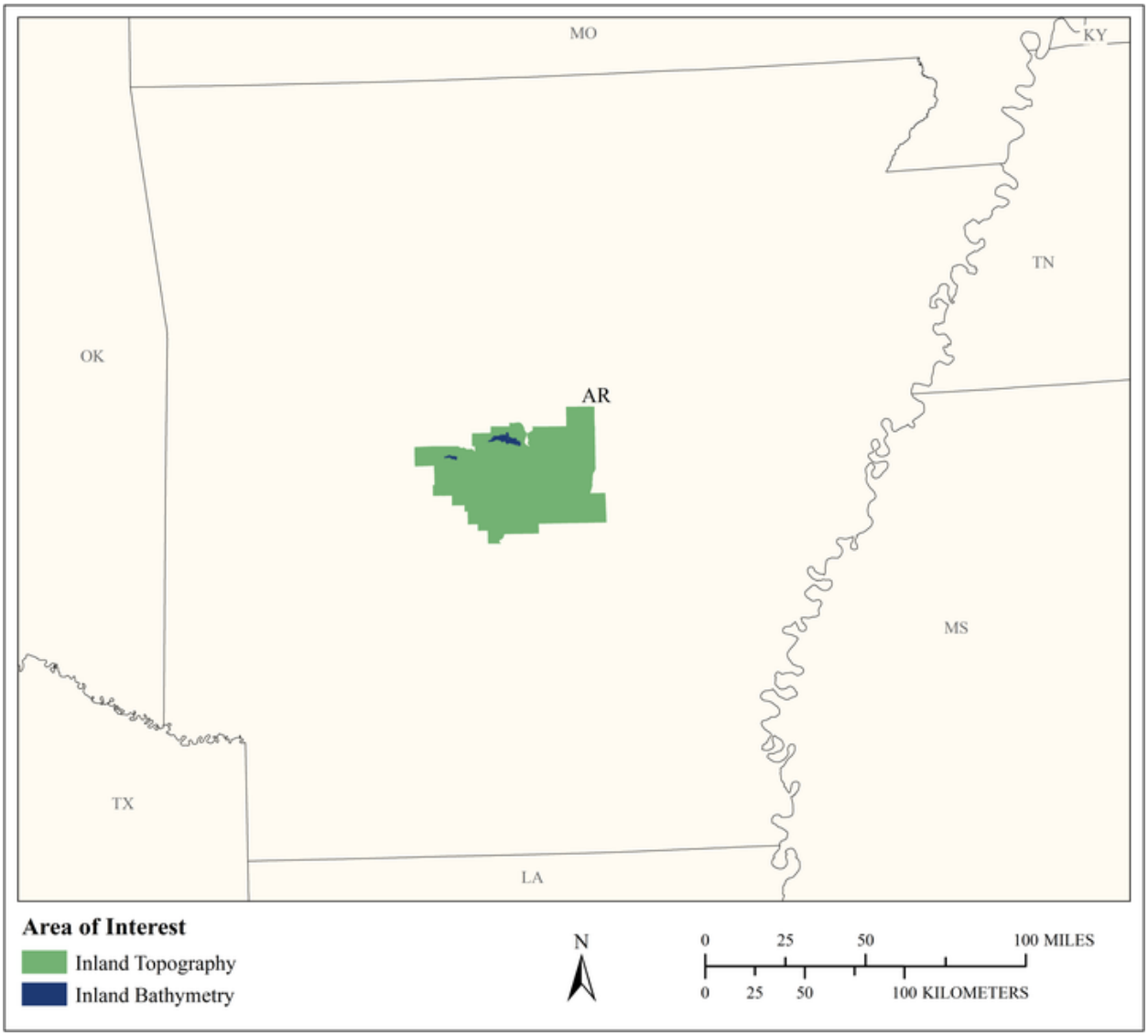
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	Existing data described above			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	None		
Cost savings/cost reduction	Major	None		
Cost avoidance	Major	None		
Increased revenues	Major	None		
Mission-driven performance improvements	None	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None		
Improved response or timeliness	Major	None		
Improved customer experience	Major	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	None		
Environmental	Major	None		
Public safety, including life and property	Major	None		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		I don't know	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	None			I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Major			Major								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: County and Regional Geospatial Data Coordination



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	Custom description		
Sub Area Requirements	Pulaski and Saline Counties, AR	The two lakes in Pulaski and Saline Counties, AR		

MCA Description	Response
Mission Critical Activity	Typical city and county government operations: development planning, public health, public safety, police & fire, infrastructure maintenance, drinking water system management, wastewater collection and treatment, transportation network design, recreation facility management, etc.
MCA Title	County and Regional Geospatial Data Coordination
MCA ID	1402
Organization Type	Regional, County, City, or other local government
Organization Name	Pulaski Area GIS (PAgis), Little Rock, Arkansas
Sub-Agency or Division	
Organization Mission	PAgis is an independent government agency specializing in the acquisition, maintenance and distribution of GIS related data within Pulaski County, Arkansas. PAgis is supported by eight partner agencies: Central Arkansas Water, the City of Little Rock, the City of North Little Rock, the City of Jacksonville, the City of Sherwood, Little Rock Water Reclamation Authority, North Little Rock Wastewater, and Pulaski County Public Works. PAgis maintains a high quality, centralized, enterprise class geodatabase with many layers that are updated and published monthly. PAgis' daily focus is on maintenance of framework data layers that provide the foundation for each member agency's custom GIS applications. The PAgis data layers are also used in various mapping applications by land development consulting engineers, academic institutions, community projects and other government agencies.
Program Name	Typical city and county departments within City of Little Rock, North Little Rock, Sherwood, and Jacksonville; , Central Arkansas Water; Little Rock Water Reclamation Authority; North Little Rock Wastewater Utility, MetroPlan, etc.
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 24 - Health and Human Services
Tertiary Business Use	BU 01 - Water Supply and Quality

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Storm water culverts and other storm drainage features

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Not required
51 - 100 ft	Not required
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Not required
5.1 – 10 acres	Not required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL1B		
Update Frequency	6-10 years	>10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Up to 1 meter		
Acceptable Vertical Error	Up to 10 cm	Up to 20 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs		Partial		
Cross section/transect requirement		Unknown		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Required			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Required	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Highly desirable	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Nice to have		
Land use/land cover	Nice to have	Nice to have		
Wetlands	Nice to have	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have	Nice to have		
Bridges/culverts	Highly desirable	Nice to have		
Landmark features	Nice to have	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Nice to have	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL2 countywide	Internally digitized contours from internal survey		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes	Yes		
Other description	Partnership with Federal Agencies	Internally digitized contours from internal survey		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor		
Cost savings/cost reduction	Major	Minor		

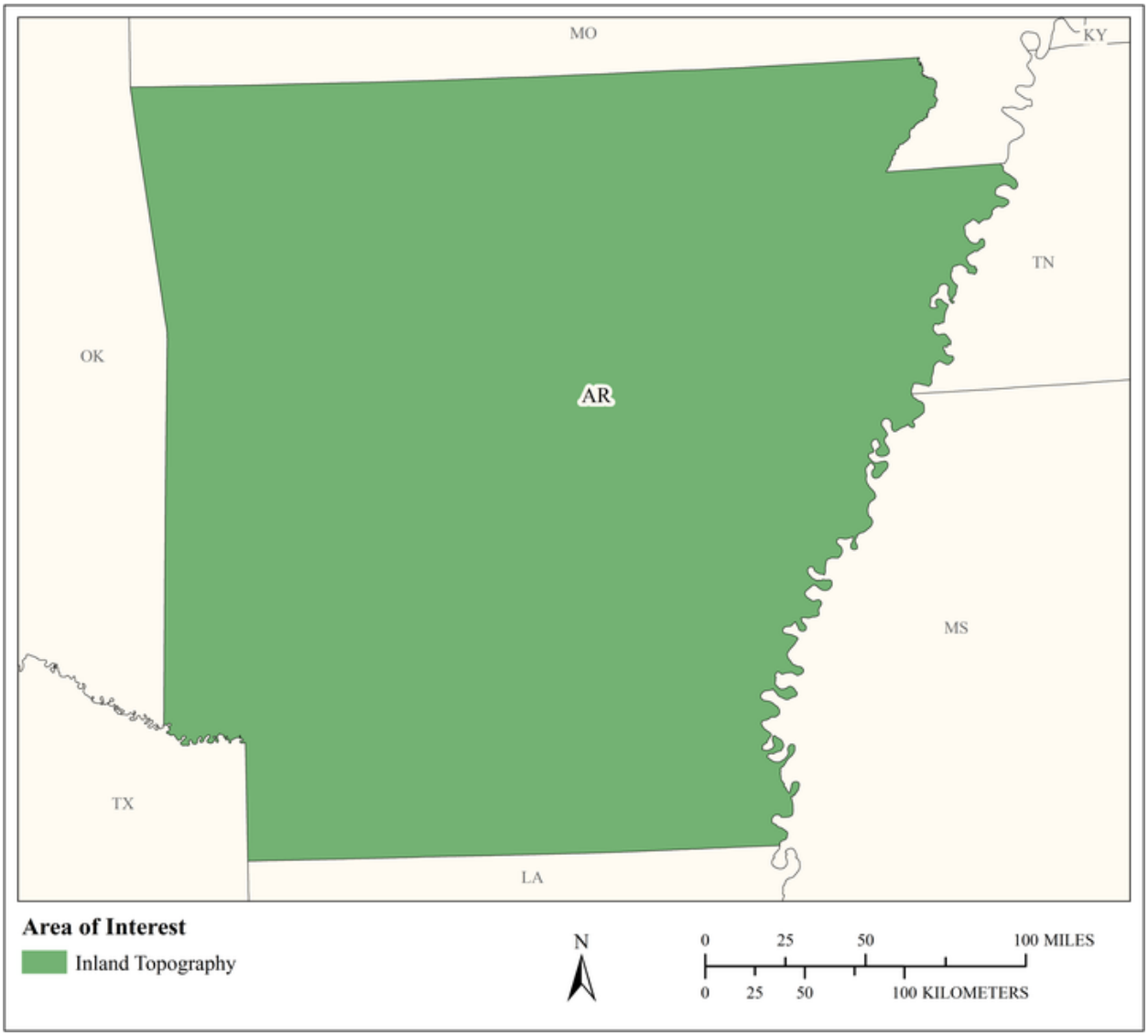
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost avoidance	Major	Minor		
Increased revenues	None	None		
Mission-driven performance improvements	Moderate	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	I don't know		
Improved response or timeliness	Minor	I don't know		
Improved customer experience	Minor	I don't know		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	I don't know		
Environmental	Moderate	Minor		
Public safety, including life and property	Moderate	I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$48,240	Minor	Unable to provide							
Time savings description	Less data processing to support analysis. Fewer ground surveys needed. More accurate data equals more confidence in information.											
Cost savings/cost reduction	Moderate	Annual dollars saved/realized	$100	Minor	Unable to provide							
Cost savings/cost reduction description	Fewer ground surveys needed.											
Cost avoidance	Major	Annual dollars saved/realized	$250,000	Minor	Unable to provide							
Cost avoidance description	Very hard to quantify unless you have responded to a disaster. Don't have to be the sole agency responsible for costs. Less time spent on error resolution.											
Increased revenues	None			Minor	Unable to provide							
Mission-driven performance improvements	Moderate	Unable to provide		Minor	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	None			Minor	Unable to provide							
Improved response or timeliness	None			Minor	Unable to provide							
Improved customer experience	Major	Unable to provide		Minor	Unable to provide							
Other customer service benefits				Minor	Unable to provide							
Other customer service benefits description												
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			Minor								
Environmental	Moderate			Minor								
Public safety, including life and property	Moderate			Minor								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Statewide Geospatial Data Coordination



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	We serve as Arkansas' spatial data infrastructure, the Arkansas node of the national spatial data infrastructure.
MCA Title	Statewide Geospatial Data Coordination
MCA ID	21724
Organization Type	State or U.S. Territorial government
Organization Name	Arkansas GIS Office
Sub-Agency or Division	
Organization Mission	Promoting efficient development, maintenance, and distribution of Arkansas' geographic information resources.
Program Name	The answer options above are flawed for this agency's use, in as much as this agency has a statutory authority in state law for the development, coordination, access, and distribution of all state framework geospatial data, including elevation. As such we support the mission of our partners in local, state, federal, private, non-profit, and academic sectors. To fully represent our function would require another answer choice from the listing above and that answer would be "State Spatial Data Infrastructure"
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 30 - Maritime and Land Boundary Management
Tertiary Business Use	BU 25 - Real Estate, Banking, Mortgage, and Insurance

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	The small features category would adequately serve the need of the vast majority of our users.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	>10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 30 cm			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Vertical Error	Up to 30 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Not required			
Cultural resources	Not required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Arkansas has several piece-meal data sets that are served through our platform. These are too numerous to describe the dates, however, they are all in the Quality Level 2 category.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Gis.arkansas.gov			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost savings/cost reduction	I don't know			
Cost avoidance	None			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know			
Improved response or timeliness	I don't know			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$5,126									
Time savings description	The agency frequently responds to requests for information on how locate lidar data. The agency has limited need for analysis, or modeling. No impact, not applicable. The agency has limited need and no use case for field inspections. Minimal impact due to limited analysis performed by this agency.											
Cost savings/cost reduction	None											
Cost savings/cost reduction description	High resolution elevation data is presently not included in the agency strategic plan for investment. No impact, not applicable.											
Cost avoidance	Minor	Annual dollars saved/realized	$500									
Cost avoidance description	No impact, not applicable for this agency. Minimal impact due to limited analysis performed by this agency.											
Increased revenues	None											
Increased revenues description	No impact, not applicable for this agency.											
Mission-driven performance improvements	Minor	Annual percent improvement	5%									
Mission-driven performance improvements description	The agency frequently responds to requests for information on how locate lidar data. A consolidate archive will improve our effectiveness. Due to the ability of other local decision makers having access to the data.											
Other operational benefits	Moderate	Annual dollars saved/realized	$3,015									
Other operational benefits description	Reduces staff time burden searching for data for constituents. Improved access to data.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	None											
Value added to products or services description	No impact, not applicable for this agency.											
Improved response or timeliness	Minor	Annual dollars saved/realized	$2,412									
Improved response or timeliness description	Cost avoidance on time to access data. No impact, not applicable for this agency.											
Improved customer experience	Moderate	Annual dollars saved/realized	$3,256									
Improved customer experience description	Cost avoidance on time to access data. Reduces staff time burden searching for data for constituents. No impact, not applicable for this agency.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None											
Education or outreach description	No impact, not applicable for this agency.											
Environmental	None											

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Environmental description	No impact, not applicable for this agency.			
Public safety, including life and property	None			
Public safety, including life and property description	No impact, not applicable for this agency.			

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

California

Current status of elevation data for California

The State of California currently has a 3DEP-compliant terrestrial coverage of about 44% including both completed and in-progress projects; a number of supplemental-funded collections are still in review and processing at the time of this writing. Over the past decade, data have been collected through a series of opportunistic cost sharing incentives, or by urban-centered counties that have the financial resources to collect and use elevation effectively. This opportunistic approach results in a patchwork quilt of data that disproportionately disadvantages rural counties and remote areas of the state. Datasets that were collected early in 3DEP (2012-14) will begin to age out of 3DEP compliancy over the next several years. Bathymetric data collections are less common and less well known or shared than topographic.

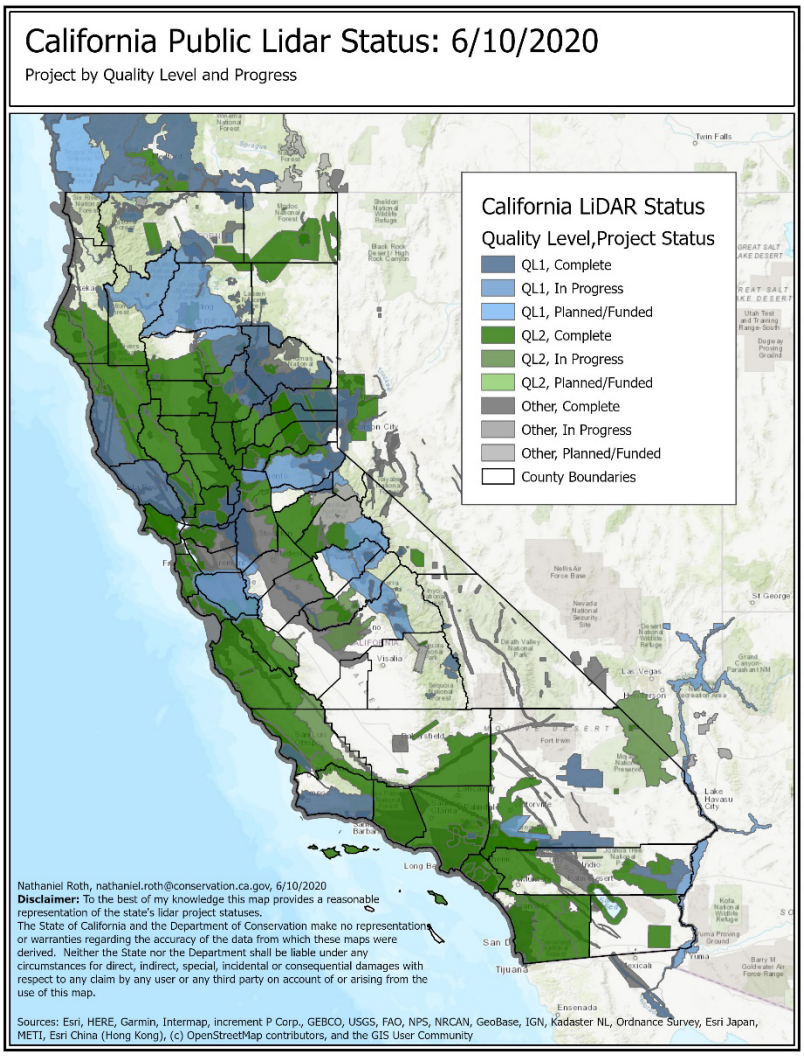


Figure 1. California Lidar Status

At present, the State of California does not have an active lead agency[1] for high-resolution elevation, including both terrestrial and bathymetric data coordination. With the April 2020 hiring of a new State Geographic Information Officer, the state now has a champion for coordination and management of framework data. The Governor's Office of Planning and Research and the CA Natural Resources Agency (parent to the Department of Conservation, Department of Forestry & Fire Protection, Department of Parks and Recreation, Department of Water Resources) have taken on an informal leadership role, but lack the authority to coordinate funding and provide collection oversight with other agencies that have interest in high-resolution elevation data as well (Caltrans, Governor's Office of Emergency Services, etc.). Coordination with counties and cities for data collection is currently conducted at the federal level. Terrestrial efforts should be expanded to include the coordinated collection of bathymetric data as an aquatic analog to terrestrial elevation data collections.

[1] The California Department of Water Resources is legally defined as the statewide mapping agency in Public Resources Code 8001-8025, though this authority has not been exercised.

The Governor's Office of Planning and Research (OPR) served as the "State Champion" for the State of California under the 3D Nation Elevation Requirements and Benefits Study. Under the guidance of the USGS and NOAA, OPR collaborated with the California Department of Conservation to identify participants, distribute and coordinate the submission of survey responses from state agencies, local governments, and academic institutions around the state. Through this exercise, the State of California was able to acquire a greater understanding of the elevation data needs of the state and how our natural resource management and emergency response priorities can benefit from the utilization of lidar data.

The California Department of Conservation has published a story map (California LIDAR: A critical Investment) to help illustrate the benefits of lidar to other state agencies and the public. A recent USGS Factsheet emphasizes the benefits that lidar can provide to the general economy of California (The 3D Elevation Program—Supporting California's Economy). California will also participate in the pilot activity for lidar state strategic planning hosted by the National States Geographic Information Council.

Importance of elevation data to California

Multiple state agencies and others have critical need for high-resolution elevation data. The elevation needs for the state, as well as some counties, is driven primarily by public safety: the safety of life and property in natural disasters, ensuring water quality, building adequate and resilient infrastructure, understanding impacts of climate change upon coastal communities, and the conservation of terrestrial and aquatic natural resources.

Lidar is the preferred source for the state's geologists for visualizing the "bare earth", stripped of trees and other vegetation, to be used for mapping the state's geology including hazards such as landslides, debris flows, and faults in addition to base geologic mapping for reference and mineral resource inventories. Forest managers, including those evaluating fire risk, use lidar to predict the impact of topography on fire behavior, the presence of slopes and fire breaks for fire response, and increasingly the structure of forest for forest health assessment and remediation or mitigation activity planning. Lidar is also used to identify the location and size of buildings under forest canopies that may require protection. Scientists studying watershed health use lidar and bathymetry to better define catchments both on the micro and macro scales to better understand contributing factors to water quantity and quality from both point and area sources. Similarly flood and inundation mapping as well as hydrologic modeling benefit from the availability of high-resolution elevation data. The detailed topography available from lidar assists with planning infrastructure such as utility corridors, solar energy facilities, dams, roads, rail, and bridges, and urban design.

High-level summary of elevation data requirements

Topographic requirements, both spatial resolution and repeat collection frequency, across the state vary by terrain and program. Programs that perform high-fidelity mapping (CalFire, Department of Conservation) of both the underlying topography and the complexity of vegetative cover (Coast ranges, Sierra Nevada, fragile riparian systems) require a Quality Level 1 (QL1) or greater with a $\geq$50% sidelap to ensure that multiple sides of trees can be readily studied. Areas of the Central Valley and easternmost deserts may be readily served by QL2 data at a lower update frequency, though higher resolution data does have significant advantages for fault and mineral resource mapping applications. Areas of dense urban and suburban buildout that undergo frequent change may need QL1 at an increased update frequency. Project-specific lidar needs for new build and maintenance of infrastructure (levees, coastal highways, dams, etc.) will require even higher quality levels with increased accuracies (Department of Water Resources, Caltrans). Overall, California would benefit from a statewide elevation dataset collected using consistent methods and within a narrow time window to establish a baseline.

Nearshore bathymetry QL1B is required along most coastal portions of the state, owing to the rapid development and vulnerability of coastal communities addressing the combined threats of ocean warming, strong storm surge, and rising sea levels. The maintenance and expansion of California's ports (Long Beach, Los Angeles, Oakland, etc.) depends upon the accurate mapping of bathymetry and the frequent influx of sediment and redeposition. Offshore bathymetry supports shipping channels and monitoring the health of the ocean, which serves the commercial fishing and recreational economy as well as renewable energy opportunities such as tidal and wind energy. Additional uses include aquatic, tidal, and estuary habitat conservation and restoration, sediment budgeting, and ecological and species modeling.

Further survey and information are needed to understand the requirements at the county-city-regional-metropolitan planning agency levels to ensure that multiple stakeholder needs can be met through a coordinated program and funding mechanism.

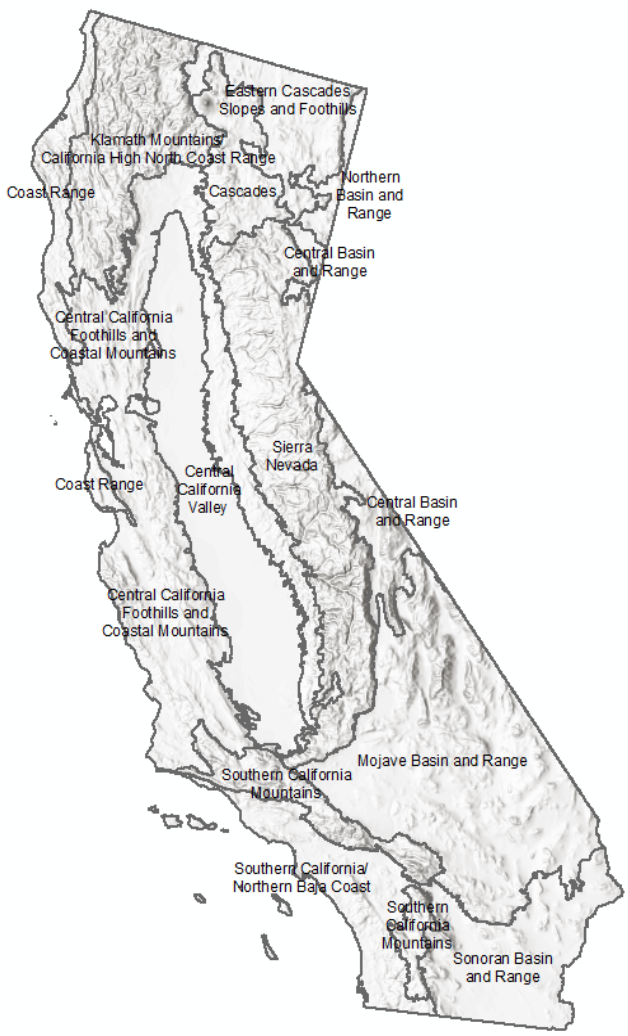


Figure 2: Geomorphic provinces of California

High-level summary of benefits that would come from higher resolution elevation data

Extending the use of elevation data beyond the present applications will happen as more lidar is available and the methods for using it become established and staff and computing resources increase. Areas of growth that could benefit the state include improved confidence and coverage in the uses identified above as well as the expansion into more detailed analyses, project planning, implementation, and monitoring.

Some examples of potential growth areas include:

- Detailed forest structure analysis informing fuels treatment and carbon storage enhancement;
- The ability to identify individual tree canopies and measures of vegetation health;
- Higher resolution earthquake fault mapping for land use planning;
- Detailed debris flow hazard mapping, particularly post-fire;
- Uplift and subsidence fluctuations; related to ground water extraction, recharge, and other ground deformation;
- Species habitat and connectivity modeling both terrestrial and aquatic;
- Terrestrial and marine transportation related efforts such as shipping and port channel management and surface transportation corridor planning;

- The use of lidar for agriculture including the mapping of crop types and irrigation management;
- Topo-bathymetric lidar for nearshore and riverine mapping (restoration, fisheries);
- The application of machine learning and related tools to hazard detection;
- Utility corridor hazard mapping; and
- Bathymetry data to support coastal and offshore wind energy projects, aquaculture, estuary management, commercial port access, and local restoration efforts.

Education and Outreach

The California GIS Council (http://cgia.org/cagiscouncil/) sponsors and oversees an active elevation workgroup that provides periodic status reports to the geospatial community. Various agencies around the state publish and outreach the benefits of elevation data to agency managers and sister agencies for purposes of building collaboration and bringing funds together.

Recent publications:

- Story Map highlighting lidar use across state: http://cadoc.maps.arcgis.com/apps/Cascade/index.html?appid=4a63a54438f74d5db21114bec266baf4
- Factsheet: The 3D Elevation Program—Supporting California's Economy: https://pubs.er.usgs.gov/publication/fs20193029
- Lidar application addressing fire vulnerability in Sonoma County: https://alumni.berkeley.edu/california-magazine/just-in/2019-08-07/scientists-are-using-laser-technology-fireproof-california

Training on the use of high-resolution elevation data is provided through internal agency-specific efforts as well as by the California State University System, the California Community College System, the University of California System, local GIS coordination groups and planning agencies, and the private sector. A catalog of elevation-specific training that is available throughout the state would be beneficial to increasing use of the data and understanding return on investment.

Additional comments

The State of California recognizes the importance of standards for data collection, storage, and dissemination of high-resolution elevation data. USGS, NOAA, and Opentopography.org provide national distribution and visualization portals to enable discovery and dissemination of data. Further requirements gathering and study will be needed to determine how data standards and collection methods may need to accommodate higher accuracy products and an expanded suite of deliverables. The State of California may decide to pursue a blend of contracting mechanisms: ideally, some projects may be contracted through state mechanisms to meet internal time constraints and specifications, while some projects may be best served through established USGS and NOAA contracts. Both of these routes can take advantage of cost share mechanisms sponsored by the federal government.

The State of California has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	California Department of Water Resources	22046	Statewide Water Resources Management	Inland Topo	QL0	6-10 years	$876,862	$234,871	I don't know	I don't know	I don't know
				Inland Bathy	Project specific, currently collect single beam, but high density multi beam is needed more and more	6-10 years	$496,481	$51,884	I don't know	I don't know	I don't know
				Nearshore Bathy	QL1B	4-5 years	$26,804	$44,157	Moderate	Moderate	Moderate
				Offshore Bathy	Order 1a	4-5 years	$5,753	$28,768	Minor	Major	Major
BU 02 – Riverine Ecosystem Management	State of California	60040	Riverine Ecosystem Management	Inland Topo	QL1 HD	6-10 years	$242,064	$24,178	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$128,858	$9,086	Major	Major	Major
BU 03 – Coastal Zone Management	Bay Conservation Development Commission	1416	Coastal Zone Management	Inland Topo	QL0 HD	Annually	$2,002,025,618	Unable to quantify	Major	Major	Major
				Inland Bathy	QL0B	Annually	$2,004,009	Unable to quantify	Minor	Moderate	Moderate
				Nearshore Bathy	QL0B	Annually	$2,000,005,809	Unable to quantify	Major	Moderate	Major
BU 03 – Coastal Zone Management	California Coastal Commission	21561	California Coastal Management, Land Use, and Protection	Inland Topo	QL1	4-5 years	$119,697	$20,925	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$51,365	$30,112	Moderate	Moderate	Moderate
				Nearshore Bathy	QL0B	4-5 years	$116,692	$197,398	Moderate	Moderate	Moderate
				Offshore Bathy	Order 1b	6-10 years	$360,318	$71,937	Minor	Moderate	Moderate
BU 04 – Forest Resource Management	State of California	60041	Forest Resources Management	Inland Topo	QL1	2-3 years	$625,281	$906,419	Major	Major	Major
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 05 – Rangeland Management	State of California	60042	Rangeland Management	Inland Topo	QL2	Annually	Unable to quantify	Unable to quantify	Minor	Major	I don't know
BU 06 – Natural Resource Management	CA Department of Parks and Recreation	22314	California State Park Management and Operations	Inland Topo	QL2	6-10 years	$2,894	Unable to quantify	Major	Major	Major
				Inland Bathy	QL2B	6-10 years	$603	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	QL2B	6-10 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

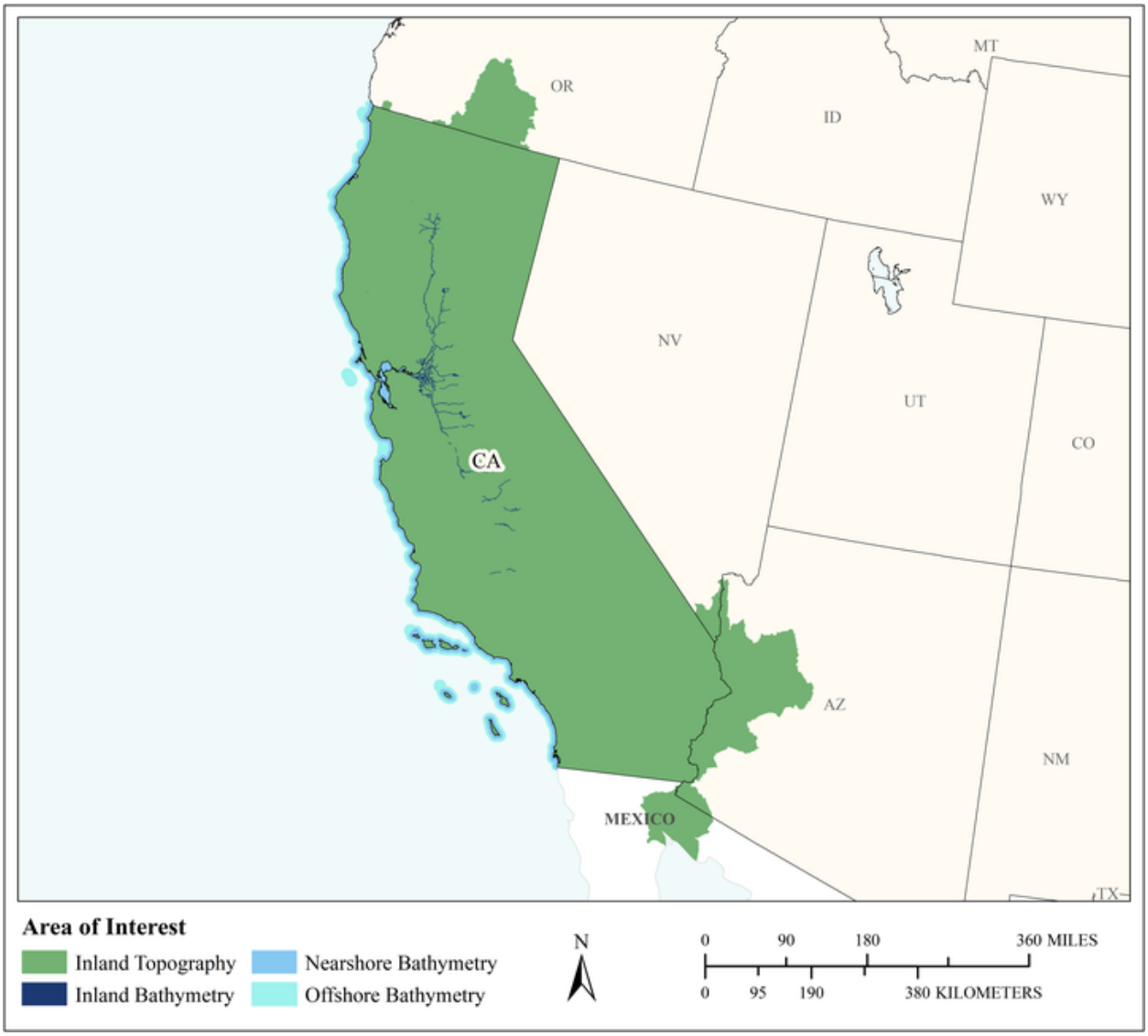
MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 07 – Wildlife and Habitat Management	State of California	60043	Wildlife and Habitat Management	Inland Topo	QL2	4-5 years	$37,671	$108,806	Moderate	Major	Moderate
				Inland Bathy	QL2B	4-5 years	$301,906	$182,484	Moderate	Moderate	Moderate
				Nearshore Bathy	QL0B	4-5 years	$804	$47	Moderate	Major	Moderate
				Offshore Bathy	Special Order	4-5 years	$4,538	$316	Moderate	Major	Major
BU 08 – Agriculture	CA Dept of Food and Agriculture	21647	Protection of Agricultural Productivity and Incentivizing Beneficial Practices	Inland Topo	QL2	2-3 years	$42,113	$33,386	Moderate	Moderate	Minor
				Inland Bathy	QL4B	Event driven	$73,782	$33,386	I don't know	I don't know	I don't know
BU 09 – Fisheries Management and Aquaculture	Yurok Tribe	21933	Riverine Ecosystem Management	Inland Topo	QL1	2-3 years	$280,225	$351,682	Major	Major	Moderate
				Inland Bathy	QL2B	2-3 years	$585,627	$270,852	Major	Major	Moderate
				Nearshore Bathy	QL2B	2-3 years	$127,839	$9,045	I don't know	I don't know	I don't know
				Offshore Bathy	Order 1	2-3 years	Unable to quantify	Unable to quantify	None	None	I don't know
BU 10 – Geologic Assessment	California Geological Survey	1211	Landslide Identification and Hazard Mapping	Inland Topo	QL1	4-5 years	$753,941	$148,941	Moderate	Major	Major
				Inland Bathy	QL2B	4-5 years	Unable to quantify	Unable to quantify	Minor	Minor	Moderate
BU 10 – Geologic Assessment	California Geological Survey	1282	Seismic Hazard Analysis and Mapping	Inland Topo	QL1	4-5 years	$963,362	$172,458	Moderate	Minor	Major
				Nearshore Bathy	QL3B	4-5 years	Unable to quantify	Unable to quantify	Moderate	Minor	Major
				Offshore Bathy	Special Order	4-5 years	Unable to quantify	Unable to quantify	Moderate	Minor	Major
BU 10 – Geologic Assessment	California Geological Survey	1287	Regional Geologic Mapping	Inland Topo	QL2	4-5 years	$260,034	$47,034	Major	Major	Major
				Nearshore Bathy	QL2B	4-5 years	Unable to quantify	Unable to quantify	Major	I don't know	Major
				Offshore Bathy	Special Order	4-5 years	Unable to quantify	Unable to quantify	Major	I don't know	Major
BU 11 – Geologic Resource Extraction	State of California	60044	Geologic Resource Mining and Extraction	Inland Topo	QL1 HD	2-3 years	Unable to quantify	Unable to quantify	Minor	Major	Major
BU 12 – Renewable Energy Resources	California Air Resources Board	21562	U.S. Forest Biomass Estimation and Carbon Monitoring	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	I don't know	Major	I don't know

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 12 – Renewable Energy Resources	State of California	60045	Renewable Energy Resources	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	None
BU 13 – Oil and Gas Resources	State of California	60046	Oil and Gas Resources	Inland Topo	QL1	Annually	$69,413	Unable to quantify	Minor	Major	Major
				Inland Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	QL2B	2-3 years	$65,939	Unable to quantify	Major	Major	Major
				Offshore Bathy	Order 1a	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 14 – Cultural Resource Management	State of California	60047	Cultural Resources Preservation and Management	Inland Topo	QL1	4-5 years	$28,987	$25,343	Minor	Minor	Minor
				Inland Bathy	QL0B	6-10 years	$69,512	Unable to quantify	Moderate	Minor	Minor
				Nearshore Bathy	QL0B	4-5 years	$2,326	Unable to quantify	Minor	Moderate	Minor
				Offshore Bathy	Order 1a	6-10 years	$11,173	Unable to quantify	Minor	Moderate	Minor
BU 15 – Flood Risk Management	State of California	60048	Flood Risk Management	Inland Topo	QL2	4-5 years	$22,204,718	$3,885,130	Major	Moderate	Major
				Inland Bathy	QL1B	4-5 years	$1,542,493	$1,731,824	Moderate	Moderate	Major
				Nearshore Bathy	QL2B	4-5 years	$153,877	$114,045	Major	Moderate	Major
BU 16 – Sea Level Rise and Subsidence	State of California	60049	Sea Level Rise and Subsidence	Inland Topo	QL1 HD	4-5 years	$8,326,016	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Minor
BU 17 – Wildfire Management	California Department of Forestry and Fire Protection	21739	Wild Land Fire Protection	Inland Topo	QL1	4-5 years	$849,698	Unable to quantify	Moderate	Moderate	Moderate
BU 18 – Homeland Security	City of Clovis, CA	22266	Law Enforcement	Inland Topo	QL0 HD	Annually	Unable to quantify	Unable to quantify	Major	Major	Major
BU 18 – Homeland Security	State of California	60050	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management	Inland Topo	QL2	4-5 years	$4,665,352	$82,458	Major	Moderate	Major
				Inland Bathy	QL0B	4-5 years	$1,313,882	$83,827	Major	Moderate	Major
				Nearshore Bathy	QL1B	6-10 years	$7,487	$214	Moderate	Moderate	Major
BU 19 – Land Navigation	State of California	60051	Land Navigation and Safety	Inland Topo	QL0	2-3 years	$2,048,691	$165,442	Minor	Major	Major
				Inland Bathy	QL0B	2-3 years	$87,385	$904	Minor	Moderate	Moderate
				Nearshore Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	None	Moderate	Moderate

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 20 – Marine and Riverine Navigation	California Ports	21591	Management of California Ports	Inland Topo	QL0 HD	2-3 years	$128,742	Unable to quantify	Minor	Minor	Moderate
				Inland Bathy	QL0B	2-3 years	$623,007	$379,663	Moderate	Moderate	Moderate
				Nearshore Bathy	QL0B	2-3 years	$2,884,726	$21,093	Minor	Major	Major
				Offshore Bathy	Order 1a	4-5 years	Unable to quantify	Unable to quantify	Minor	Major	Major
BU 21 – Aviation Navigation	State of California	60052	Aviation Navigation and Safety	Inland Topo	QL1 HD	Annually	$1,495,056	$1,862,004	Minor	Moderate	Moderate
BU 22 – Infrastructure Management	California Dept. of Transportation	1371	Designing and Building of Transportation Systems	Inland Topo	QL0 HD	Event driven	$955,975	Unable to quantify	I don't know	I don't know	Moderate
				Inland Bathy	QL0B	Event driven	$930,900	Unable to quantify	Minor	Minor	Moderate
				Nearshore Bathy	QL0B	Event driven	Unable to quantify	Unable to quantify	None	Moderate	Moderate
BU 23 – Urban and Regional Planning	Los Angeles County, CA	22318	Emergency Planning and Hazard Assessment	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 23 – Urban and Regional Planning	City of San Buenaventura	22342	Regional Planning	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 24 – Health and Human Services	State of California	60053	Health and Human Services	Inland Topo	QL1	6-10 years	$56,428	$7	Moderate	Moderate	Major
BU 26 – Education and Basic Research	State of California	60054	Education K12 and Beyond, Basic Research	Inland Topo	QL1 HD	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL2B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Minor
				Offshore Bathy	Order 1a	6-10 years	Unable to quantify	Unable to quantify	Major	Minor	Minor
BU 27 – Recreation	State of California	60055	Recreation	Inland Topo	QL1	4-5 years	$36,288	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	4-5 years	$21,853	Unable to quantify	Major	Major	Moderate
				Nearshore Bathy	QL0B	4-5 years	$105,180	Unable to quantify	Major	Major	Moderate
BU 28 – Telecom-munications	State of California	60056	Telecommunications	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 29 – Military	State of California	60057	Military	Inland Topo	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 30 – Maritime and Land Boundary Management	State of California	60058	Maritime and Land Boundary Management	Inland Topo	QL1	6-10 years	$177,957	$682,296	Moderate	Minor	None

MCA Title: Statewide Water Resources Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Custom description	Custom description	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements	California and HUCs 1503 & 1801	Central Valley and reservoirs throughout California		

MCA Description	Response
Mission Critical Activity	Our primary water management goals are related to water supply reliability, which include supply infrastructure development, conveyance, infrastructure O&M, and water quality. Elevation data are needed for planning, design and construction, operations and maintenance for projects. The data are used to identify risk, for environmental permitting, infrastructure design, regional monitoring, subsidence monitoring (requires more frequent updates), groundwater monitoring. The data are also used for H&H modeling, flood management, water supply to the state, delta specific and statewide operations models, and to monitor snowpack. For emergency response, elevation data is critical for analyzing the potential for spillway failure, flooding, etc. Elevation is more critical than imagery. The state acquires its own lidar and bathymetry, uses contractors, and uses USGS 3DEP/NOAA data.
MCA Title	Statewide Water Resources Management
MCA ID	22046
Organization Type	State or U.S. Territorial government
Organization Name	California Department of Water Resources
Sub-Agency or Division	
Organization Mission	To manage the water resources of California in cooperation with other agencies, to benefit the State's people and to protect, restore and enhance the natural and human environments.
Program Name	There are many, many Programs related to our Mission Critical Activity.
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Really can be any one of those between "Less than 1 sq mi" and 25,000 mi2, depending on day
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Individual trees, small erosion areas in waterways, pieces of critical infrastructure associated with conveyance aqueducts, weirs

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required

Inland Bathy Feature Size Requirements	Response
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	Project specific, currently collect single beam, but high density multi beam is needed more and more	QL1B	Order 1a
Update Frequency	6-10 years	6-10 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI	It is highly variable, on a per project/area of interest basis. Hard to represent spatially. Sacramento Delta and Central valley rivers are most important. Also state water project rivers.			
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 10 cm	I don't know	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial	Partial		

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross section/transect requirement	It varies greatly. Hydraulic models sometimes require very high density, sometimes they can be every 1000 feet with spacing every 50 feet. There isn't one answer to this question.	Lower accuracy than topo is OK.		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required	Nice to have	Nice to have	Not required	Nice to have
Entire AOI under same environmental conditions	Not required	Not required	Highly desirable	Highly desirable	Not required	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Required	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Nice to have	Required
DTM	Highly desirable	Highly desirable	Nice to have	Required
DEM	Highly desirable	Highly desirable	Required	Required
Raw point cloud data	Required	Required	Nice to have	Nice to have
Classified point cloud	Highly desirable	Highly desirable	Nice to have	
Edited/cube XYZ		Not required	Nice to have	Nice to have
Full waveform	Not required	Not required	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Not required	Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Required	Highly desirable	Nice to have	Nice to have
Ground control/ground truthing	Required	Required	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Nice to have	Required
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required	Nice to have	Highly desirable	Required
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Highly desirable
Bottom type			Nice to have	Highly desirable
Submerged features			Nice to have	Highly desirable
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Required	Highly desirable	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Nice to have	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Not required
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Highly desirable
Floating observation/navigation systems			Nice to have	Highly desirable
Shorelines – current, historic, change rates	Nice to have	Nice to have	Highly desirable	
Land use/land cover	Highly desirable	Nice to have	Highly desirable	Nice to have
Wetlands	Highly desirable	Highly desirable	Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required	Highly desirable	Highly desirable	
Bridges/culverts	Required	Nice to have		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Nice to have	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We use quite a lot of LIDAR, most of it (the older stuff) is like QL3 or worse in some cases, although recent acquisitions are typically more in range of QL1 with some QL2.	Self collected		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes	Yes		
Other description	We contract for it ourselves	We contract for it ourselves		

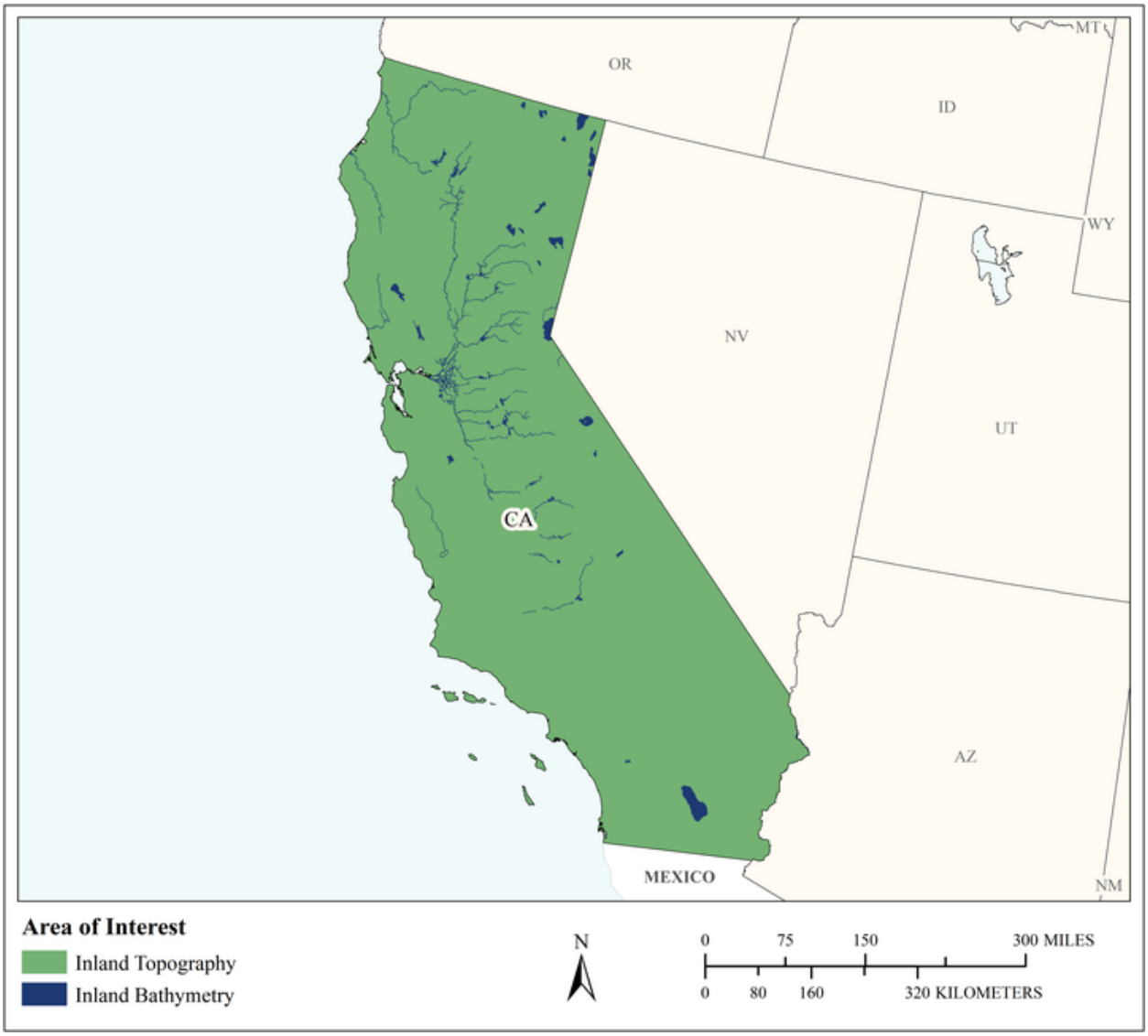
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Major	Moderate	Moderate
Cost savings/cost reduction	Major	Major	Moderate	Moderate
Cost avoidance	Moderate	Moderate	Minor	Moderate
Increased revenues	None	None	Minor	Minor
Mission-driven performance improvements	Major	Major	Minor	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Moderate	Minor
Improved response or timeliness	Major	Major	Moderate	Moderate
Improved customer experience	Major	Major	Moderate	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	Minor
Environmental	Moderate	Moderate	Moderate	Minor
Public safety, including life and property	Major	Major	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide		Minor	Unable to provide		None		
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		Minor	Unable to provide		None		
Mission-driven performance improvements	I don't know	Unable to provide		I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$876,862		Annual dollars saved/ realized	$496,481		Annual dollars saved/ realized	$26,804		Annual dollars saved/ realized	$5,753
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$234,871		Annual dollars saved/ realized	$51,884		Annual dollars saved/ realized	$44,157		Annual dollars saved/ realized	$28,768
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know			Moderate			Minor		
Environmental	I don't know			I don't know			Moderate			Major		
Public safety, including life and property	I don't know			I don't know			Moderate			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours			Yes	Yes
Hillshades			Yes	Yes
Slope maps			Yes	Yes
Aspect maps				
Curvature maps				
Cross sections			Yes	Yes
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids			Yes	
Hydrologic Flow Accumulation Grids			Yes	
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Riverine Ecosystem Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Stream channel analysis and mapping. Stream bank erosion analysis. Aquatic and terrestrial species habitat management. Environmental management.
MCA Title	Riverine Ecosystem Management
MCA ID	60040
Organization Type	State or U.S. Territorial government
Organization Name	State of California
Sub-Agency or Division	California Department of Fish and Wildlife
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B		
Update Frequency	6-10 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Required			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Required	Highly desirable		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Highly desirable	Nice to have		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Moderate	Minor		
Cost avoidance	Moderate	None		
Increased revenues	None	None		
Mission-driven performance improvements	Major	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		

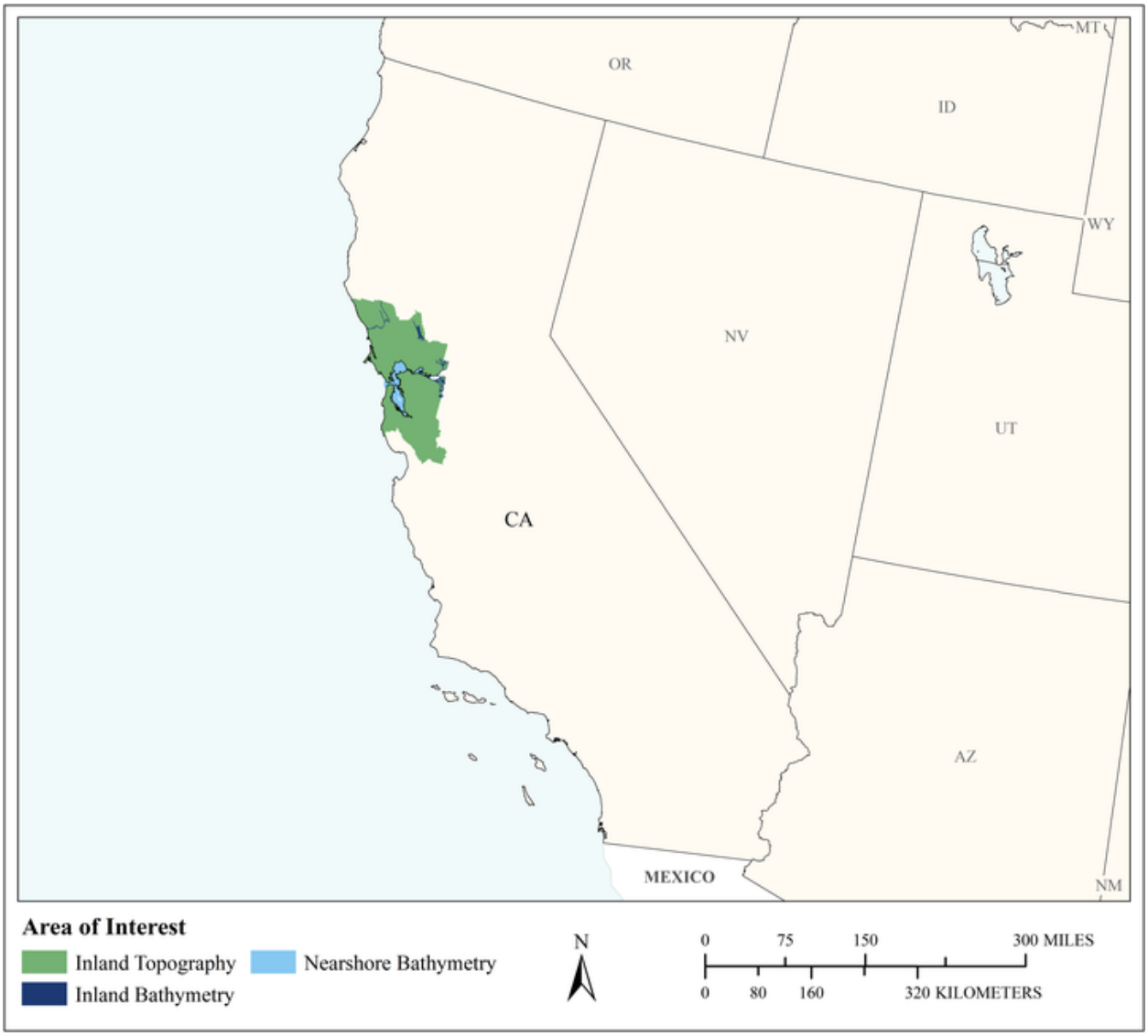
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Moderate		
Improved customer experience	Major	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate		
Environmental	Major	Major		
Public safety, including life and property	Major	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$242,064		Annual dollars saved/ realized	$128,858						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$24,178		Annual dollars saved/ realized	$9,086						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Major			Major								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Coastal Zone Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Nice to have	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Custom description	
Sub Area Requirements	9 San Francisco Bay Counties	9 San Francisco Bay Counties	San Francisco Bay	

MCA Description	Response
Mission Critical Activity	Coastal Zone Management, Flood Hazard Planning. The Commission needs elevation data for developing coastal flood maps for adaptation planning, sediment management, and wetland restoration. Additionally, the coastal zone jurisdictional boundaries are elevation-based, particularly Suisun Marsh and the head of tide.
MCA Title	Coastal Zone Management
MCA ID	1416
Organization Type	State or U.S. Territorial government
Organization Name	Bay Conservation Development Commission
Sub-Agency or Division	
Organization Mission	The San Francisco Bay Conservation and Development Commission (BCDC) is a California state planning and regulatory agency with regional authority over the San Francisco Bay, the Bay's shoreline band, and the Suisun Marsh. BCDC was created in 1965 and is the nation's oldest coastal zone agency. Its mission is to protect and enhance San Francisco Bay and to encourage the Bay's responsible and productive use for this and future generations. State law requires sponsors of projects that propose to fill or extract materials from the Bay to apply for a BCDC permit. In addition to minimizing any fill required for an appropriate project and ensuring that the project is compatible with the conservation of Bay resources, BCDC is tasked with requiring maximum feasible public access within the Bay's 100-foot shoreline band. Throughout its existence, BCDC has approved projects worth billions of dollars, and the Commission continues to work closely with all applicants – private and public – from a project's initial stages to ensure that they comply with state law. In addition, the Commission leads the Bay Area's ongoing multi-agency regional effort to address the impacts of rising sea level on shoreline communities and assets. Its authority is found in the McAteer-Petris Act, the San Francisco Bay Plan, and other special area plans and laws and policies.
Program Name	Adapting to Rising Tides
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 16 - Sea Level Rise and Subsidence
Tertiary Business Use	BU 15 - Flood Risk Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])

General Geographic Area and Size	
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Water control structures such as tide gates, narrow berms

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Not required
5.1 – 10 acres	Not required
Greater than 10 acres	Not required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B	QL0B	
Update Frequency	Annually	Annually	Annually	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Less than 50 cm	Less than 50 cm	
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm	Less than 10 cm	
How far onshore needed			1 kilometer inland	
How far down the beach profile needed	To MHW		Below MLLW	
Tide correction requirement			MHW	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable		Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Required		Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Highly desirable	
DTM	Required	Highly desirable	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Not required	Nice to have	Not required	
Classified point cloud	Not required	Not required	Not required	
Edited/cube XYZ		Nice to have	Not required	
Full waveform	Not required	Nice to have	Not required	
Bathymetric Attributed Grid (BAG)		Nice to have	Not required	
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Not required	Highly desirable	Nice to have	
Ground control/ground truthing	Nice to have	Highly desirable	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Not required	Not required	Not required	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Not required	
Geologic and seismic data	Not required	Nice to have	Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Highly desirable	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Not required	
Routes			Nice to have	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Nice to have	Not required	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Highly desirable	Not required	Nice to have	
Bridges/culverts	Highly desirable	Not required		
Landmark features	Nice to have	Not required	Not required	
Cultural resources	Not required	Not required	Not required	
Coastal and riverine structures	Required	Not required	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy

Current dataset used	High-quality topographic data were leveraged for the terrain development and shoreline delineation tasks. The primary data set was the light detection and ranging (LiDAR) 2data collected by USGS and NOAA as part of the California Shoreline Mapping Project (CSMP) (OPC2016). USGS managed the data collection in the South Bay, and NOAA managed the data collection in the North Bay. This combined dataset provides complete coverage of the shoreline areas up to the 16ft (5-meter[m]) elevation contour. The collected LiDAR data have a vertical accuracy of +/- 0.05m based on the tested root mean square error for all checkpoints (Dewberry 2011a, 2011b). This accuracy exceeds that specified in the USGS National Geospatial Program LiDAR Guidelines and Base Specifications (USGS2010). Additional topographic, bathymetric, survey, and field verification datasets were leveraged to build seamless 1-meter	None currently used	California Seafloor mapping project: multibeam and SWATH bathymetry. Sidescan sonar and intensity collected through same systems.	

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
	horizontal resolution DEM datasets in each county.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes	Yes	Yes	
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Inland bathy data not available	Major	
Cost savings/cost reduction	Moderate	Inland bathy data not available	Major	
Cost avoidance	Major	Inland bathy data not available	Major	
Increased revenues	None	Inland bathy data not available	None	
Mission-driven performance improvements	Moderate	Inland bathy data not available	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Inland bathy data not available	Major	
Improved response or timeliness	Moderate	Inland bathy data not available	Major	
Improved customer experience	Moderate	Inland bathy data not available	Major	

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Inland bathy data not available	Major	
Environmental	Moderate	Inland bathy data not available	Major	
Public safety, including life and property	Moderate	Inland bathy data not available	Moderate	

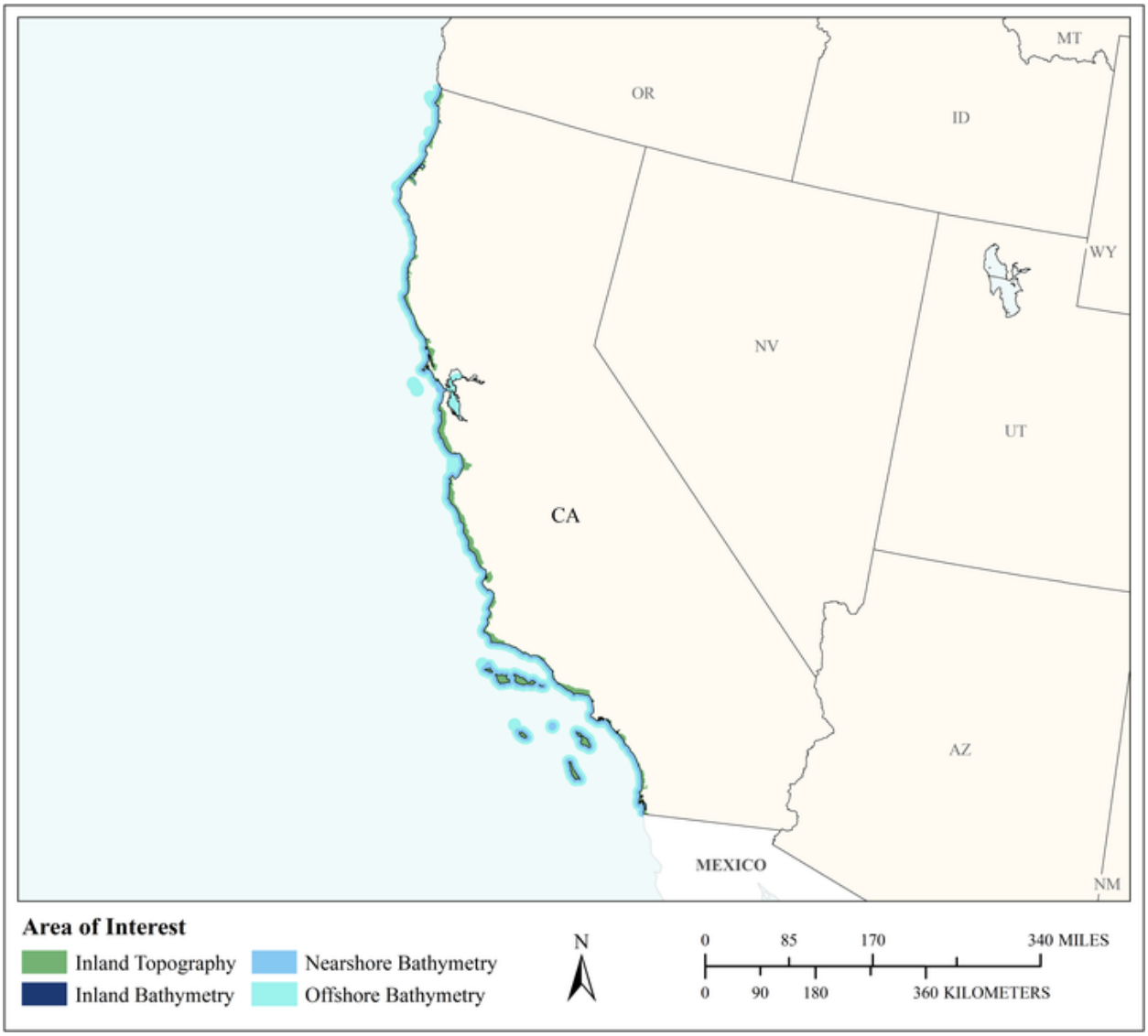
Future Benefits if Elevation Data Requirements Are Met	**Inland Topo**			**Inland Bathy**			**Nearshore Bathy**			**Offshore Bathy**		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$3,618	Major	Annual dollars saved/realized	$1,809	Moderate	Annual dollars saved/realized	$1,809			
Time savings description	Benefits include ability to document annual change to shoreline to determine accurate flood risks, improve ability of local jurisdictions to better plan and adapt for current flood risks. Benefits include having shared authoritative regional data (updated on annual basis) to be used by local and regional jurisdictions when discussing planning for flood risks. Reduce time searching and combining data from variety of sources with varying quality.			Benefits include having shared authoritative regional data (updated on annual basis) to be used by local and regional jurisdictions when discussing planning for flood risks. Reduce time searching and combining data from variety of sources with varying quality. Benefits include ability to document annual change to inland watersheds and flood storage capacity to determine accurate flood risks, improve ability of local jurisdictions to better plan and adapt for current flood risks.			Benefits include having shared authoritative regional data (updated on annual basis) to be used by local and regional jurisdictions when discussing planning for flood risks. Reduce time searching and combining data from variety of sources with varying quality. Benefits include ability to document annual change to bay bathymetry for purposes of understanding sediment availability/change to nearshore wetland restoration, improve ability of local jurisdictions to better plan and adapt for current flood risks.					
Cost savings/cost reduction	Major	Annual dollars saved/realized	$2,000,000	Moderate	Annual dollars saved/realized	$2,000	Major	Annual dollars saved/realized	$2,000			
Cost savings/cost reduction description	BCDC doesn't have capacity to collect or process raw lidar data. Would have to pay consultants. Given large geographic area this cost would be substantial (roughly $500/sq miX7000 sq mi = 4.2 million). These costs can be used to generate value added mapping products, web applications, and analysis to support regional and local adaptation planning. Benefits would be millions of dollars per year.			BCDC doesn't have capacity to collect or process raw multibeam data. Would have to pay consultants. These costs can be used to generate value added mapping products, web applications, and analysis to support regional and local adaptation planning. Benefits would be thousands of dollars per year.			BCDC doesn't have capacity to collect or process raw multibeam data. Would have to pay consultants. These costs can be used to generate value added mapping products, web applications, and analysis to support regional and local adaptation planning. Benefits would be thousands of dollars per year.					
Cost avoidance	Major	Annual dollars saved/realized	$2,000,022,000	Moderate	Annual dollars saved/realized	$2,000,200	Major	Annual dollars saved/realized	$2,000,002,000			
Cost avoidance description	Availability of annual reliable lidar data would have direct applications for communicating flood risk hazards to local jurisdictions and private citizens. This data is already being used to support adaptation planning for sea level rise. Annual updates to data would give more real time information about shoreline change and impacts to flood risk. Billions of dollars in real estate property, transportation infrastructure, and municipal services could be saved. BCDC doesn't have staff capacity to do data QAQC on raw remote sensing data. Would require outside consultants. Reliance on 3D Programs consistent QAQC would eliminate this need. Benefits would be thousands of dollars per year. BCDC doesn't have staff capacity to do data processing on raw remote sensing data. Would require outside consultants. Reliance on 3D Programs consistent processing SOPs would eliminate this need. Benefits would be tens of thousands of dollars per year.			Availability of annual reliable lidar data would have direct applications for communicating flood risk hazards to local jurisdictions and private citizens. This data is already being used to support adaptation planning for sea level rise. Annual updates to data would give more real time information about shoreline change and impacts to flood risk. Millions of dollars in real estate property, transportation infrastructure, and municipal services could be saved. BCDC doesn't have staff capacity to do data QAQC on raw remote sensing data. Would require outside consultants. Reliance on 3D Programs consistent QAQC would eliminate this need. Benefits would be hundreds of dollars per year.			Availability of annual reliable lidar data would have direct applications for communicating flood risk hazards to local jurisdictions and private citizens. This data is already being used to support adaptation planning for sea level rise. Annual updates to data would give more real time information about shoreline change and impacts to flood risk. Billions of dollars in real estate property, transportation infrastructure, and municipal services could be saved. BCDC doesn't have staff capacity to do data QAQC on raw remote sensing data. Would require outside consultants. Reliance on 3D Programs consistent QAQC would eliminate this need. Benefits would be thousands of dollars per year.					
Increased revenues	None			None			None					
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		None			Major	Unable to provide				

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Value added to products or services description	Real time information that we could make available to local jurisdictions. Better confidence in maps to support planning.											
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Minor			Major					
Education or outreach description	Huge benefits to stakeholders in better understanding shoreline dynamics (yearly change, impacts from adaptation), BCDC ability to support local jurisdictions awareness of flood risk and adaptation planning											
Environmental	Major			Moderate			Moderate					
Environmental description	Additional data on yearly change would help Bay Area plan and implement shoreline protection to reduce flood risk to contaminated areas and reduce mobilization of contaminants. Would also help marsh restoration planners understand how marsh restoration projects are providing ecosystem benefits.											
Public safety, including life and property	Major			Moderate			Major					
Public safety, including life and property description	Updated data would give stakeholders ability to understand shoreline dynamics, support adaptation planning, and implement shoreline protection for vulnerable communities, transportation infrastructure, and health and human services.											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes	Yes	Yes	
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement	Yes	Yes	Yes	
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: California Coastal Management, Land Use, and Protection



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Custom description	Custom description	Custom description	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements	Coastal zone of California	Coastal zone of California	Coastal zone of California	

MCA Description	Response
Mission Critical Activity	The primary function of the California Coastal Commission of the coastal zone management program is to protect, conserve, restore, and enhance environmental and human-based resources of the California coast and ocean for environmentally sustainable use by current and future generations. High resolution elevation data supports spatial analysis, data development, data visualization, and the production of maps for multiple coastal management applications within the Agency. Application areas consist of mapping geographic jurisdictional boundaries, delineation of legal boundaries and other coastal and inland boundaries, and shoreline mapping, habitat mapping and assessment, land use mapping and zoning, assessing vulnerability to sea level rise, storm surge, and coastal erosion, slope stability analysis, emergency response and enforcement, and mapping public access and recreational use areas.
MCA Title	California Coastal Management, Land Use, and Protection
MCA ID	21561
Organization Type	State or U.S. Territorial government
Organization Name	California Coastal Commission
Sub-Agency or Division	
Organization Mission	Coastal Zone Management – Protection of coastal resources and regulation of coastal development
Program Name	Energy, Ocean Resources and Federal
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 30 - Maritime and Land Boundary Management
Tertiary Business Use	BU 22 - Infrastructure and Construction Management

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Coastal armoring structure (i.e. seawall, retaining wall), or road, sign or pathway, house, small stream, small coastal structure

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
10 - 50 ft	Required
51 - 100 ft	Not required
101 - 500 ft	Required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Not required
2.1 – 5 acres	Not required
5.1 – 10 acres	Not required
Greater than 10 acres	Not required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	Order 1b
Update Frequency	4-5 years	4-5 years	4-5 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter	Up to 1 meter	Up to 5 meters
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed			To cover entire intertidal zone	
How far down the beach profile needed	To MLLW		To MHHW	
Tide correction requirement			MHW	
Cross sections and/or transects meet needs		Partial	Partial	
Cross section/transect requirement		Where streams/tributaries meet the ocean and any inland stream/river within the coastal zone boundary of CA.	Unknown	

Hydrologic Processing Required	Response
Hydro-flattening	
Hydro-enforcement	
Hydro-conditioning	
No Treatment	

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Nice to have	Highly desirable	Nice to have	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Nice to have	Highly desirable	Nice to have	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Not required	Not required	Nice to have	Not required	Not required
DEM for entire AOI needs to be seamless	Required	Required	Required	Highly desirable	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	I don't know	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have	Nice to have	Highly desirable
DTM	Highly desirable	Nice to have	Nice to have	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Not required	Not required	Not required	Highly desirable
Classified point cloud	Highly desirable	Not required	Nice to have	
Edited/cube XYZ		Not required	Not required	Nice to have
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Not required	Not required	Highly desirable

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Not required	Not required		
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)			Not required	Nice to have
Tide Predictions			Not required	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Nice to have
Intensity imagery/sidescan imagery		Not required	Not required	Highly desirable
Ground control/ground truthing	Highly desirable	Not required	Nice to have	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Required
Nautical and/or navigation charts			Not required	Nice to have
Acoustic imagery of the seafloor			Not required	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Highly desirable
Underwater videography			Not required	Nice to have
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Nice to have
Geologic and seismic data	Highly desirable	Nice to have	Highly desirable	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Highly desirable	Nice to have
Tide/wave heights			Highly desirable	Nice to have
Sea ice conditions			Not required	Nice to have
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Required	Nice to have
Routes			Not required	Nice to have
Offshore cadastral			Not required	Nice to have
Lease areas			Required	Nice to have
Fixed obstructions			Highly desirable	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Required	Required	Required	Nice to have
Wetlands	Required	Required	Required	Nice to have
Estuaries			Required	Nice to have
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Required	Required	Not required	
Cultural resources	Required	Nice to have	Nice to have	
Coastal and riverine structures	Required	Nice to have	Nice to have	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	USGS contour lines	When needed, we use data from NOAA Digital Coast (California Coastal Conservancy Lidar Data 2010 or USACE Bathymetry or Topobathy Data	When needed, we use data from NOAA Digital Coast (California Coastal Conservancy Lidar Data 2010 or USACE Bathymetry or Topobathy Data	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	
NCEI		Yes		
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories				
State repositories used				

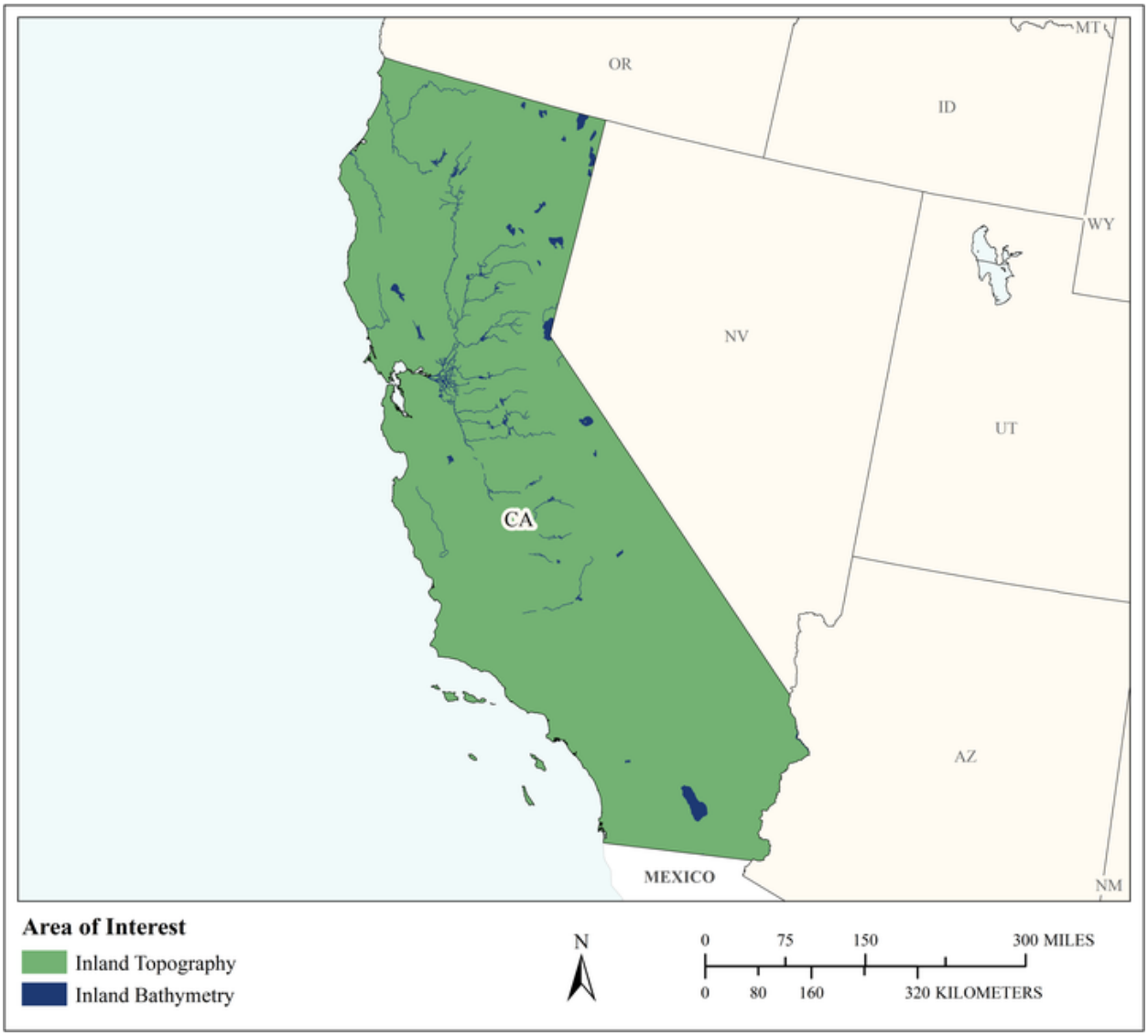
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other		Yes		
Other description		US Interagency Elevation Inventory		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know	I don't know	I don't know	Moderate
Cost savings/cost reduction	I don't know	I don't know	I don't know	Moderate
Cost avoidance	I don't know	I don't know	I don't know	Minor
Increased revenues	I don't know	I don't know	I don't know	None
Mission-driven performance improvements	Major	I don't know	I don't know	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Major	Minor
Improved response or timeliness	Major	I don't know	Major	Minor
Improved customer experience	Major	Moderate	Major	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Major	Minor
Environmental	Major	Moderate	Major	Moderate
Public safety, including life and property	Major	Moderate	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	I don't know	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$119,697		Annual dollars saved/ realized	$51,365		Annual dollars saved/ realized	$116,692		Annual dollars saved/ realized	$360,318
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Other customer service benefits	Major	Unable to provide					Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$20,925		Annual dollars saved/ realized	$30,112		Annual dollars saved/ realized	$197,398		Annual dollars saved/ realized	$71,937
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate			Moderate			Minor		
Education or outreach description	More definitive of Commission jurisdiction			More definitive of Commission jurisdiction			More definitive of Commission jurisdiction					
Environmental	Major			Moderate			Moderate			Moderate		
Environmental description	Better identification of coastal resources			Better identification of coastal resources			Better identification of coastal resources					
Public safety, including life and property	Major			Moderate			Moderate			Moderate		
Public safety, including life and property description	Improved hazards analysis and mapping			Improved hazards analysis and mapping			Improved hazards analysis and mapping					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes	Yes	
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Forest Resources Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Forest health assessment. Determination of standing inventory of forest resources. Prescribed burn planning. Analysis of carbon stocks for trade. Harvest systems planning.
MCA Title	Forest Resources Management
MCA ID	60041
Organization Type	State or U.S. Territorial government
Organization Name	State of California
Sub-Agency or Division	California Department of Forestry and Fire Protection
Organization Mission	
Program Name	Fire and Resource Assessment Program
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B		
Update Frequency	2-3 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Not required		
DTM	Required	Not required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Required	Highly desirable		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Required		
Land use/land cover	Required	Required		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Highly desirable	Required		
Landmark features	Nice to have	Nice to have		
Cultural resources	Highly desirable	Nice to have		
Coastal and riverine structures	Nice to have	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Major		
Increased revenues	Minor	Moderate		
Mission-driven performance improvements	Major	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		

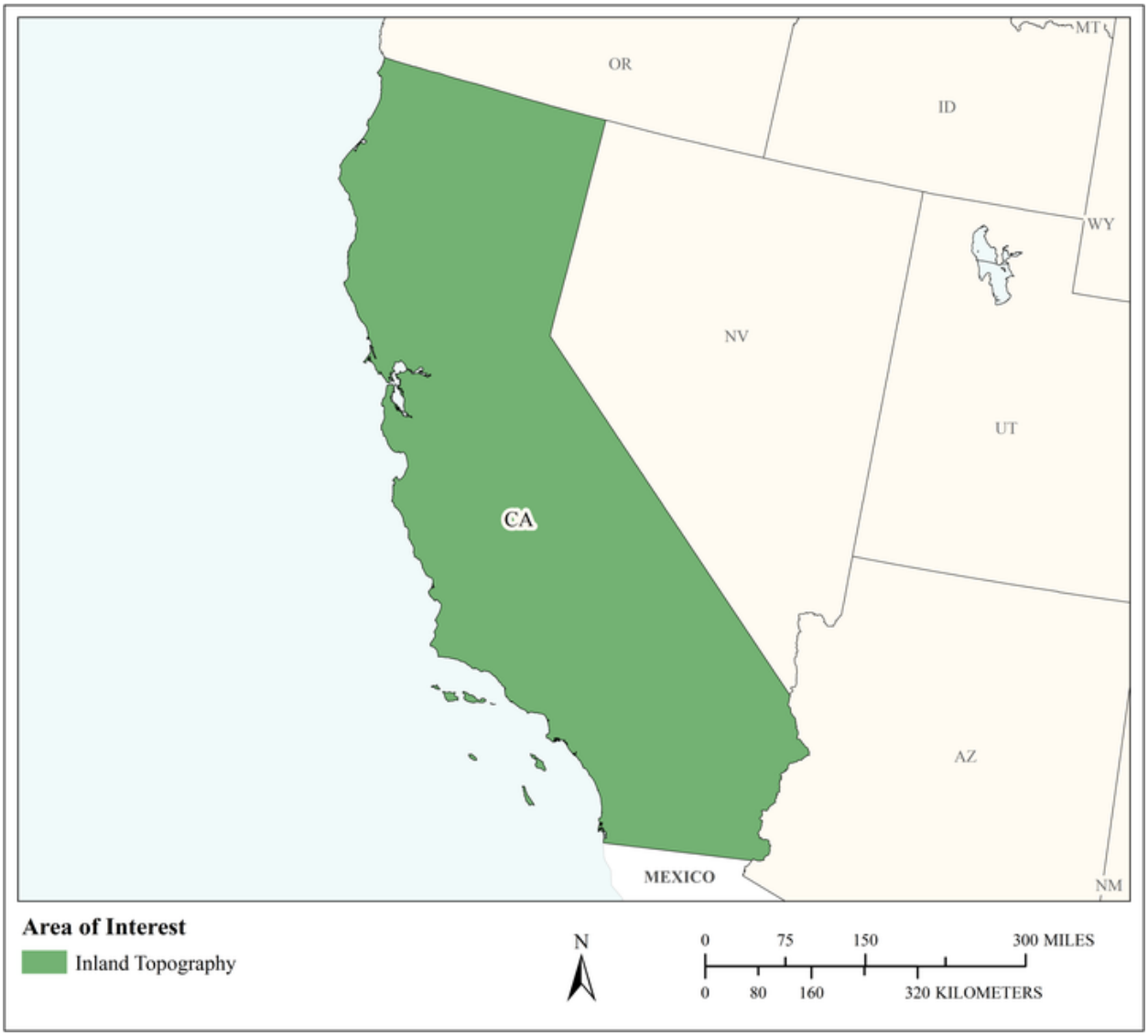
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major		
Improved customer experience	Moderate	Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Major		
Environmental	Major	Major		
Public safety, including life and property	Moderate	Major		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Major	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$625,281									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$906,419									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Major			Major								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes		
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Rangeland Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Assessment of rangeland health. Mapping for soil erosion potential due to grazing.
MCA Title	Rangeland Management
MCA ID	60042
Organization Type	State or U.S. Territorial government
Organization Name	State of California
Sub-Agency or Division	California Department of Forestry and Fire Protection
Organization Mission	
Program Name	Fire and Resource Assessment Program
Total Annual Program Budget	
Primary Business Use	BU 05 - Rangeland Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Highly desirable			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Not required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None			
Cost savings/cost reduction	None			
Cost avoidance	None			
Increased revenues	None			
Mission-driven performance improvements	None			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None			

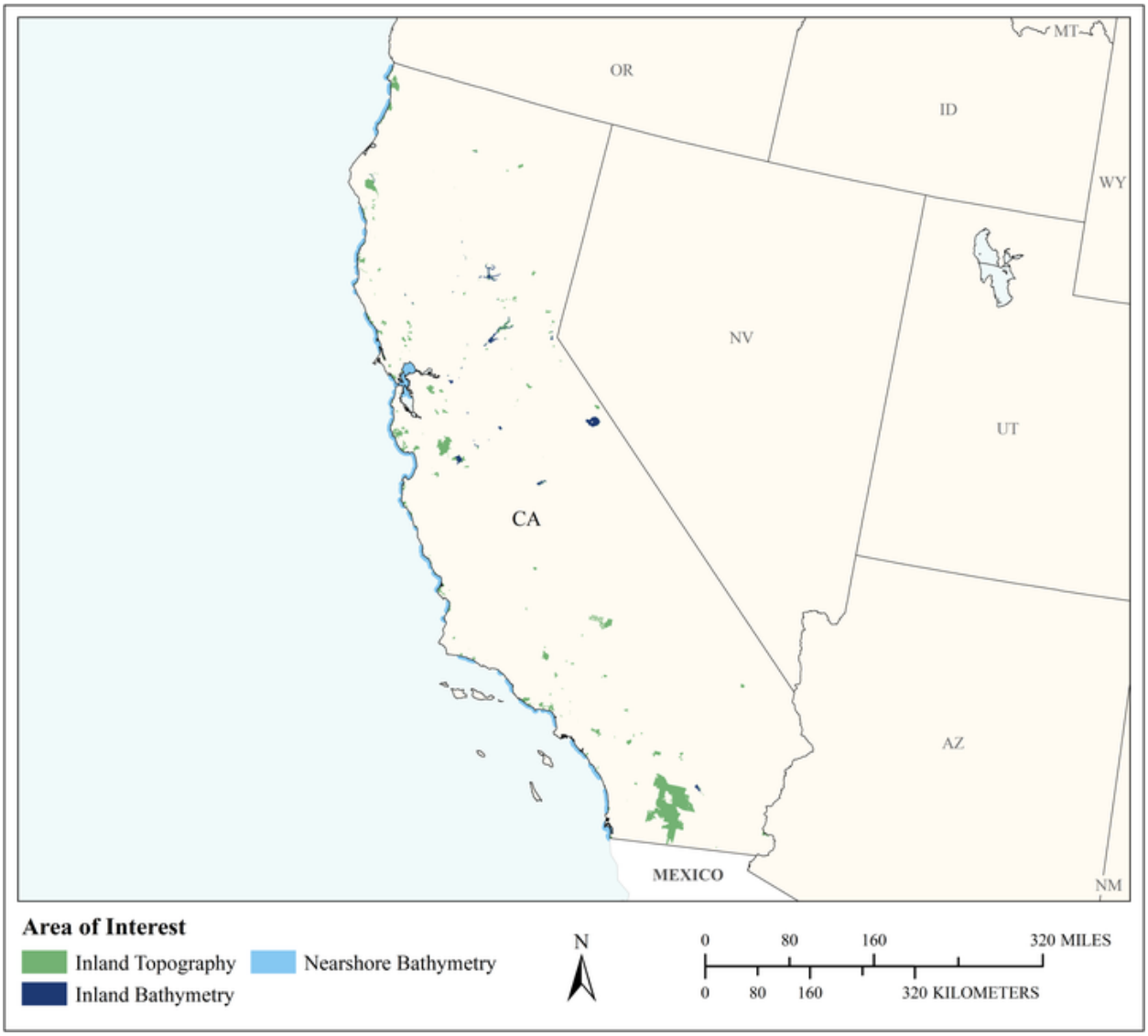
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	None			
Improved customer experience	None			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	None			
Public safety, including life and property	None			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	None											
Cost avoidance	Minor	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: California State Park Management and Operations



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Respondent provided own shapefile, KML, or geodatabase	Respondent provided own shapefile, KML, or geodatabase	Custom description	
Sub Area Requirements	California State Parks	California State Parks	California State Parks	

MCA Description	Response
Mission Critical Activity	Park Operations, including and not limited to: -Public Safety (police, medical, fire, towing) -Natural Resources (conservation, invasive species, wildland fire management) -Cultural Resources (archaeology, history, museums) -Interpretation and Education (publications, mapping, exhibits) -Facilities Management (physical plant). The Road and Trails Program needs elevation data to assess the condition of trails and dirt roads, set priorities for repair, address "volunteer" trails, and for general land management. The shoreline is where most significant revenue exists; elevation data are needed for sea level rise planning to project costs and cost avoidance from sea level rise. Underwater bathymetry is needed to support FWS and others to interpret and deliver recreation in the submarine environment, and for habitat conservation as well. The Boating and Waterways group also has planning and design engineering need for elevation data and for management of invasives (along with other agencies). Fire risk assessments require elevation data for inland resources. Bathymetry are also used to identify archaeological resources at shorelines that may be exposed as water levels change.
MCA Title	California State Park Management and Operations
MCA ID	22314
Organization Type	State or U.S. Territorial government
Organization Name	CA Department of Parks and Recreation
Sub-Agency or Division	
Organization Mission	The Mission of the California Department of Parks and Recreation (California State Parks) is to provide for the health, inspiration and education of the people of California by helping to preserve the state's extraordinary biological diversity, protecting its most valued natural and cultural resources, and creating opportunities for high-quality outdoor recreation.
Program Name	Natural Resources Management -Forest rehabilitation: elevation data used to select optimum treatment sites
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	BU 14 - Cultural Resources Preservation and Management
Tertiary Business Use	BU 26 - Education K12 and Beyond, Basic Research

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)

General Geographic Area and Size	
Description of smallest 3D features	Iindividual buildings and appurtenant works, submerged vegetation, submerged archaeological features

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B	QL2B	
Update Frequency	6-10 years	6-10 years	6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter	Up to 1 meter	
Acceptable Vertical Error	Up to 50 cm	Up to 50 cm	Up to 50 cm	
How far onshore needed			>1 kilometer inland	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs	Partial	Partial		

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross section/transect requirement	Variable due to wide range of landscape and public use density in California, statewide. Engineering staff submits needs, contracts engineering firms for project specific data. Longest covered bridge to be raised 18" to reduce flood risk, High requirements for topo and bathy, will collect own data.	Variable. Greatest requirement was for mm accuracy for Neptune Pool tile replacement at Hearst Castle (contracted for data).		

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required	Not required		Nice to have	Not required
Entire AOI under same environmental conditions	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Nice to have	Highly desirable		Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Nice to have	Nice to have	Highly desirable		Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level		Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	
DTM	Highly desirable	Highly desirable	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Nice to have	Nice to have	
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Not required	Nice to have	Not required	
Ground control/ground truthing	Highly desirable	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Nice to have	
Underwater videography			Highly desirable	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Required	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Highly desirable	Highly desirable	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Highly desirable	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Not required	
Habitat distribution and classification				
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Nice to have	Nice to have	Highly desirable	
Wetlands	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Highly desirable	Required	
Bridges/culverts	Required	Highly desirable		
Landmark features	Nice to have	Nice to have	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Required	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Intermap NEXTMap California (c. 2005 - 2007), self-collected or contracted data.	USGS Lake Tahoe bathymetry; USBR Folsom Lake bathymetry; self collected or contracted data – boat based collection.	NOAA data for SLR analysis and planning	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes	Yes	Yes	
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes	Yes		
Other description	State-sponsored purchase of NEXTMap	Peer group		
Data that meet my needs are not available				

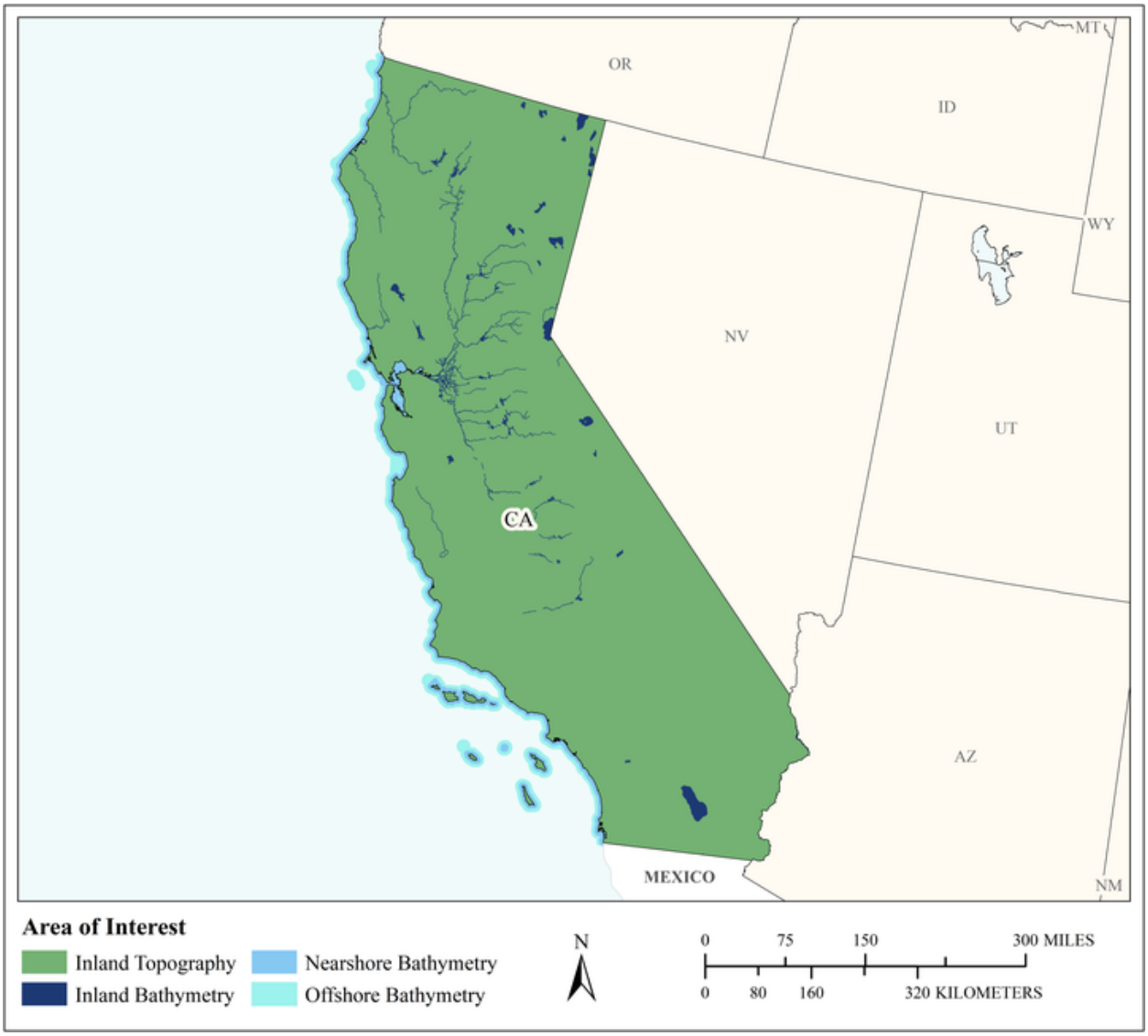
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Major	I don't know	
Cost savings/cost reduction	Major	Major	I don't know	
Cost avoidance	Minor	Major	I don't know	
Increased revenues	None	I don't know	I don't know	
Mission-driven performance improvements	Moderate	Minor	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate	I don't know	
Improved response or timeliness	Moderate	Moderate	Moderate	
Improved customer experience	Major	I don't know	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	I don't know	
Environmental	Moderate	Moderate	Moderate	
Public safety, including life and property	Moderate	Major	Major	
Other Current Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other		Major		
Other description		Folsom Lake bathymetry used to analyze boating hazard buoy placements. Other lakes as well.		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$2,894	Moderate	Annual dollars saved/realized	$603	I don't know	Unable to provide				
Time savings description	Having a statewide, seamless elevation fabric save staff time on a case-by-case basis. 3D modeling of mountainous parks supporting interpretation/education.			Rough estimate.								
Cost savings/cost reduction	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Increased revenues	Minor	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Other operational benefits	Major	Unable to provide										
Other operational benefits description	Terrain visualization; Unmanned Aircraft System operational planning.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			I don't know			I don't know					
Education or outreach description	Relative difficulty rating of hiking trails would be objectively based											
Environmental	Major			I don't know			I don't know					
Environmental description	Accurate accounts of drainage, improvement needs, minimized impacts of site development											
Public safety, including life and property	Major			I don't know			I don't know					
Public safety, including life and property description	Line-of-site analysis, radio coverage area analysis											
Other												
Other benefits	Moderate			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness		Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Wildlife and Habitat Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation planning for wildlife refuges and marine sanctuaries. Conservation of critical habitats. Management of diverse migratory bird habitats, coral reef and coral communities, marine mammals, protected fish species, and trust resources.
MCA Title	Wildlife and Habitat Management
MCA ID	60043
Organization Type	State or U.S. Territorial government
Organization Name	State of California
Sub-Agency or Division	California Department of Fish and Wildlife
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B	QL0B	Special Order
Update Frequency	4-5 years	4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 2 meters	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DTM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Nice to have	Nice to have	Highly desirable
Classified point cloud	Highly desirable	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Highly desirable
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Highly desirable	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Not required	Nice to have
Lease areas			Not required	Nice to have
Fixed obstructions			Nice to have	Highly desirable
Floating observation/navigation systems			Nice to have	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Nice to have
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Highly desirable	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Nice to have	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Minor	Moderate
Cost savings/cost reduction	Major	Minor	Minor	Minor
Cost avoidance	Major	Minor	Moderate	Major
Increased revenues	None	Minor	None	None
Mission-driven performance improvements	Moderate	Moderate	Moderate	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate	Minor	Minor

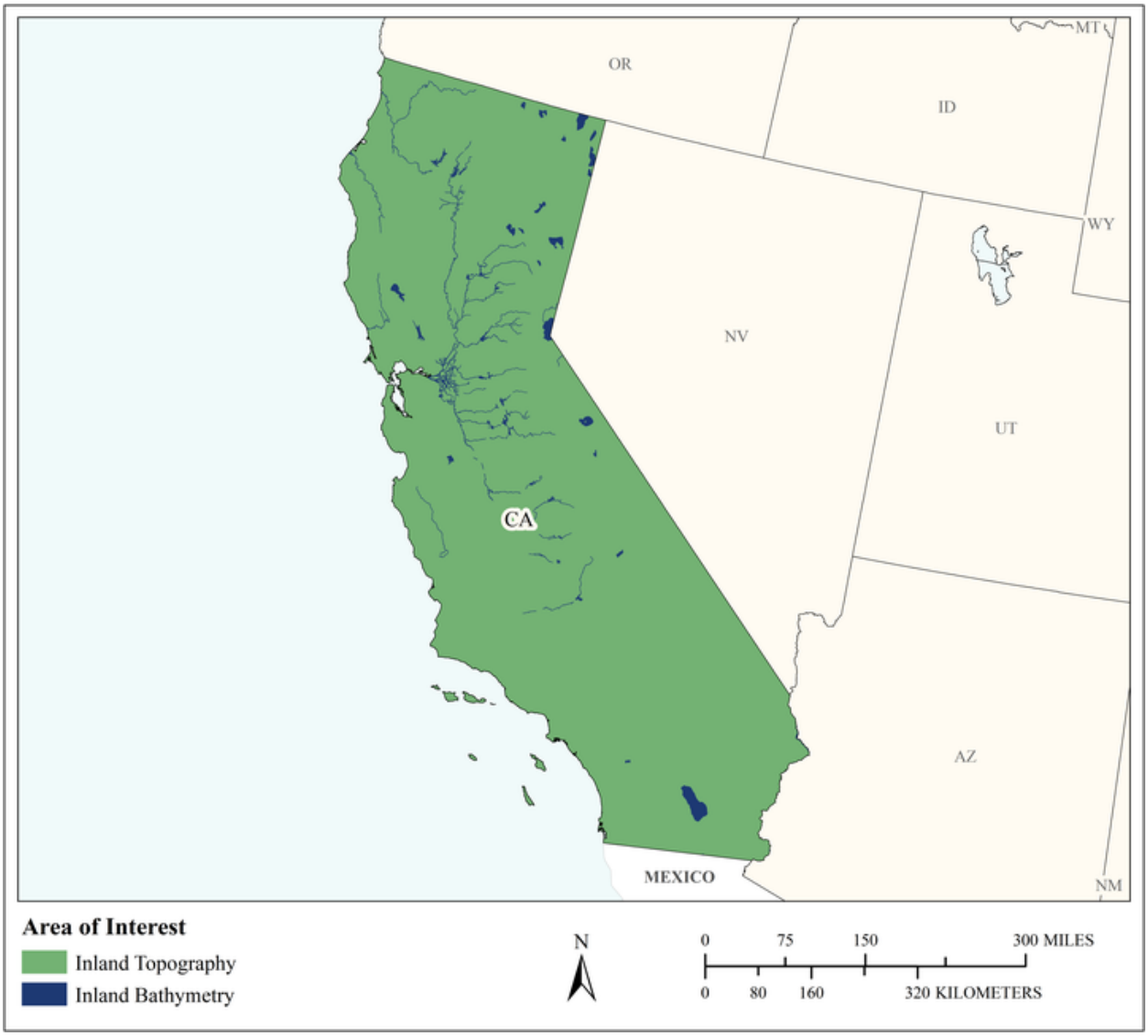
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Minor	Minor	Minor	Minor
Improved customer experience	Minor	Moderate	Minor	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Moderate	Minor	Minor
Environmental	Moderate	Moderate	Moderate	Major
Public safety, including life and property	Minor	Minor	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$37,671		Annual dollars saved/ realized	$301,906		Annual dollars saved/ realized	$804		Annual dollars saved/ realized	$4,538
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$108,806		Annual dollars saved/ realized	$182,484		Annual dollars saved/ realized	$47		Annual dollars saved/ realized	$316
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate			Moderate		
Environmental	Major			Moderate			Major			Major		
Public safety, including life and property	Moderate			Moderate			Moderate			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes			Yes
Curvature maps				
Cross sections	Yes			Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Protection of Agricultural Productivity and Incentivizing Beneficial Practices



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Protection of agricultural productivity and incentivizing beneficial practices
MCA Title	Protection of Agricultural Productivity and Incentivizing Beneficial Practices
MCA ID	21647
Organization Type	State or U.S. Territorial government
Organization Name	CA Dept of Food and Agriculture
Sub-Agency or Division	
Organization Mission	Promote and protect California agriculture
Program Name	Division of Animal Health Division of Plant Health Office of Environmental Farming and Innovation
Total Annual Program Budget	
Primary Business Use	BU 08 - Agriculture and Precision Farming
Secondary Business Use	BU 06 - Natural Resources Conservation
Tertiary Business Use	BU 22 - Infrastructure and Construction Management

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Individual host plants, irrigation system components

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Not required
51 - 100 ft	Not required
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Not required
5.1 – 10 acres	Not required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Not required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL4B		
Update Frequency	2-3 years	Event driven only – Data need to coincide with a specific event.		
Event type(s)		Event driven only		
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	I don't know	I don't know		
Acceptable Vertical Error	I don't know	I don't know		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Not required			Not required	
Entire AOI under same environmental conditions	Highly desirable	Not required			Not required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Not required			Not required	
DEM for entire AOI needs to be seamless	Nice to have	Not required			Not required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know				Up to double the required TVU at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM				
DTM				
DEM				
Raw point cloud data				
Classified point cloud				
Edited/cube XYZ				
Full waveform				
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening				
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery				
Ground control/ground truthing				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Nice to have		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Highly desirable		
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Nice to have	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Nice to have	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	None	None		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None	Inland bathy data not available		
Cost savings/cost reduction	None	Inland bathy data not available		
Cost avoidance	None	Inland bathy data not available		
Increased revenues	None	Inland bathy data not available		

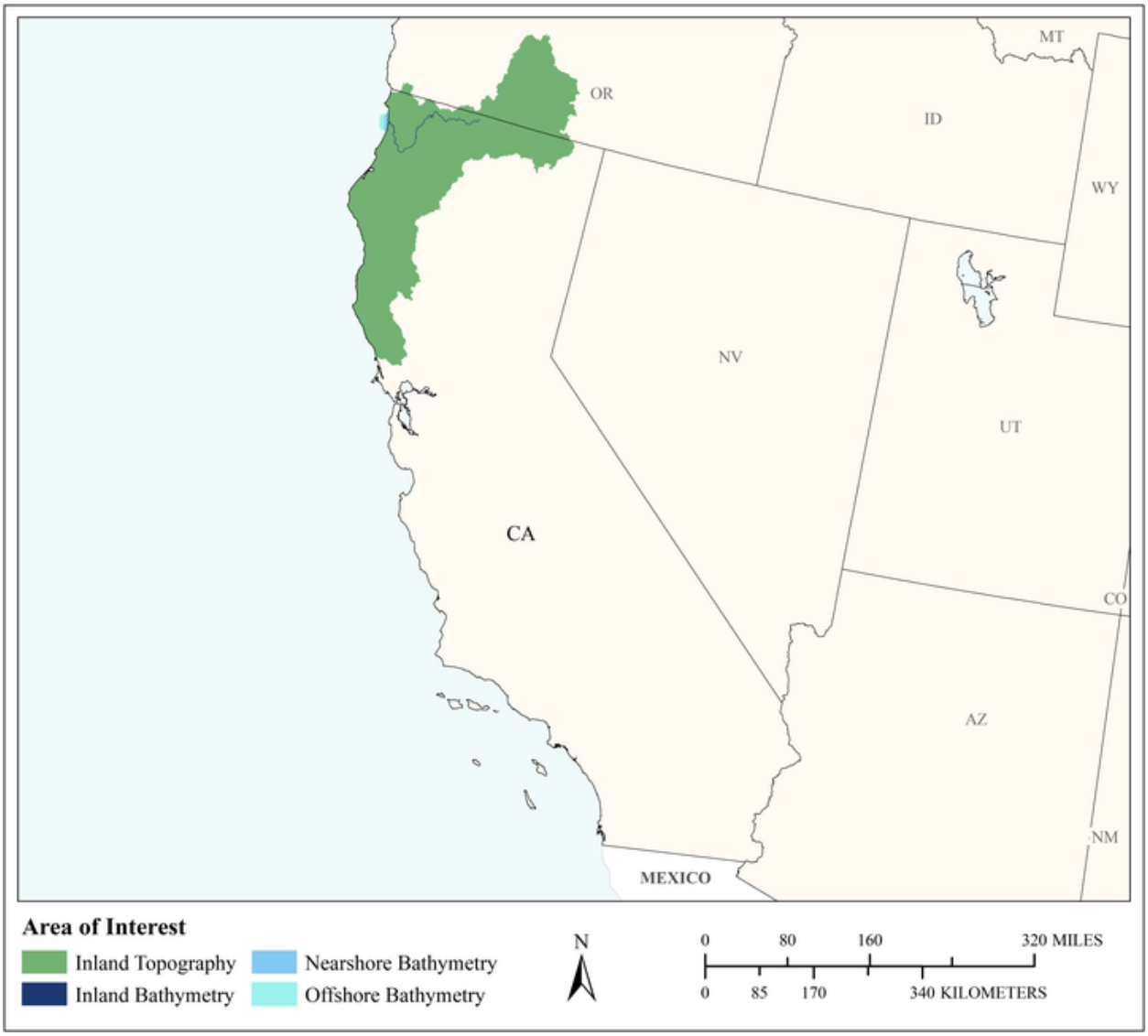
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Mission-driven performance improvements	None	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None	Inland bathy data not available		
Improved response or timeliness	None	Inland bathy data not available		
Improved customer experience	None	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	Inland bathy data not available		
Environmental	None	Inland bathy data not available		
Public safety, including life and property	None	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		I don't know	Unable to provide							
Cost avoidance	Minor	Unable to provide		I don't know	Unable to provide							
Increased revenues	None			I don't know	Unable to provide							
Mission-driven performance improvements	Moderate	Unable to provide		I don't know	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$42,113		Annual dollars saved/ realized	$73,782						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	None			I don't know	Unable to provide							
Improved response or timeliness	Minor	Unable to provide		I don't know	Unable to provide							
Improved customer experience	Minor	Unable to provide		I don't know	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$33,386		Annual dollars saved/ realized	$33,386						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			I don't know								
Environmental	Moderate			I don't know								
Public safety, including life and property	Minor			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Riverine Ecosystem Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)	Custom description	Custom description	Custom description

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Sub Area Requirements		Klamath River basin, 1st prioroity: 40 miles of Klamath R from mouth to confluence with Trinity R at Weitchpec, 2nd priority: rest of 150 miles of river to Iron Gate dam (lowest dam in series)	5 miles N and S of Klamath River mouth (closer to river is higher priority)	5 miles offshore (closer to shore is higher priority)

MCA Description	Response
Mission Critical Activity	Riverine Ecosystem Management Elevation data are needed for construction and restoration design on the Trinity River and Klamath River. USACE will collect bathymetry and USGS will collect lidar prior to the 2021 dam removals on the Klamath River (four dams in sequence will be removed). The bathymetry will be multi-beam for the Klamath River. 2D hydraulic modeling will be performed of baseline conditions and geomorphic, biologic, and physical changes during and after dam removal. The goal is to understand the impacts of dam removal over the long term, better understand the river response to the dam removals. Subsequent 3DEP data will be important to seeing the river response and to inform future projects and scientific studies. Long term topo and bathy collections out into the future will be desired to evaluate changes over time. A healthy river and salmon population is the end goal. BU 02 – Riverine Ecosystem Management is a Business Use.
MCA Title	Riverine Ecosystem Management
MCA ID	21933
Organization Type	Tribal government
Organization Name	Yurok Tribe
Sub-Agency or Division	
Organization Mission	The mission of the Yurok Tribe is to exercise the aboriginal and sovereign rights of the Yurok People to continue forever our Tribal traditions of self-governance, cultural and spiritual preservation, stewardship of Yurok lands, waters and other natural endowments, balanced social and economic development, peace and reciprocity, and respect for the dignity and individual rights of all persons living within the jurisdiction of the Yurok Tribe, while honoring our Creator, our ancestors and our descendants.
Program Name	Natural Resources Division - Fisheries Department
Total Annual Program Budget	
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	BU 06 - Natural Resources Conservation
Tertiary Business Use	BU 07 - Wildlife and Habitat Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required

What Needs to be Measured in 3D	Response
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Boulders and bedrock within the river

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B	QL2B	Order 1
Update Frequency	2-3 years	2-3 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI	1st priority: Klamath River reservation boundary (1 mile on either side of River for 40 miles), 2nd priority: Klamath Basin (HUC 1801)			
Acceptable Horizontal Error	Up to 30 cm	Less than 50 cm	Less than 50 cm	Up to 1 meter

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 40 cm	Less than 1 meter
How far onshore needed			500 meters inland	
How far down the beach profile needed	To MLLW		To MHW	
Tide correction requirement			MHW	MHW
Cross sections and/or transects meet needs		Partial	Partial	Partial
Cross section/transect requirement		Up to 20cm accuracy, average every ½ to 1 mile	Up to 20cm accuracy, average every ½ to 1 mile	Up to 20cm accuracy, average every ½ to 1 mile

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Required	Required	Required	Required
Entire AOI under same environmental conditions	Nice to have	Nice to have	Required	Highly desirable	Highly desirable	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable	Highly desirable	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	Required
DTM	Required	Required	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Required	Required	Required	Required
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Required	Required	Required
Full waveform	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	Highly desirable

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)			Required	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Required	Highly desirable
Intensity imagery/sidescan imagery	Highly desirable	Required	Required	Required
Ground control/ground truthing	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Required
Acoustic imagery of the seafloor			Highly desirable	Required
Aerial and/or satellite imagery	Required	Required	Highly desirable	Required
Underwater videography			Highly desirable	Required
Bottom texture			Highly desirable	Required
Bottom type			Highly desirable	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Highly desirable	Required
Geologic and seismic data	Nice to have	Required	Highly desirable	Highly desirable
Water column properties - Physical			Highly desirable	Highly desirable
Water column properties - Chemical			Highly desirable	Highly desirable
Water column properties - Biological			Highly desirable	Highly desirable
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Highly desirable	Highly desirable
Habitat distribution and classification			Highly desirable	Nice to have
Boundaries			Highly desirable	Required
Routes			Highly desirable	Required
Offshore cadastral			Highly desirable	Required
Lease areas			Highly desirable	Required
Fixed obstructions			Highly desirable	Required
Floating observation/navigation systems			Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Required	Required	Required	Required
Wetlands	Required	Required	Required	Required
Estuaries			Required	Required
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Required	Required	
Cultural resources	Highly desirable	Required	Required	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL2 and QL3 data	Small sections of estuary at QL3, multibeam sonar in dam reservoirs QL2 or better	Boat Based - Side Scan Sonar - Multibeam Sonar	None
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	Yes
NCEI		Yes	Yes	Yes
Open Topography				
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts		Yes	Yes	Yes
USGS Inland Waters server		Yes		
USGS data series				
Marine Minerals Program GIS			Yes	Yes
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	None

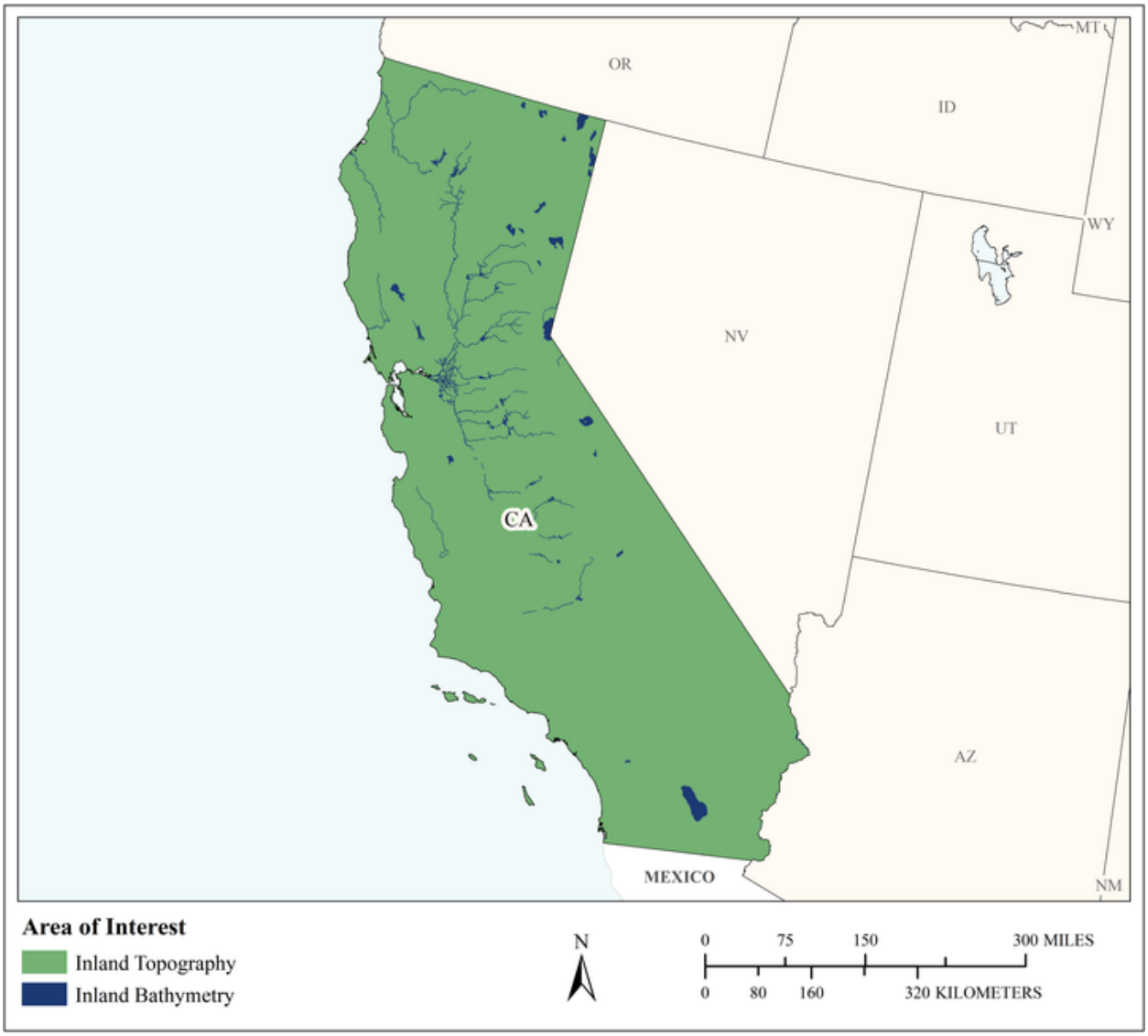
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Cost savings/cost reduction	Major	Major	Major	None
Cost avoidance	Moderate	Major	Moderate	None
Increased revenues	Major	Major	Moderate	None
Mission-driven performance improvements	Major	Major	Moderate	None
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Moderate	None
Improved response or timeliness	Major	Major	Moderate	None
Improved customer experience	Major	Major	Moderate	None
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Moderate	None
Environmental	Major	Major	Moderate	None
Public safety, including life and property	Major	Moderate	Moderate	None

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$15,226	Major	Annual dollars saved/realized	$25,628	Moderate	Annual dollars saved/realized	$7,839	None		
Cost savings/cost reduction	Major	Annual dollars saved/realized	$165,000	Major	Annual dollars saved/realized	$350,000	Moderate	Annual dollars saved/realized	$30,000	None		
Cost avoidance	Major	Annual dollars saved/realized	$50,000	Major	Annual dollars saved/realized	$110,000	Moderate	Annual dollars saved/realized	$90,000	None		
Increased revenues	None			None			None			None		
Mission-driven performance improvements	Major	Annual percent improvement	50%	Major	Annual percent improvement	63%	Major	Annual percent improvement	48%	None		
Other operational benefits	Major	Annual dollars saved/realized	$50,000	Major	Annual dollars saved/realized	$100,000						
Other operational benefits description	Fisheries Improvement.			Fisheries Habitat Improvement.								
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$130,000	Major	Annual dollars saved/realized	$10,552	None			None		
Improved response or timeliness	Major	Annual dollars saved/realized	$26,683	Major	Annual dollars saved/realized	$43,718	Moderate	Annual dollars saved/realized	$9,045	None		
Improved customer experience	Major	Annual dollars saved/realized	$95,000	Major	Annual dollars saved/realized	$16,582	I don't know	Unable to provide		None		
Other customer service benefits	Major	Annual dollars saved/realized	$100,000	Major	Annual dollars saved/realized	$200,000						
Other customer service benefits description	Develop tools and technology to build capacity for tribal members and community. Build Tribal Capacity.			Capacity building for Tribal Members and Employees. Tribal Members.								
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			I don't know			None		
Education or outreach description	Training Tribal Members on Topographic Data for Cultural Resources/Natural Resource Protection			Training of Tribal Members and Youth								
Environmental	Major			Major			I don't know			None		
Environmental description	Salmon Habitat Restoration Technology Tools and Management Decision Making			Salmon Habitat Restoration and Cultural Resources								
Public safety, including life and property	Moderate			Moderate			I don't know			I don't know		
Public safety, including life and property description	Protection against natural disasters, flooding, etc.			Natural Disasters Prevention, Flooding, etc.								
Other	Community Education			Fisheries Restoration								
Other benefits	Major			Major								
Other description	Training tribal members and youth on the importance of geographic information and data			New Technology and Tools to help make informed management decisions								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes	Yes	Yes	Yes
Curvature maps				
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps	Yes	Yes	Yes	Yes
Viewshed maps	Yes	Yes	Yes	Yes
Hydrologic Flow Direction Grids	Yes	Yes	Yes	Yes
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	Yes
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Landslide Identification and Hazard Mapping



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Landslide mapping and hazard assessment; Post-fire analysis to determine landslide-prone areas; Watershed assessment for protected water supplies; Stream channel analysis and mapping; Erosion control. QL1 hillshades and contours are needed for geomorphic interpretation and measurement for landslide mapping. Elevation data are needed for post-fire analysis for rapid assessment after fires and risk of flooding. The data are used to model debris flow hazards downstream of burn areas, impacts of debris flow runoff, and watershed assessment/erosion. Additionally, forest management, timber harvest, landslide assessments, and erosion hazard mapping are all improved with lidar. Elevation data are used for comprehensive identification of landslide and erosion potential for consideration. In timber harvest planning operations, elevation data are used to minimize landslides that generate sediment that would impair riverine ecosystems. Inland bathy is a new use case to identify watershed sediment generated by erosion and landslides in and near burn areas. Also for mapping migration of sediment downstream. Bare earth elevation data that is hydro-enforced for water flow (preferably through low-order streams and culverts), and a consistent quality of the data across the state, are both important.
MCA Title	Landslide Identification and Hazard Mapping
MCA ID	1211
Organization Type	State or U.S. Territorial government
Organization Name	California Geological Survey
Sub-Agency or Division	
Organization Mission	The California Geological Survey (CGS) maps and analyzes data on the state's diverse geologic environment, earthquakes, and other geologic hazards and mineral resources to provide critical information to protect life, property, commerce, and the environment from natural hazards. CGS provides geologic information used for decision-making by California's government agencies, its businesses, and the public.
Program Name	Forest and Watershed Geology Program
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 01 - Water Supply and Quality
Tertiary Business Use	BU 17 - Wildfire Management, Planning, and Response

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)

General Geographic Area and Size	
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Trails, gullies

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm		
How far onshore needed				
How far down the beach profile needed	To MHW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required			Not required	
Entire AOI under same environmental conditions	Required	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Not required		
DTM	Required	Nice to have		
DEM	Required	Required		
Raw point cloud data	Not required	Not required		
Classified point cloud	Required	Required		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Nice to have		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required	Required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Required		
Land use/land cover	Required	Nice to have		
Wetlands	Nice to have	Highly desirable		
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Highly desirable		
Landmark features	Not required	Not required		
Cultural resources	Not required	Not required		
Coastal and riverine structures	Nice to have	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Currently using a variety of lidar datasets across the state (too many to research and list), acquired on different dates, primarily QL1 (where available) and QL2. Data were located primarily using sources below. Have contracted with USGS to coordinate acquisition of new lidar data in some areas.	Not currently using.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes			
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				

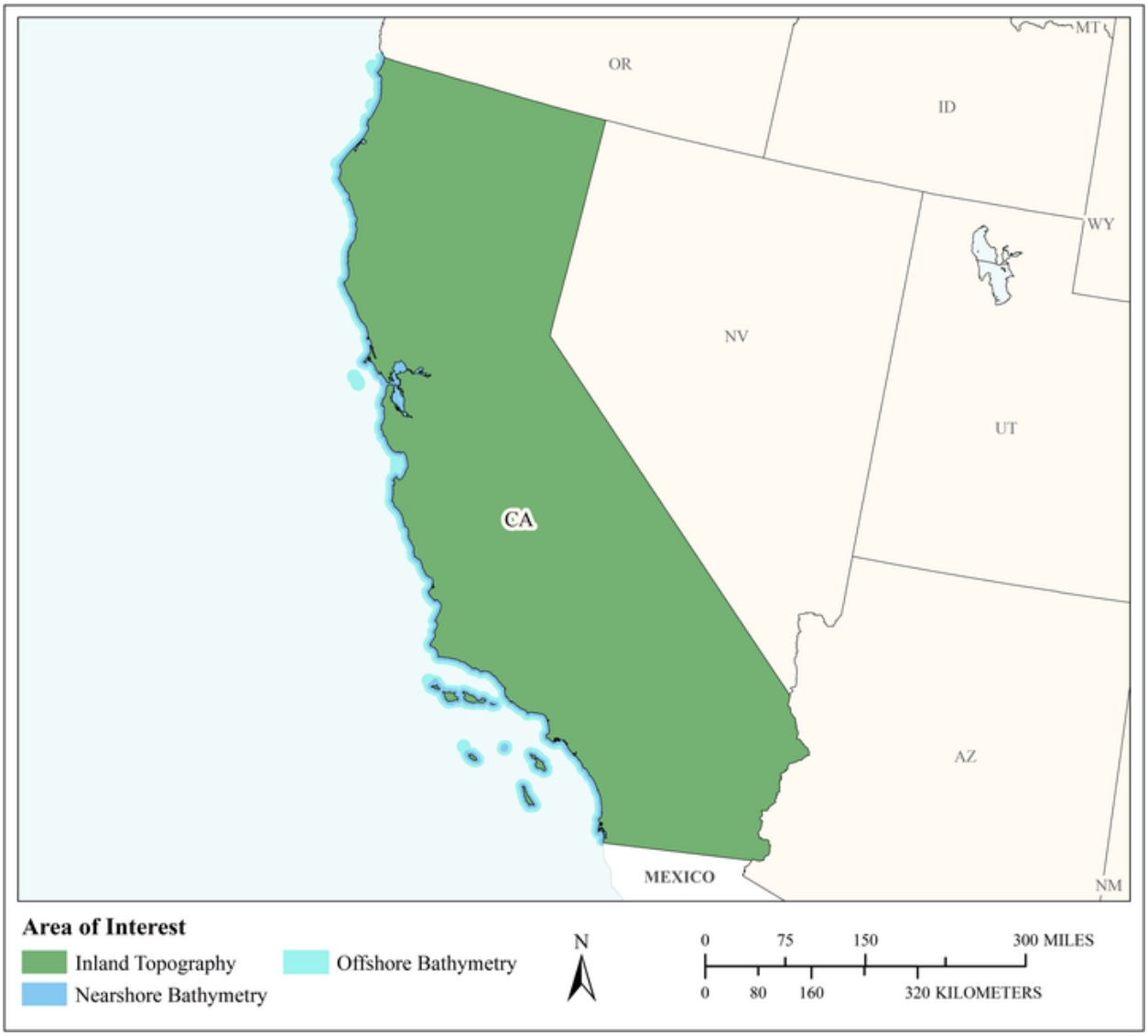
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	California			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Inland bathy data not available		
Cost savings/cost reduction	Moderate	Inland bathy data not available		
Cost avoidance	I don't know	Inland bathy data not available		
Increased revenues	I don't know	Inland bathy data not available		
Mission-driven performance improvements	Major	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available		
Improved response or timeliness	Moderate	Inland bathy data not available		
Improved customer experience	Moderate	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Inland bathy data not available		
Environmental	Moderate	Inland bathy data not available		
Public safety, including life and property	Major	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$148,941	Minor	Unable to provide							
Cost savings/cost reduction	Moderate	Annual dollars saved/realized	$550,000	None								
Cost savings/cost reduction description	Salary saved.											
Cost avoidance	Moderate	Annual dollars saved/realized	$55,000	Minor	Unable to provide							
Increased revenues	Minor	Unable to provide		None								
Mission-driven performance improvements	Major	Annual percent improvement	43%	Moderate	Unable to provide							
Other operational benefits	Major	Unable to provide										
Other operational benefits description	Cost reductions would allow for doubling of production. Given current funding stream, cost reductions would allow for doubling of production.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$148,941	Minor	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness description	Improved emergency response mapping time during post-wildfire assessments.											
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide							
Improved customer experience description	Reduction in loss of lives and property. Improved emergency response planning.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Minor								
Education or outreach description				Ability to provide stakeholders with improved estimates of erosion and sedimentation rates								
Environmental	Major			Minor								
Environmental description	More effective protection of water sources from sedimentation through more accurate predictive modeling of erosion potential.			Improved calculations of erosion and sedimentation rates								
Public safety, including life and property	Major			Moderate								
Public safety, including life and property description	Increased level of public safety through more accurate mapping of hazards from landslides and post-fire debris flows and flooding.			Improved projections flood hazard and at-risk locations								
Other	Statewide risk reduction efforts											
Other benefits	Major											
Other description	Statewide risk reduction efforts											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps	Yes	Yes		
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Seismic Hazard Analysis and Mapping



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	Required
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Seismic hazard mapping and analysis (liquefaction, earthquake-induced landslides); Fault mapping; Tsunami inundation zone mapping. Legislatively mandated and regulatory products are provided by state survey agency. Regulatory zones require investigation. Planning products are used differently than project specific products. Regulatory maps are used by planners, building code officials, etc. to identify where detailed site specific studies are needed. Building is not allowed on an active fault. Seismic hazard maps are developed using geologic maps – lidar allows more accurate identification of young alluvium subject to liquefaction and settlement. More accurate mapping is possible. Liquefaction zone modeling requires more accurate elevations in flat areas in order to obtain more accurate groundwater elevations, which are often tied to surface elevations through depth-to-groundwater records. Bathymetric data for offshore areas in California are needed for tsunami modeling both offshore and onshore. With higher detail, the predictive models become more useful. It is also very helpful to capture recent grading activity for landslide hazard zone mapping.
MCA Title	Seismic Hazard Analysis and Mapping
MCA ID	1282
Organization Type	State or U.S. Territorial government
Organization Name	California Geological Survey
Sub-Agency or Division	
Organization Mission	The California Geological Survey (CGS) maps and analyzes data on the state's diverse geologic environment, earthquakes, and other geologic hazards and mineral resources to provide critical information to protect life, property, commerce, and the environment from natural hazards. CGS provides geologic information used for decision-making by California's government agencies, its businesses, and the public.
Program Name	Seismic Hazards Program
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 03 - Coastal Zone Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Ground fissures

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1		QL3B	Special Order
Update Frequency	4-5 years		4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI	QL 1 needed for Fault Mapping. QL 2-3 is acceptable for Tsunami Zone Mapping. QL 3 is acceptable for Landslide Mapping in this program.			
Acceptable Horizontal Error	Up to 80 cm		Up to 2 meters	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm		Up to 40 cm	Less than 1 meter
How far onshore needed			To Mean Higher High Water (MHHW)	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MLLW	MLLW
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required		Not required	Not required		Not required
Entire AOI under same environmental conditions	Required		Highly desirable	Highly desirable		Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable		Required	Highly desirable		Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable		Required	Highly desirable		Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required		Not required	Nice to have
DTM	Required		Required	Required
DEM	Required		Required	Required
Raw point cloud data	Not required		Not required	Required
Classified point cloud	Required		Required	
Edited/cube XYZ			Not required	Not required
Full waveform	Required		Required	Required
Bathymetric Attributed Grid (BAG)			Highly desirable	Nice to have

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Required		Highly desirable	Nice to have
Ground control/ground truthing	Highly desirable		Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required		Required	Required
Underwater videography			Not required	Not required
Bottom texture			Required	Highly desirable
Bottom type			Required	Required
Submerged features			Nice to have	Nice to have
Subbottom characteristics			Required	Required
Geologic and seismic data	Required		Required	Required
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Highly desirable	Highly desirable
Tide/wave heights			Required	Required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Not required	Not required
Boundaries			Highly desirable	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Highly desirable	Nice to have
Lease areas			Required	Highly desirable
Fixed obstructions			Highly desirable	Nice to have
Floating observation/navigation systems			Not required	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Required		Required	
Land use/land cover	Required		Highly desirable	Not required
Wetlands	Nice to have		Highly desirable	Not required
Estuaries			Required	Not required
Inland surface water features	Required		Required	
Bridges/culverts	Required			
Landmark features	Not required		Not required	
Cultural resources	Not required		Not required	
Coastal and riverine structures	Required		Required	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Currently using a variety of lidar datasets across the state, acquired on different dates, with data quality ranging between QL1 and QL3.		Publicly available bathymetry sources of variable resolution and dates, available via Digital Coast, NOAA charts, USACE.	Various publicly-available sources.
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes		Yes	Yes
NCEI				
Open Topography	Yes			
NOAA nautical charts			Yes	Yes
USACE navigation charts			Yes	
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	California			
Data that meet my needs are not available				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate		Major	Moderate
Cost savings/cost reduction	Moderate		Moderate	Moderate
Cost avoidance	I don't know		Moderate	Moderate
Increased revenues	I don't know		I don't know	I don't know
Mission-driven performance improvements	Major		Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		Major	Major
Improved response or timeliness	Moderate		Moderate	Major
Improved customer experience	Moderate		Moderate	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate		Major	Moderate
Environmental	Minor		Minor	Minor
Public safety, including life and property	Major		Major	Major
Other Current Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other			Major	
Other description			Improved accuracy of tsunami inundation zone models	

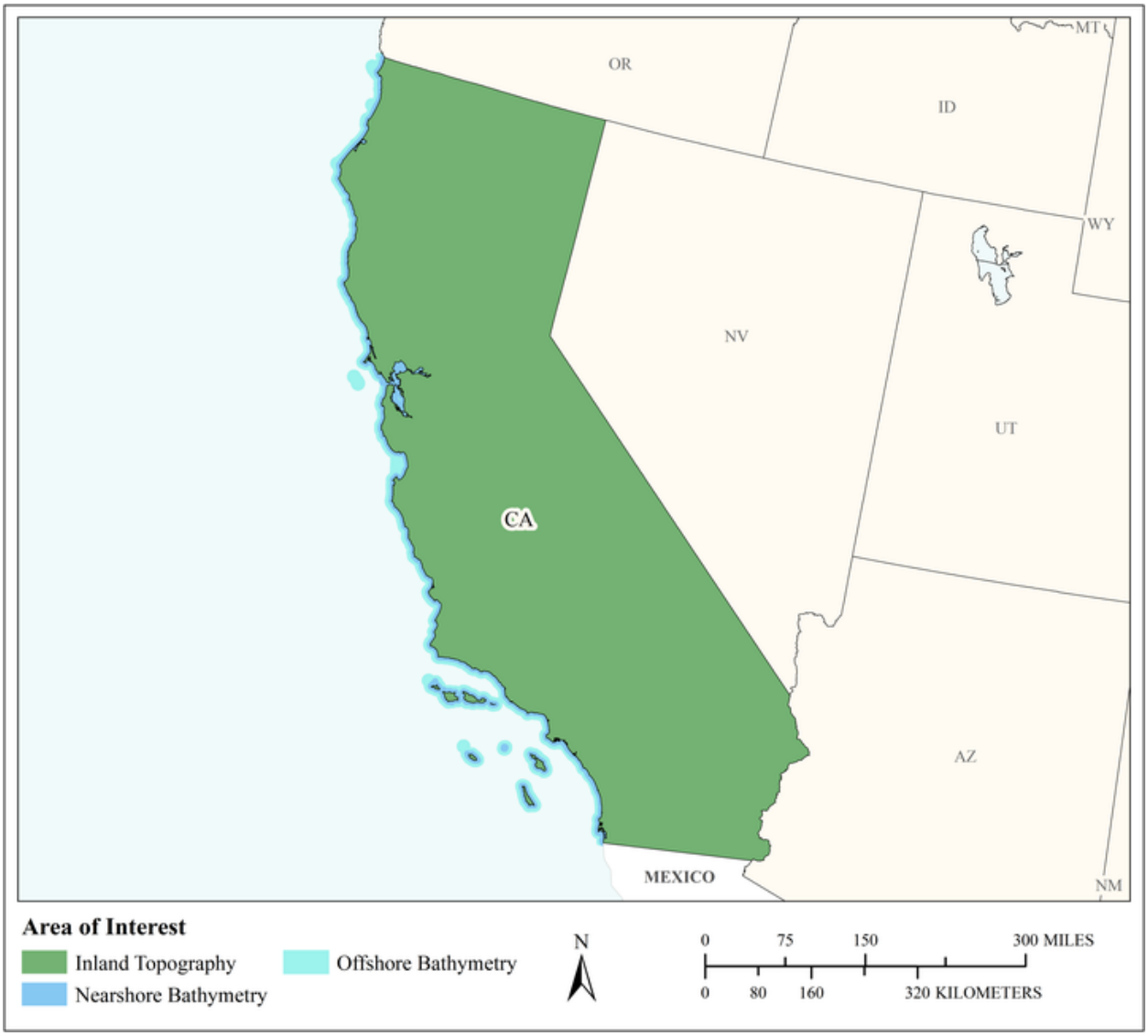
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$173,362				Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Moderate	Annual dollars saved/realized	$630,000				Moderate	Unable to provide		Minor	Unable to provide	
Cost savings/cost reduction description	Annual salary saved.											
Cost avoidance	Major	Annual dollars saved/realized	$160,000				Major	Unable to provide		Major	Unable to provide	
Increased revenues	Moderate	Unable to provide					I don't know	Unable to provide		Moderate	Unable to provide	
Mission-driven performance improvements	Major	Annual percent improvement	14% to 24%				Major	Unable to provide		Major	Unable to provide	
Mission-driven performance improvements description							Uniformity in analysis for slope calculations and base map generation.					
Other operational benefits	Major	Unable to provide										
Other operational benefits description	Cost reductions would allow for doubling the production of regulatory fault zone maps, and 10% increase in production of liquefaction and landslide zone maps. Given current funding stream, cost reductions would allow for doubling the production of regulatory fault zone maps, and 10% increase in production of liquefaction and landslide zone maps.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$172,458				Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness description	Improved coverage of the state with regulatory map products; enhanced land use planning.											
Improved customer experience	Moderate	Unable to provide					Major	Unable to provide		Moderate	Unable to provide	
Improved customer experience description							Product data may better match the base maps in use by different counties.					
Other customer service benefits	Major	Unable to provide										
Other customer service benefits description	Improved risk reduction.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate						Moderate			Moderate		
Education or outreach description	Increased inter-agency cooperation through increased appreciation of products from partner agencies.						Increased inter-agency cooperation through increased appreciation of products from partner agencies.					
Environmental	Minor						Minor			Minor		
Public safety, including life and property	Major						Major			Major		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Public safety, including life and property description	Enhanced elevation data would make it possible to construct more accurate tsunami hazard zone maps, and construct new maps for areas where they currently don't exist. This would be a great benefit to public safety and to the land use and maritime planning communities.		Enhanced elevation data would make it possible to construct more accurate tsunami hazard zone maps, and construct new maps for areas where they currently don't exist. This would be a great benefit to public safety and to the land use and maritime planning communities.	
Other	Statewide risk reduction efforts			
Other benefits	Major			
Other description	Statewide risk reduction efforts			

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	Yes
Contours	Yes		Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes		Yes	Yes
Aspect maps	Yes		Yes	Yes
Curvature maps	Yes		Yes	Yes
Cross sections	Yes		Yes	Yes
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Regional Geologic Mapping



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	Required
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Geologic mapping (regional mapping and coastal sediment mapping). Maps of surficial and bedrock geology landslides are used as framework data for other derivative products (e.g. landslide susceptibility mapping, seismic hazard regulatory maps, coastal sediment mapping and coastal sediment management plans). River and lake bottom data are used for sediment management plans.
MCA Title	Regional Geologic Mapping
MCA ID	1287
Organization Type	State or U.S. Territorial government
Organization Name	California Geological Survey
Sub-Agency or Division	
Organization Mission	The California Geological Survey (CGS) maps and analyzes data on the state's diverse geologic environment, earthquakes, and other geologic hazards and mineral resources to provide critical information to protect life, property, commerce, and the environment from natural hazards. CGS provides geologic information used for decision-making by California's government agencies, its businesses, and the public.
Program Name	Geologic Mapping Program
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 03 - Coastal Zone Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Roads, underwater pipelines, transmission lines (~2ft diameter)

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2		QL2B	Special Order
Update Frequency	4-5 years		4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Horizontal Error	Up to 2 meters		Up to 2 meters	The best horizontal accuracy achievable for the vertical accuracy I need
Acceptable Vertical Error	Up to 20 cm		Up to 40 cm	Less than 1 meter
How far onshore needed			To cover the beach slope	
How far down the beach profile needed	To MHW		Below MLLW	
Tide correction requirement			MLLW	MLLW
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required		Not required	Not required		Not required
Entire AOI under same environmental conditions	Highly desirable		Highly desirable	Highly desirable		Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable		Highly desirable	Highly desirable		Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable		Highly desirable	Highly desirable		Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required		Not required	Nice to have
DTM	Required		Required	Required
DEM	Required		Required	Required
Raw point cloud data	Not required		Not required	Required
Classified point cloud	Required		Required	
Edited/cube XYZ			Not required	Highly desirable
Full waveform	Not required		Not required	Nice to have
Bathymetric Attributed Grid (BAG)			Not required	Nice to have

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have		Highly desirable	Nice to have
Ground control/ground truthing	Nice to have		Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required		Required	Required
Underwater videography			Not required	Not required
Bottom texture			Required	Required
Bottom type			Required	Required
Submerged features			Required	Required
Subbottom characteristics			Required	Required
Geologic and seismic data	Required		Required	Required
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Not required	Not required
Boundaries			Highly desirable	Required
Routes			Nice to have	Nice to have
Offshore cadastral			Highly desirable	Nice to have
Lease areas			Required	Required
Fixed obstructions			Required	Highly desirable
Floating observation/navigation systems			Nice to have	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Required		Required	
Land use/land cover	Highly desirable		Highly desirable	Not required
Wetlands	Highly desirable		Nice to have	Not required
Estuaries			Highly desirable	Not required
Inland surface water features	Required		Not required	
Bridges/culverts	Nice to have			
Landmark features	Nice to have		Nice to have	
Cultural resources	Nice to have		Nice to have	
Coastal and riverine structures	Required		Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL3 or better data, various dates, publicly available		Publicly available bathymetry sources of variable resolution and dates.	Various publicly-available sources. Using 2 m grid spacing data in cooperative offshore mapping project with USGS.
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes		Yes	Yes
NCEI				
Open Topography	Yes			
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	California			
Data that meet my needs are not available				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor		Minor	Minor
Cost savings/cost reduction	Minor		Minor	Minor
Cost avoidance	Minor		Minor	Minor
Increased revenues	I don't know		I don't know	I don't know
Mission-driven performance improvements	Major		Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		Major	Major
Improved response or timeliness	Minor		Moderate	Minor
Improved customer experience	Moderate		Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major		Major	Major
Environmental	I don't know		I don't know	I don't know
Public safety, including life and property	Major		Major	Major

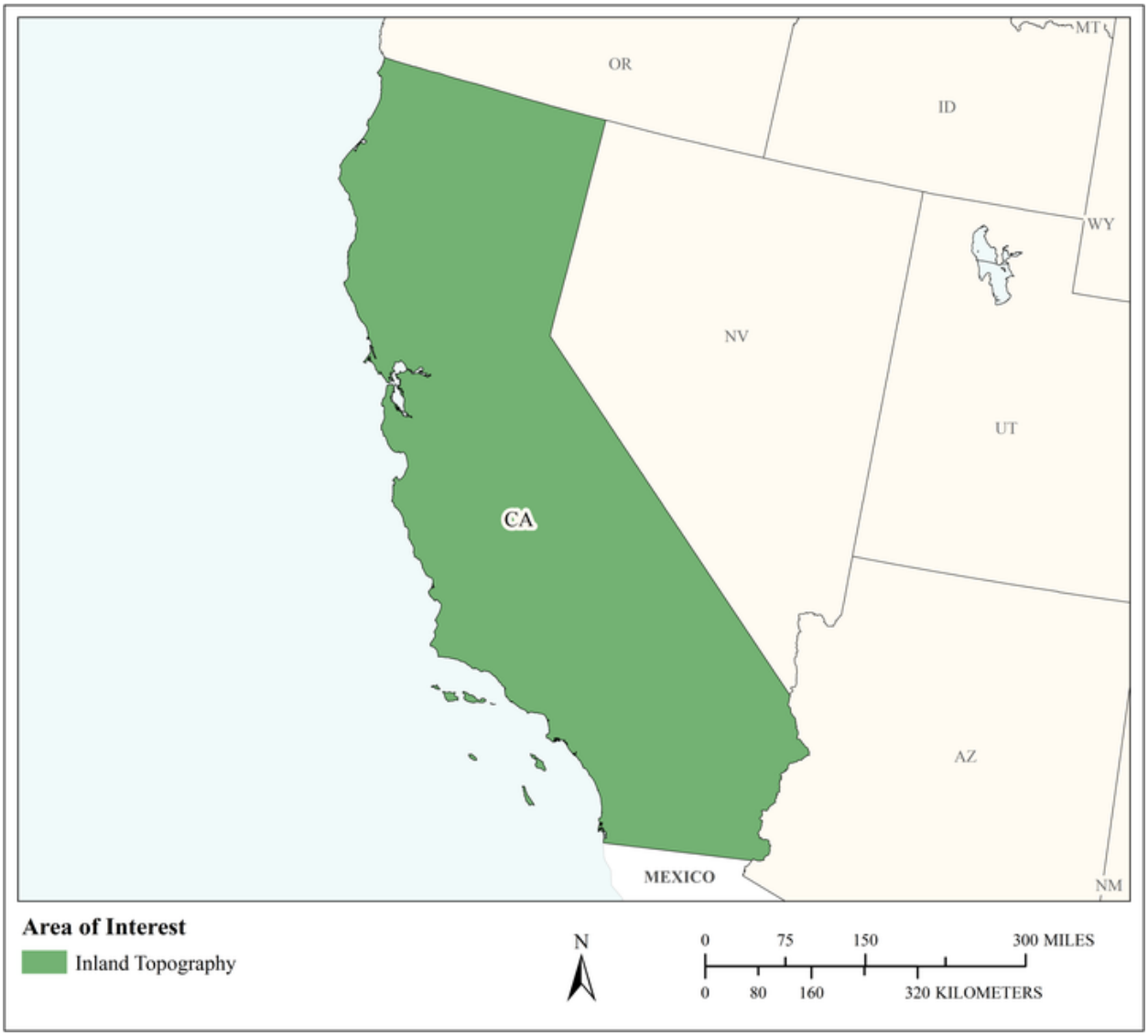
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other Current Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other	Major			
Other description	Improved mission compliance through improved accuracy of geologic, geomorphic, and geologic hazard mapping, particularly alluvial fan surfaces. Have seen improved performance of our product, especially for mapping of alluvial fan surfaces in Los Angeles County using 3 m lidar data. Geologic maps are now more detailed in areas where lidar data exists. Higher resolution data provides more accurate data about existing geologic hazards, which allows for better decision making with regard to public safety issues.			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$47,034				Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Moderate	Annual dollars saved/realized	$170,000				Moderate	Unable to provide		Minor	Unable to provide	
Cost avoidance	Moderate	Annual dollars saved/realized	$43,000				Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide					Minor	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Annual percent improvement	25%				Major	Unable to provide		Major	Unable to provide	
Mission-driven performance improvements description	Given current funding stream, cost reductions would allow for a 1.5-fold increase in the production of surficial geologic maps.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$47,034				Major	Unable to provide		Major	Unable to provide	
Value added to products or services description	Increased accuracy and detail of geologic map and derivative products.											
Improved response or timeliness	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness description	Improved coverage of the state.											
Improved customer experience	Moderate	Unable to provide					Major	Unable to provide		Moderate	Unable to provide	
Other customer service benefits	Moderate	Unable to provide										
Other customer service benefits description	Improved risk reduction where geologic map product are used in regulatory derivative map products. Improved risk reduction where geologic map products are used in regulatory derivative map products.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major						Major			Major		
Environmental	Major						I don't know			I don't know		
Public safety, including life and property	Major						Major			Major		
Public safety, including life and property description	Higher resolution data provides more accurate data about existing geologic hazards, which allows for better decision making with regard to public safety issues.											
Other	Statewide risk reduction efforts											
Other benefits	Major											
Other description	Statewide risk reduction efforts											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	Yes
Contours	Yes		Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes		Yes	Yes
Aspect maps	Yes		Yes	Yes
Curvature maps	Yes		Yes	Yes
Cross sections	Yes		Yes	Yes
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic Resource Mining and Extraction



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Onshore or offshore mineral extraction. Monitoring sand as a local resource. Seabed resources. Open mine volume computations. Stockpile analysis. Environmental impact assessment and site restoration.
MCA Title	Geologic Resource Mining and Extraction
MCA ID	60044
Organization Type	State or U.S. Territorial government
Organization Name	State of California
Sub-Agency or Division	California Geological Survey
Organization Mission	
Program Name	Mineral Resources Program
Total Annual Program Budget	
Primary Business Use	BU 11 - Geologic Resource Mining and Extraction
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			

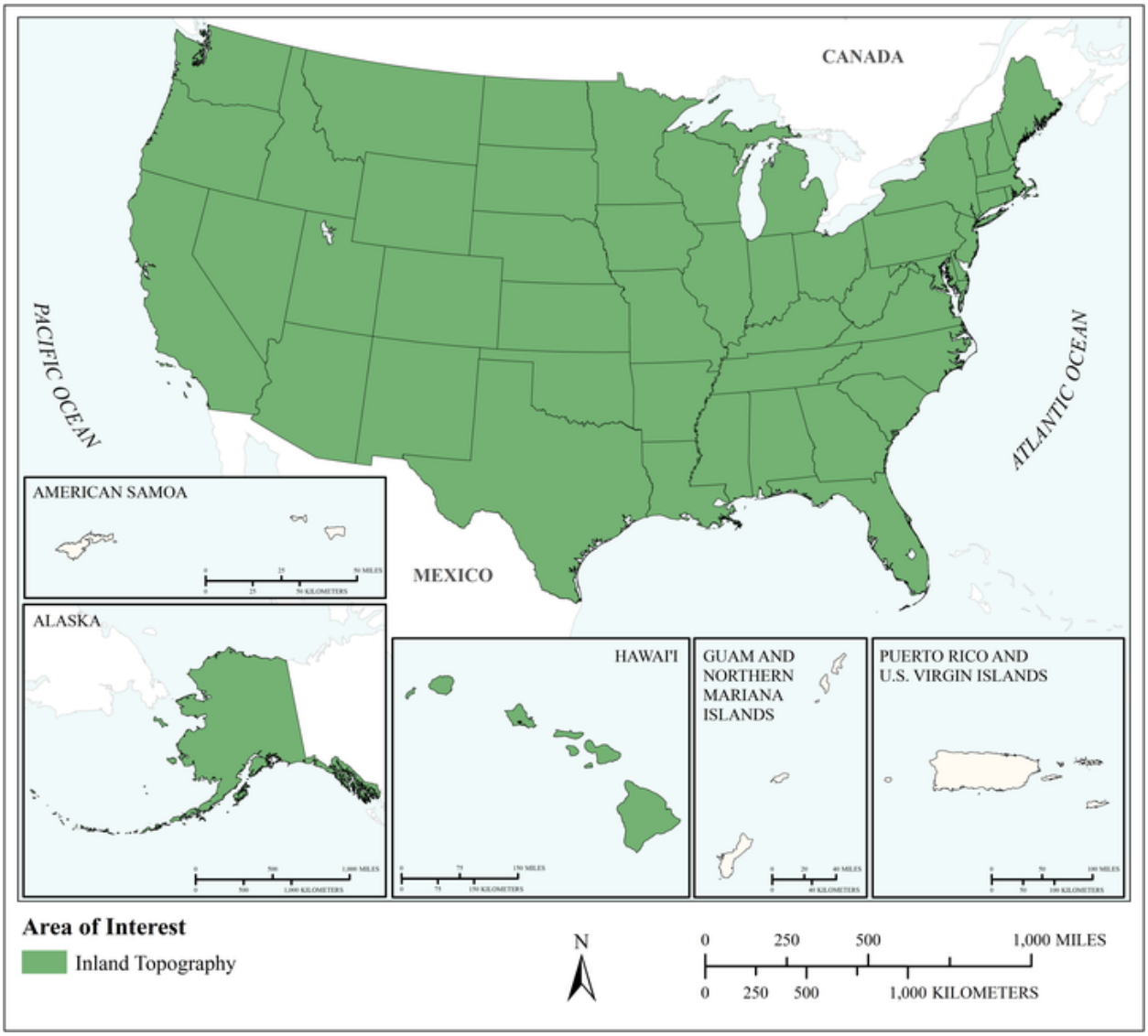
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Minor	Unable to provide										
Cost avoidance	Minor	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: U.S. Forest Biomass Estimation and Carbon Monitoring



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Nationwide, inland areas			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Carbon sequestration: Develop a high resolution nationwide biomass estimation tool. Forest/veg structure data (heights, diameters, species, age) and canopy outlines. One project requires nationwide lidar, two require statewide lidar. Other projects are in development including the California working lands inventory, the biomass estimation tool (nationwide) which has NASA funding, and the Garcia project in Mendocino County. Lidar are input into the tool to estimate biomass for forests for cap and trade and estimating carbon. Carbon accounting will be a future requirement for fire; the biomass calculator would support this effort. Elevation data are also used for emissions inventory of facilities that output carbon such as refineries, waste, etc. – the facilities are geocoded, building footprints are used for spatial analysis along with building height and parcel data.
MCA Title	U.S. Forest Biomass Estimation and Carbon Monitoring
MCA ID	21562
Organization Type	State or U.S. Territorial government
Organization Name	California Air Resources Board
Sub-Agency or Division	
Organization Mission	To promote and protect public health, welfare and ecological resources through the effective and efficient reduction of air pollutants while recognizing and considering the effects on the economy of the state.
Program Name	Emissions Inventory Branch and Climate Change Program Operations
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	BU 04 - Forest Resources Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	We are interested in forest/veg structure data (heights, diameters, species, age) and canopy outlines

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	6-10 years			
Event type(s)				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed	Only where mangroves exist - need to the shoreline			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	1 meter					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Highly desirable			
Other	Highly desirable			
Other description	Geomorphological features (NC dataset)			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Required			
Wetlands	Nice to have			
Estuaries				
Inland surface water features	Not required			
Bridges/culverts	Not required			
Landmark features	Not required			
Cultural resources	Not required			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			
Other	Highly desirable			
Other description	Building footprints and building heights			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	3DEP aspect, slope, contour, hillshade, point cloud, DEM, DSM			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	All			
Data that meet my needs are not available				

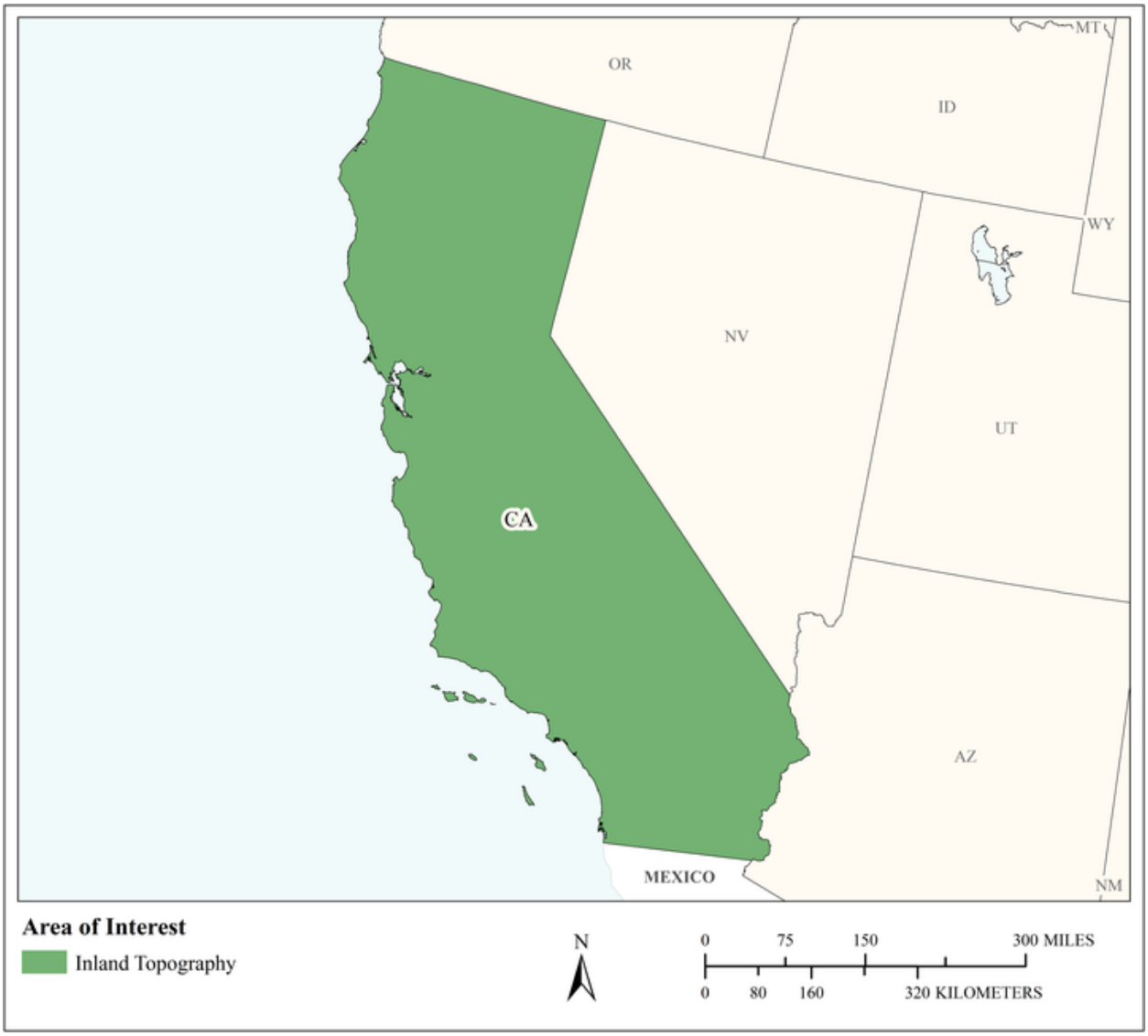
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			
Improved response or timeliness	Minor			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	Major											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Renewable Energy Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Alternate energy development – solar, tidal, wind, wave, and ocean current. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Low head power potential for hydropower.
MCA Title	Renewable Energy Resources
MCA ID	60045
Organization Type	State or U.S. Territorial government
Organization Name	State of California
Sub-Agency or Division	California Energy Commission
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Not required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Minor			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor			

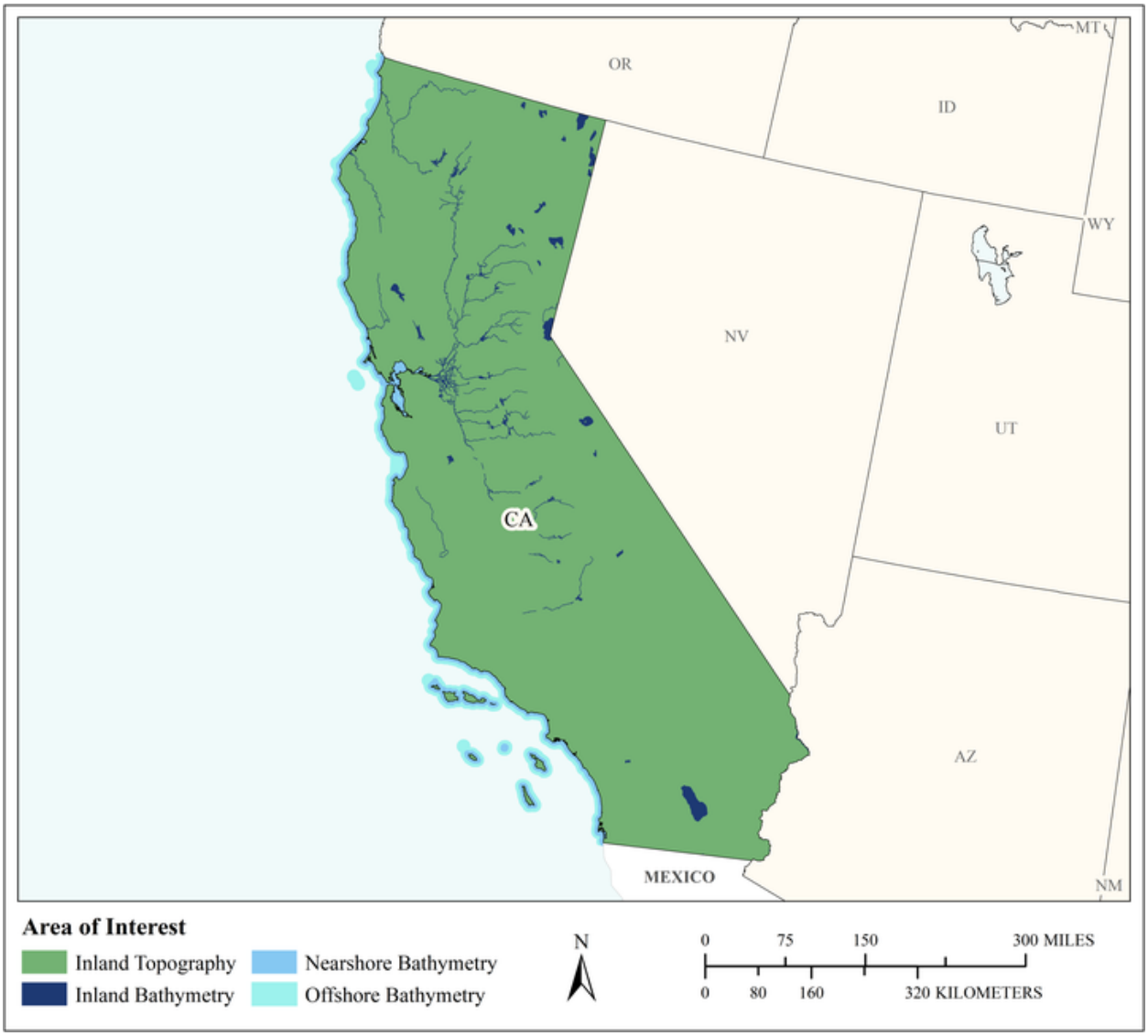
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Minor			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	None											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Oil and Gas Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Oil and gas exploration and production. Pipeline and route selection. Facility siting to mitigate geologic hazards. Construction planning. Environmental impact assessment and mitigation. Regulatory compliance.
MCA Title	Oil and Gas Resources
MCA ID	60046
Organization Type	State or U.S. Territorial government
Organization Name	State of California
Sub-Agency or Division	California Department of Conservation
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 13 - Oil and Gas Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B	QL2B	Order 1a
Update Frequency	Annually	2-3 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 5 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 40 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Required	Required	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Required	Required	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required	Nice to have	Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Required	Required	Required	Nice to have	Highly desirable	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Highly desirable	Required	Highly desirable
DEM	Required	Highly desirable	Required	Highly desirable
Raw point cloud data	Highly desirable	Nice to have	Required	Nice to have
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Not required	Nice to have	Nice to have
Full waveform	Nice to have	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Not required	Not required	Nice to have
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Nice to have
Ground control/ground truthing	Highly desirable	Nice to have	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	Highly desirable
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Underwater videography			Not required	Nice to have
Bottom texture			Nice to have	Nice to have
Bottom type			Nice to have	Nice to have
Submerged features			Required	Highly desirable
Subbottom characteristics			Not required	Nice to have
Geologic and seismic data	Highly desirable	Highly desirable	Nice to have	Highly desirable
Water column properties - Physical			Not required	Nice to have
Water column properties - Chemical			Not required	Nice to have
Water column properties - Biological			Not required	Nice to have
Currents			Not required	Nice to have
Tide/wave heights			Not required	Nice to have
Sea ice conditions			Nice to have	Highly desirable
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Highly desirable	Nice to have
Routes			Highly desirable	Highly desirable
Offshore cadastral			Nice to have	Highly desirable
Lease areas			Nice to have	Highly desirable
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Required	
Land use/land cover	Nice to have	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Highly desirable	Highly desirable	Highly desirable	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Nice to have	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	I don't know	I don't know	I don't know
Cost savings/cost reduction	Minor	I don't know	I don't know	I don't know
Cost avoidance	Minor	I don't know	I don't know	I don't know
Increased revenues	None	I don't know	I don't know	I don't know
Mission-driven performance improvements	Minor	I don't know	I don't know	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	I don't know	I don't know	I don't know

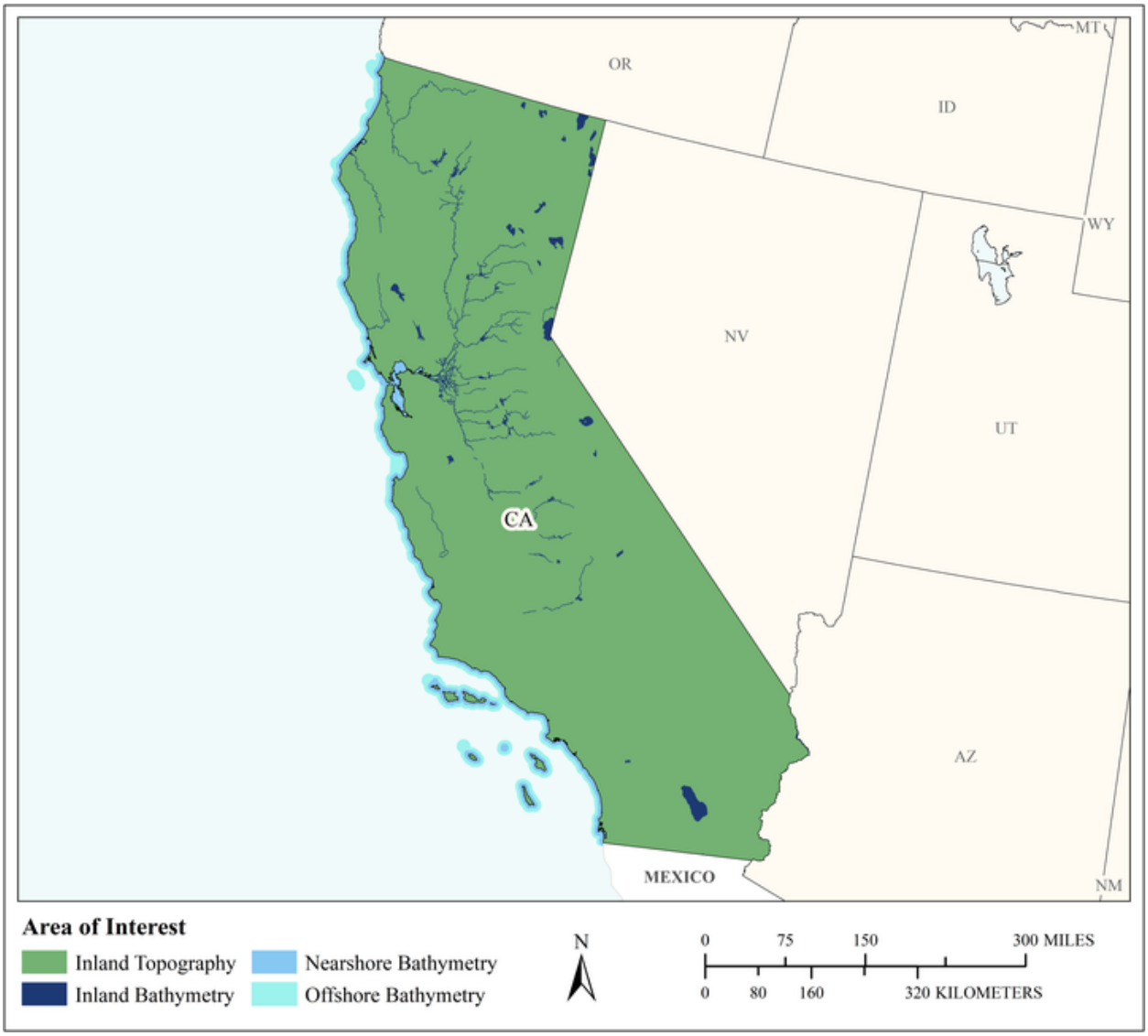
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	I don't know	I don't know	I don't know
Improved customer experience	Moderate	I don't know	I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	I don't know	I don't know	I don't know
Environmental	Minor	I don't know	I don't know	I don't know
Public safety, including life and property	Minor	I don't know	I don't know	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Moderate	Unable to provide		I don't know	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Increased revenues	None			I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$69,413					Annual dollars saved/ realized	$65,939			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			I don't know			Major			I don't know		
Environmental	Major			I don't know			Major			I don't know		
Public safety, including life and property	Major			I don't know			Major			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes		Yes	Yes
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids		Yes	Yes	
Hydrologic Flow Accumulation Grids		Yes	Yes	
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Cultural Resources Preservation and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Discovery and analysis of underwater archaeological and historical cultural sites. Site protection and preservation planning. Discovery and analysis of Native American and other historical cultural sites and subsistence activities.
MCA Title	Cultural Resources Preservation and Management
MCA ID	60047
Organization Type	State or U.S. Territorial government
Organization Name	State of California
Sub-Agency or Division	California Department of Parks and Recreation
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	Order 1a
Update Frequency	4-5 years	6-10 years	4-5 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Not required	Nice to have	Nice to have	Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	Required
DTM	Required	Highly desirable	Nice to have	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Not required	Not required	Not required	Not required
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Not required	Nice to have
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Nice to have	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Highly desirable
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Nice to have	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Required
Nautical and/or navigation charts			Highly desirable	Required
Acoustic imagery of the seafloor			Highly desirable	Required
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Nice to have
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Required	Required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have	Highly desirable	Highly desirable	Highly desirable
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Highly desirable	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Highly desirable	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Required	Required
Floating observation/navigation systems			Highly desirable	Required
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Required	
Land use/land cover	Nice to have	Highly desirable	Nice to have	Highly desirable
Wetlands	Nice to have	Highly desirable	Nice to have	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Nice to have	Highly desirable	Nice to have	
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Nice to have	Highly desirable	Highly desirable	
Cultural resources	Required	Highly desirable	Required	
Coastal and riverine structures	Nice to have	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	Moderate
Cost savings/cost reduction	Moderate	Minor	Minor	Minor
Cost avoidance	Minor	Minor	Minor	Minor
Increased revenues	None	Minor	None	None
Mission-driven performance improvements	Moderate	Moderate	Minor	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor	None	Minor

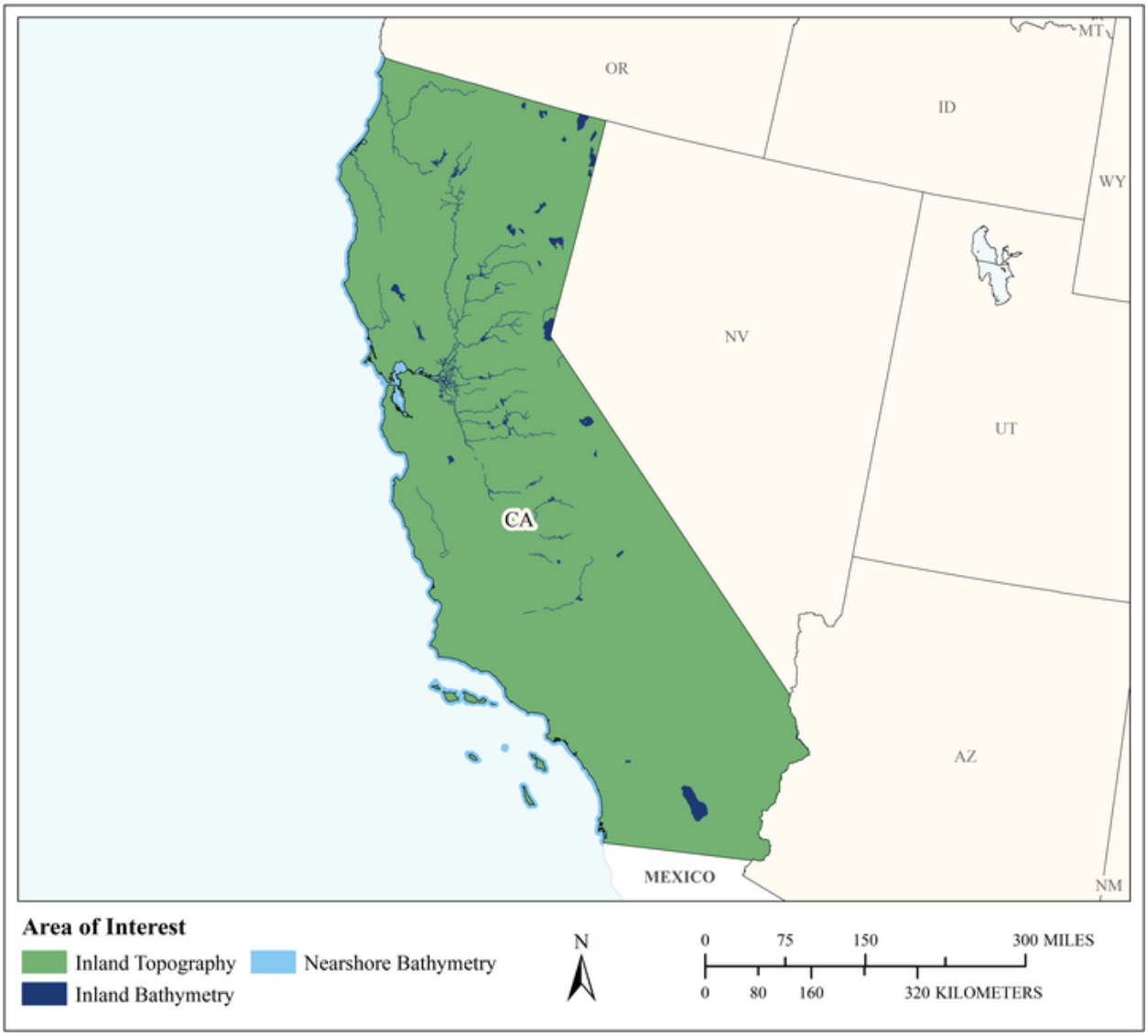
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major	Minor	Moderate
Improved customer experience	Moderate	Moderate	Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	Minor	Minor
Environmental	Minor	Moderate	Minor	Moderate
Public safety, including life and property	Minor	Moderate	None	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Increased revenues	None			None			None			None		
Mission-driven performance improvements	Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$28,987		Annual dollars saved/ realized	$69,512		Annual dollars saved/ realized	$2,326		Annual dollars saved/ realized	$11,173
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$25,343									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Moderate			Minor			Minor		
Environmental	Minor			Minor			Moderate			Moderate		
Public safety, including life and property	Minor			Minor			Minor			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				Yes

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Flood Risk Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Flood risk modeling and mapping of riverine and coastal areas. Dam/dike/levee safety analysis. Emergency management. Flood forecasts.
MCA Title	Flood Risk Management
MCA ID	60048
Organization Type	State or U.S. Territorial government
Organization Name	State of California
Sub-Agency or Division	California Department of Water Resources
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL2B	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Highly desirable	
DTM	Required	Required	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	
Classified point cloud	Required	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Not required	
Geologic and seismic data	Nice to have	Nice to have	Not required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Highly desirable	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Not required	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Minor	
Cost savings/cost reduction	Major	Minor	Minor	
Cost avoidance	Major	Moderate	Minor	
Increased revenues	Minor	Minor	None	
Mission-driven performance improvements	Major	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Minor	

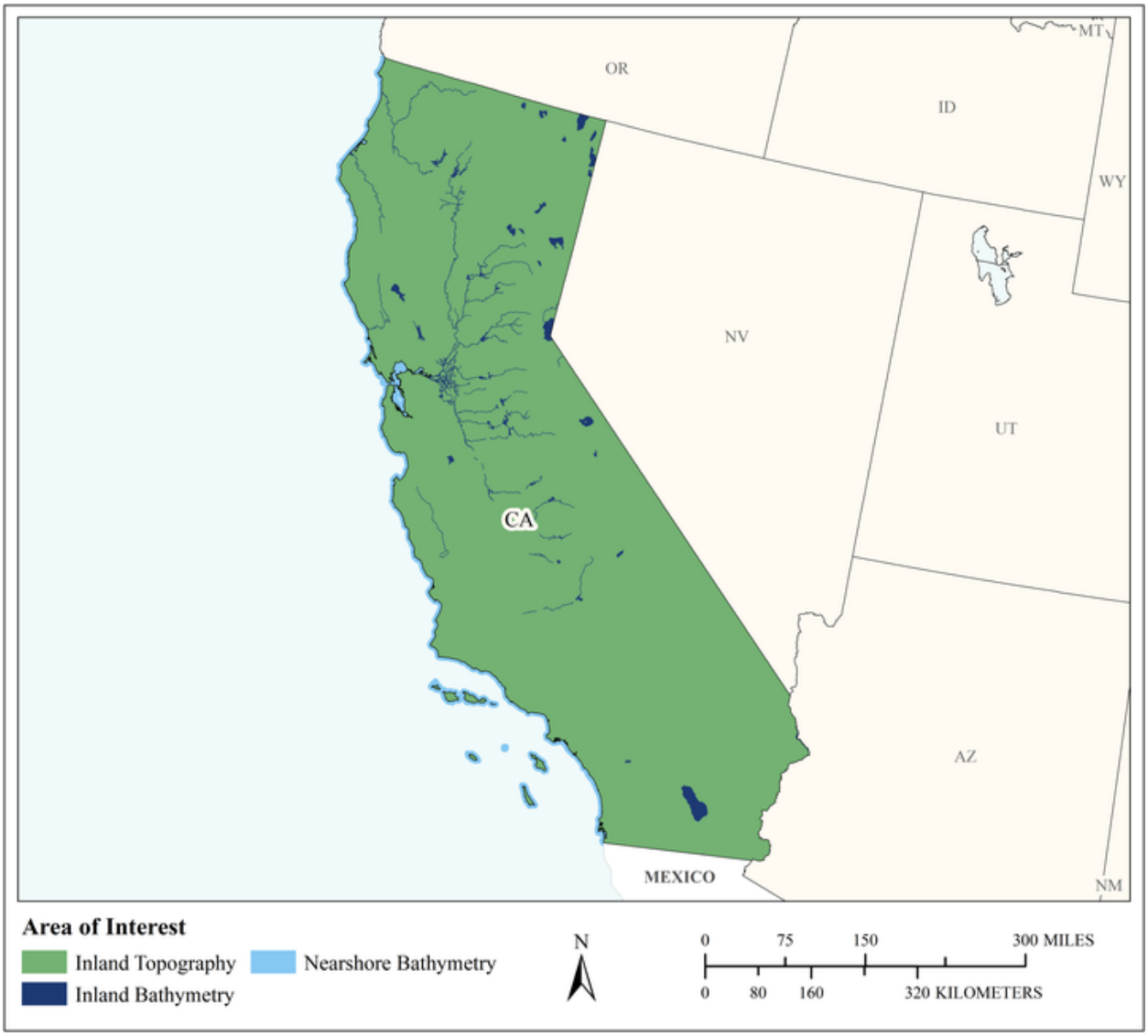
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	Minor	
Improved customer experience	Major	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor	Minor	
Environmental	Major	Moderate	Moderate	
Public safety, including life and property	Major	Moderate	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	Minor	Unable to provide		None			Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$22,204,718		Annual dollars saved/ realized	$1,542,493		Annual dollars saved/ realized	$153,877			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$3,885,130		Annual dollars saved/ realized	$1,731,824		Annual dollars saved/ realized	$114,045			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate			Major					
Environmental	Moderate			Moderate			Moderate					
Public safety, including life and property	Major			Major			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Sea Level Rise and Subsidence



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Modeling and mapping the effects of sea level rise or subsidence. Population and economic vulnerability assessments. Coastal inundation and infrastructure assessment.
MCA Title	Sea Level Rise and Subsidence
MCA ID	60049
Organization Type	State or U.S. Territorial government
Organization Name	State of California
Sub-Agency or Division	California Department of Water Resources
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 16 - Sea Level Rise and Subsidence
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL1B	QL2B	
Update Frequency	4-5 years	4-5 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Required	Required		Highly desirable	Required
Entire AOI under same environmental conditions	Highly desirable	Required	Required		Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Required		Highly desirable	Required
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have	Highly desirable	
DTM	Required	Required	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Highly desirable	Nice to have	
Classified point cloud	Required	Nice to have	Highly desirable	
Edited/cube XYZ		Not required	Not required	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Not required	Not required	
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Highly desirable	
Ground control/ground truthing	Required	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Required	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Required	Required	Highly desirable	
Wetlands	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Required	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes	Yes	Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Major	
Cost savings/cost reduction	Major	Major	Major	
Cost avoidance	Major	Major	Major	
Increased revenues	None	Minor	Minor	
Mission-driven performance improvements	Major	Major	Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	

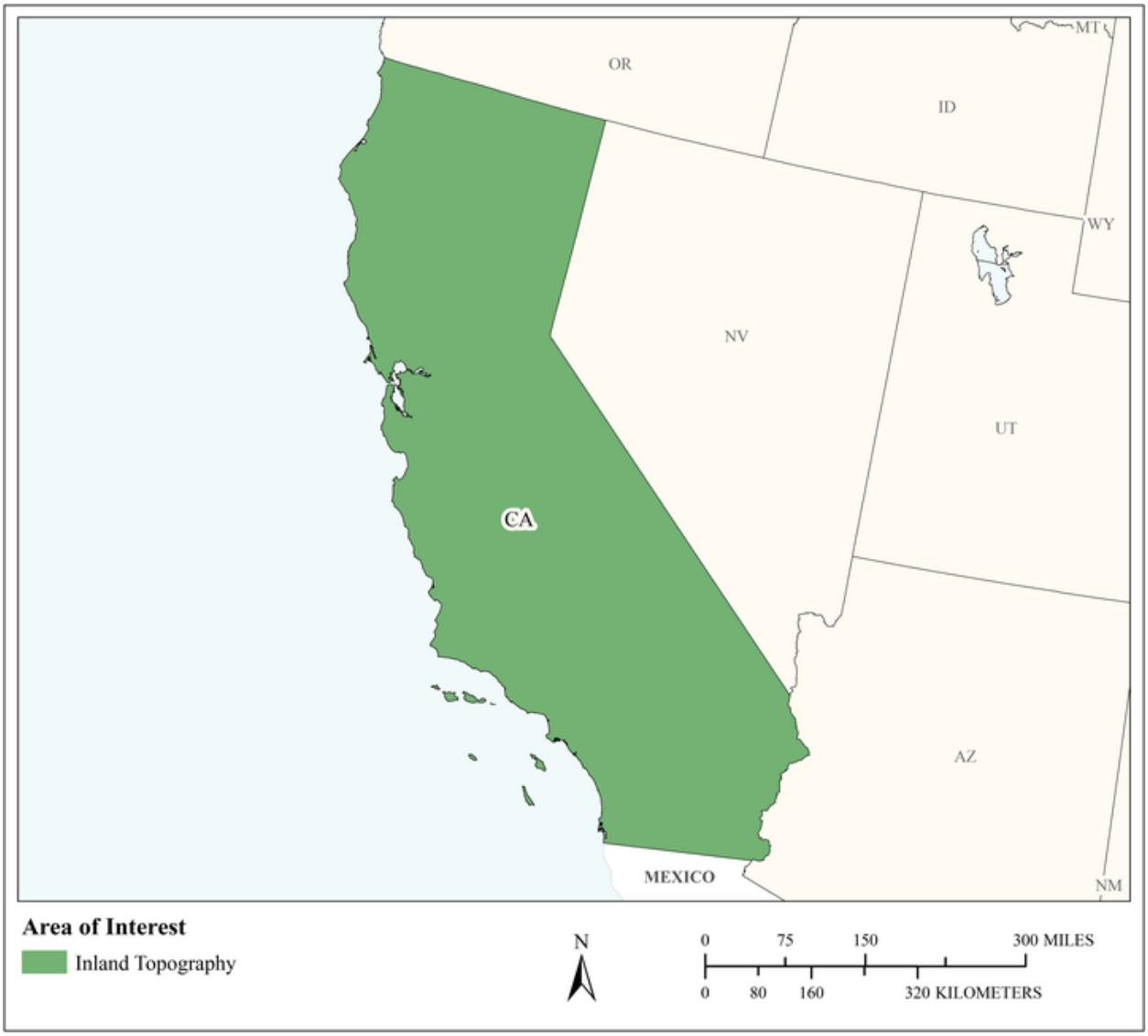
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Minor	Major	
Improved customer experience	Moderate	Moderate	Major	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Major	
Environmental	Moderate	Moderate	Major	
Public safety, including life and property	Major	Moderate	Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Increased revenues	Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$8,326,016									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Major					
Environmental	Moderate			Major			Major					
Public safety, including life and property	Moderate			Major			Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Wild Land Fire Protection



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Wild land Fire Protection. Elevation data are needed for managing incidents – elevation, fire spread, informing maps (hillshades and topo maps used as a base for incident action plan maps, also as fire behavior analysis tool input). The data are also used for risk assessments – fire burns faster uphill – to identify hazard and risk. For forestry, elevation data are needed for growing conditions, seed zone selection and delineation with elevation breaks for reforestation after harvest. There are many other uses, including analytical uses such as to improve wind speed models.
MCA Title	Wild Land Fire Protection
MCA ID	21739
Organization Type	State or U.S. Territorial government
Organization Name	California Department of Forestry and Fire Protection
Sub-Agency or Division	
Organization Mission	The California Department of Forestry and Fire Protection serves and safeguards the people and protects the property and resources of California.
Program Name	Fire Protection
Total Annual Program Budget	
Primary Business Use	BU 17 - Wildfire Management, Planning, and Response
Secondary Business Use	BU 04 - Forest Resources Management
Tertiary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Trees, vegetation and structures.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Horizontal Error	Up to 30 cm			
Acceptable Vertical Error	Up to 30 cm			
How far onshore needed				
How far down the beach profile needed	To MHHW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have					
DEM for entire AOI needs to be seamless	Nice to have					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	7.5 minute USGS topo maps and DEM. Statewide DEMs of various age.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	CAL FIRE			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Minor			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Moderate			

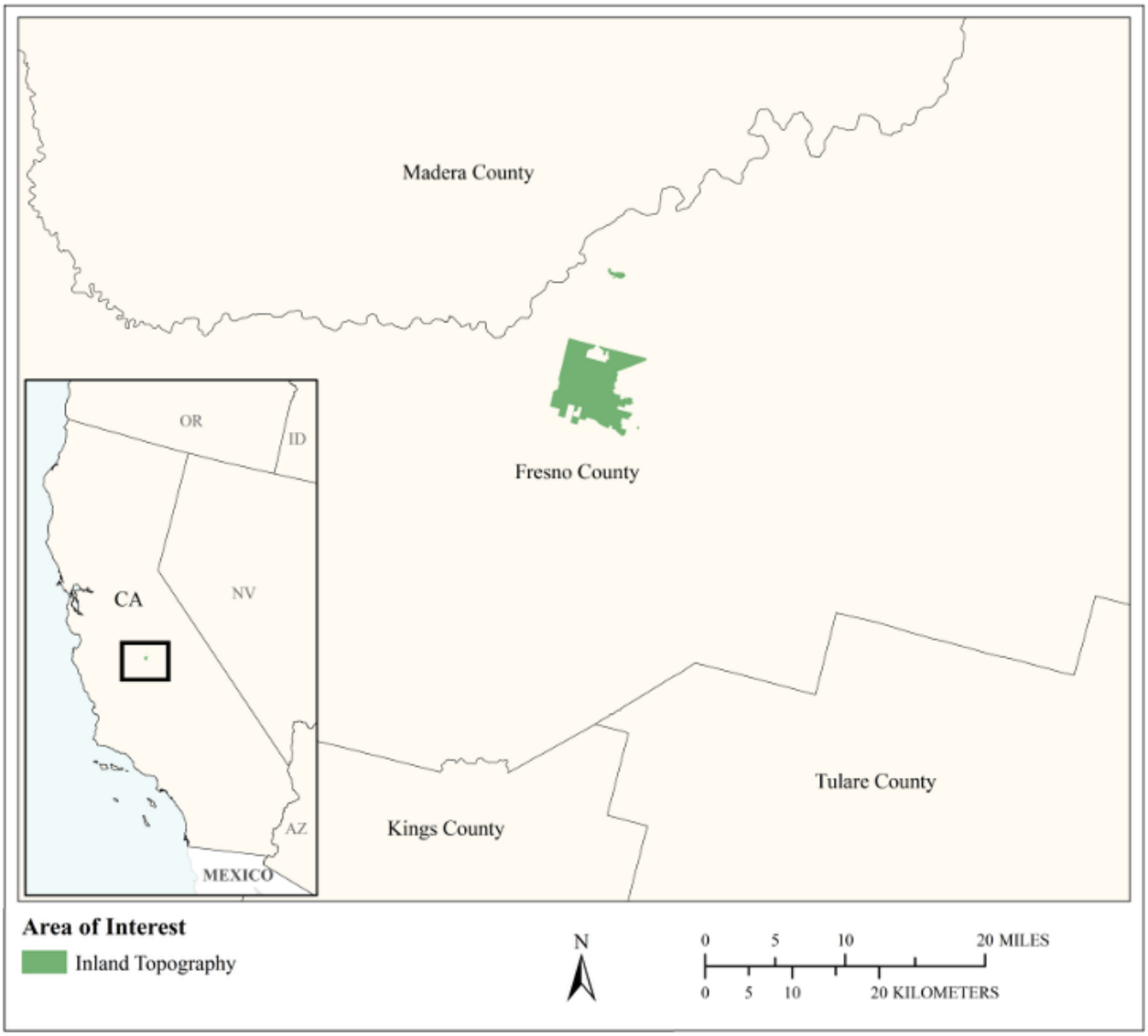
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Time savings description	Ability to do more in the office. Probably still need to go to the field for most permitting activities. Increased accuracy and precision means better model/data results = time saved. Probably more manipulation of data with LiDAR than traditional DEM. Improved models of slope stability, fire behavior etc. potential saved lives. Good for pre-harvest/post harvest inspection, approval of Timber harvest plans.											
Cost savings/cost reduction	Minor	Unable to provide										
Cost savings/cost reduction description	Probably will result in more costs from agencies investing in LiDAR. No previous costs for DEM.											
Cost avoidance	Moderate	Unable to provide										
Cost avoidance description	Better mapping and modeling results. Better fire modeling.											
Increased revenues	None											
Mission-driven performance improvements	Moderate	Unable to provide										
Mission-driven performance improvements description	Safer fire fighters and public places. Incident command teams get better intel. Fire spread modeling, post fire modeling debris flow modeling.											
Future annual operational benefits added during validation		Annual dollars saved/ realized	$849,698									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Value added to products or services description	More accurate depiction of slopes = improved fire fighter safety. Carbon and habitat modeling, fire spread and risk analysis improvements.											
Improved response or timeliness	Moderate	Unable to provide										
Improved response or timeliness description	Better, more accurate fire and flood modeling. Better modeling = improved customer assistance. Better post fire debris flow modeling and fire spread modeling. Better hazard mapping. Better post fire debris flow modeling. Better environmental documentation.											
Improved customer experience	Minor	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Moderate											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Law Enforcement



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Custom description			
Sub Area Requirements	City of Clovis, CA			

MCA Description	Response
Mission Critical Activity	Law Enforcement. First responder actions. Sewage, stormwater management, Hazmat, groundwater management, agriculture, fire, solar development, line of sight analysis, drone integration, and landfill maintenance. City and county functions. Engineering level requirements.
MCA Title	Law Enforcement
MCA ID	22266
Organization Type	Regional, County, City, or other local government
Organization Name	City of Clovis, CA
Sub-Agency or Division	
Organization Mission	Public Safety
Program Name	GIS
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	BU 22 - Infrastructure and Construction Management
Tertiary Business Use	BU 23 - Urban and Regional Planning

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Slope = 0.0015 feet

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm			
Acceptable Vertical Error	Less than 5 cm			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required					
Entire AOI under same environmental conditions	Not required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	USGS Quad Sheets 1970s. Acquire survey data for engineering purposes of new projects. 30M and 10M DEMs don't work for the city.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None			
Cost savings/cost reduction	None			
Cost avoidance	None			

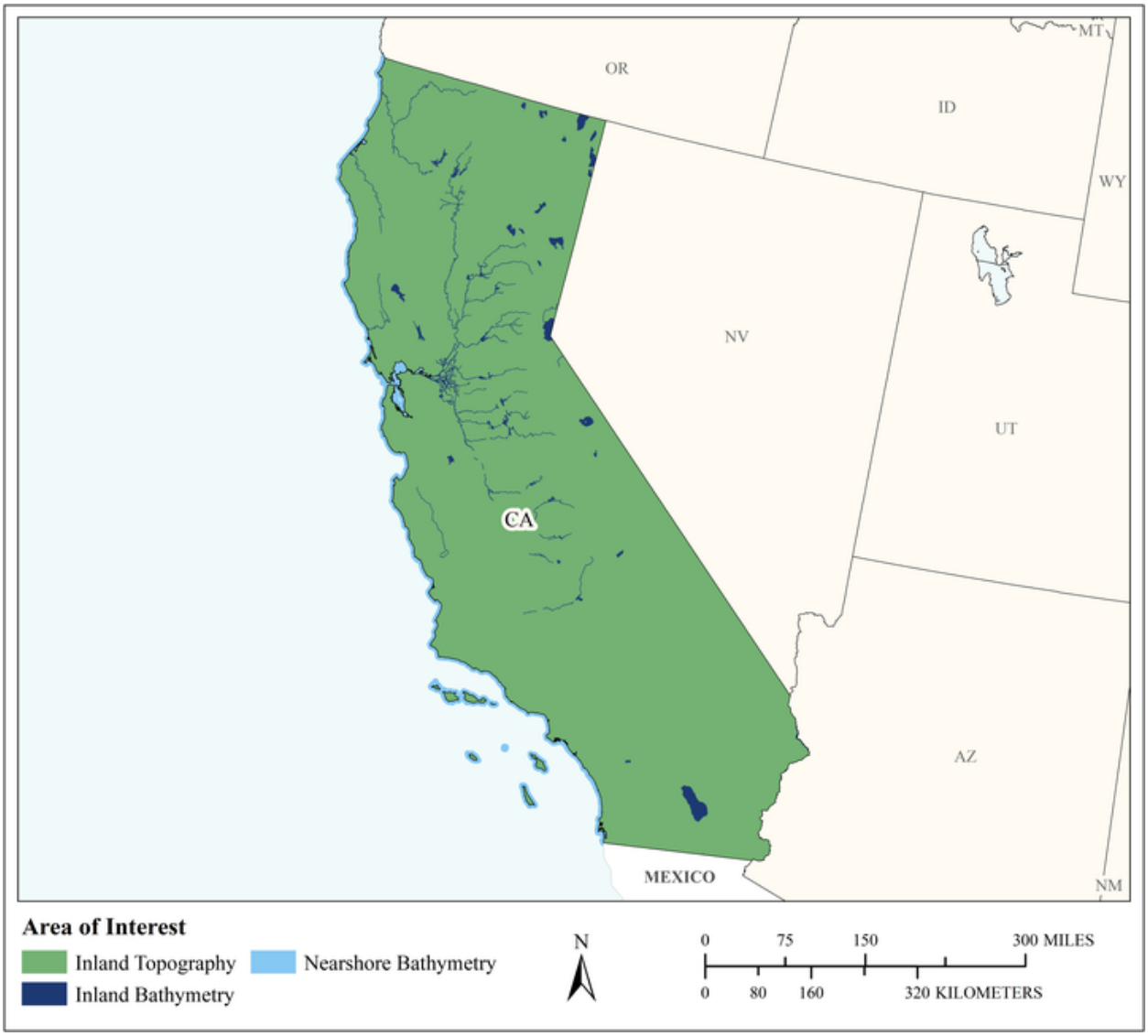
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	None			
Mission-driven performance improvements	None			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None			
Improved response or timeliness	None			
Improved customer experience	None			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	None			
Public safety, including life and property	None			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Time savings description	Reliability and future planning would be improved.											
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Mission-driven performance improvements description	Reliability and future planning would be improved.											
Other operational benefits	Major	Unable to provide										
Other operational benefits description	Tactical Line of Sight.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Value added to products or services description	Reliability and future planning would be improved.											
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Improved customer experience description	Reliability and future planning would be improved.											
Other customer service benefits	Major	Unable to provide										
Other customer service benefits description	Indoor 911.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											
Other	Public Safety / EOC											
Other benefits	Major											
Other description	Unable to provide											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Homeland Security, Law Enforcement, Disaster Response, and Emergency Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Infrastructure and border protection. Coastal search and rescue. Population dynamics. Emergency fuel supply and movement. Line of sight analysis in urban areas. Disaster response. Flood risk analysis resulting from acts of terrorism.
MCA Title	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
MCA ID	60050
Organization Type	State or U.S. Territorial government
Organization Name	State of California
Sub-Agency or Division	California Office of Emergency Services
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B	QL1B	
Update Frequency	4-5 years	4-5 years	6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable		Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Required	
DTM	Required	Highly desirable	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Highly desirable	Highly desirable	
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Highly desirable	Highly desirable	
Full waveform	Nice to have	Nice to have	Highly desirable	
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Highly desirable	
Ground control/ground truthing	Required	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Required	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Highly desirable	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Nice to have	
Boundaries			Highly desirable	
Routes			Highly desirable	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	
Cost savings/cost reduction	Major	Major	Major	
Cost avoidance	Major	Moderate	Moderate	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	Moderate	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Minor	

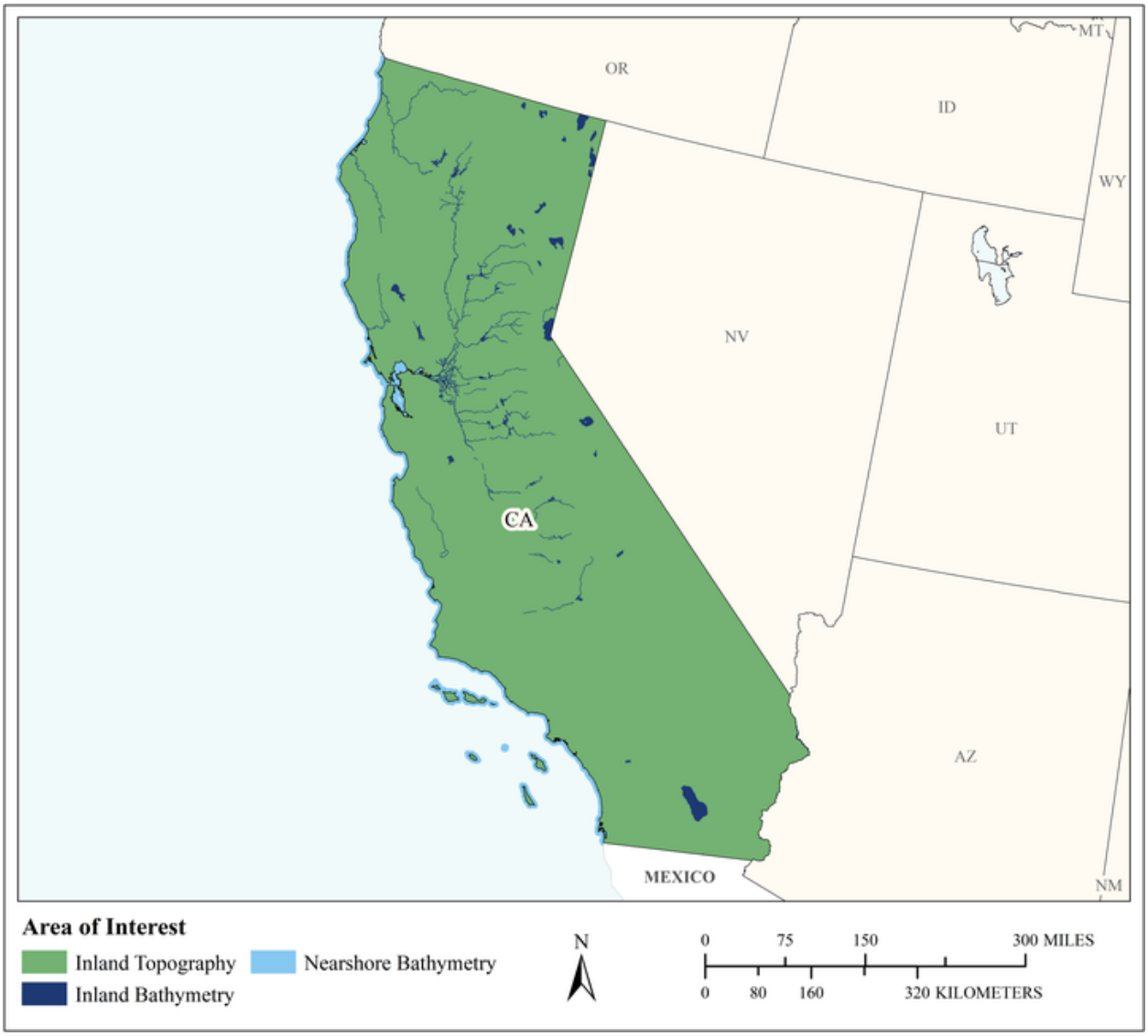
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major	Minor	
Improved customer experience	Major	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	Minor	
Environmental	Minor	Moderate	Minor	
Public safety, including life and property	Major	Major	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$4,665,352		Annual dollars saved/ realized	$1,313,882		Annual dollars saved/ realized	$7,487			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$82,458		Annual dollars saved/ realized	$83,827		Annual dollars saved/ realized	$214			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate					
Environmental	Moderate			Moderate			Moderate					
Public safety, including life and property	Major			Major			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Land Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Road and railroad route selection and maintenance. Slope analysis for autonomous cars. GPS navigation visualization.
MCA Title	Land Navigation and Safety
MCA ID	60051
Organization Type	State or U.S. Territorial government
Organization Name	State of California
Sub-Agency or Division	California Department of Transportation
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 19 - Land Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL0B	QL0B	
Update Frequency	2-3 years	2-3 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable		Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Highly desirable	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	
Classified point cloud	Highly desirable	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Highly desirable	
Full waveform	Nice to have	Nice to have	Highly desirable	
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	
Ground control/ground truthing	Required	Required	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Highly desirable	Highly desirable	Highly desirable	
Water column properties - Physical			Highly desirable	
Water column properties - Chemical			Highly desirable	
Water column properties - Biological			Highly desirable	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Highly desirable	
Boundaries			Highly desirable	
Routes			Highly desirable	
Offshore cadastral			Highly desirable	
Lease areas			Highly desirable	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Nice to have	Required	Highly desirable	
Land use/land cover	Highly desirable	Required	Highly desirable	
Wetlands	Required	Required	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Highly desirable	Highly desirable	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Minor	
Cost savings/cost reduction	Major	Minor	Minor	
Cost avoidance	Moderate	Minor	Minor	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	None	

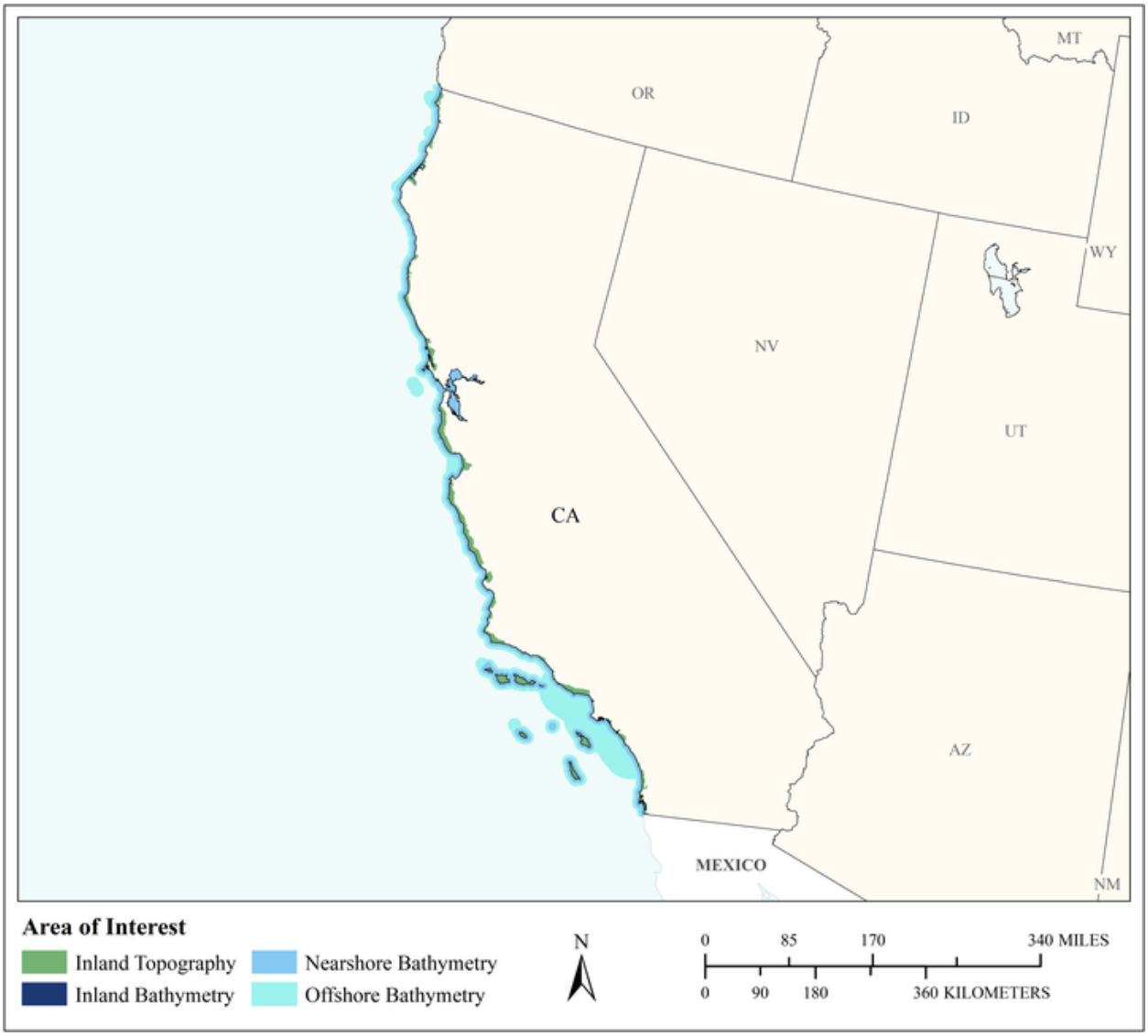
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	None	
Improved customer experience	Major	Minor	None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	None	
Environmental	Moderate	Moderate	Moderate	
Public safety, including life and property	Major	Minor	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		None					
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,048,691		Annual dollars saved/ realized	$87,385						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$165,442		Annual dollars saved/ realized	$904						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			None					
Environmental	Major			Moderate			Moderate					
Public safety, including life and property	Major			Moderate			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps	Yes		Yes	
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes		Yes	
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Management of California Ports



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Custom description	Custom description	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Custom description
Sub Area Requirements	Coastal zone of California	Coastal zone of California		25 miles off of California

MCA Description	Response
Mission Critical Activity	To protect and preserve the coastal lands and waters within and around California ports. We need 3D elevation data and related information products for two very simple reasons: Looking down, we need to know where the bottom is and where the water level is to ensure ships don't run aground. Looking up, we need to know where the water level is and where bridges, power lines, and other overhead obstructions are so ships can pass safely underneath. Both are increasingly challenging as ships get bigger, deeper, wider, and taller... all dimensions! Elevation and bathymetry are also used for planning and engineering, dredging, maintenance, environmental, and railway development. Included in this activity are the Port of Long Beach, the San Diego Unified Port District, and the Marine Exchange of Southern California. The Marine Exchange is responsible for the ports at Port Hueneme, Los Angeles, Long Beach, San Diego, Seal Beach Naval Weapons' Station, and El Segundo Refinery Chevron Offshore Moorings. The exchange is also responsible for vessel traffic service for Los Angeles and Long Beach out to a 25 mile radius, (like air traffic control). Additional Business Uses include BU 01 – Water Supply and Quality, BU 06 – Natural Resources Conservation, BU 18 – Homeland Security, BU 23 – Urban and Regional Planning, BU 27 – Recreation, and BU 30 – Maritime and Land Boundary Management.
MCA Title	Management of California Ports
MCA ID	21591
Organization Type	State or U.S. Territorial government
Organization Name	California Ports
Sub-Agency or Division	
Organization Mission	The San Diego Unified Port District was created by Chapter 67, Statutes of 1962 to manage in trust certain tide and submerged lands within the San Diego Bay. Lands within the Bay that had been previously granted to the cities of San Diego, Chula Vista, Coronado, and National City were transferred to the District. In addition land originally granted to Imperial Beach along the Pacific Ocean was transferred to the Port. The lands are to be used for purposes that benefit the statewide public, including commerce, navigation, fisheries, and recreation. The mission of the Marine Exchange is to provide Maritime Information and Communications Service to Southern California and operate the Vessel Traffic Service to the ports of Los Angeles and Long Beach in a public/private partnership with the U.S. Coast Guard that facilitates safe, secure, efficient, reliable, and environmentally sound maritime transportation. The Port of Long Beach is an international gateway for the reliable, efficient and sustainable movement of goods for the benefit of our local and global economies.
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Secondary Business Use	BU 03 - Coastal Zone Management
Tertiary Business Use	BU 22 - Infrastructure and Construction Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required

What Needs to be Measured in 3D	Response
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required
Other	Required
Other description	Bottom type

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Survey level features
Description of smallest 3D features	We need to know where the bottom is in general and where: Looking down: 1. Where the bottom is and what it is made of in general 2. Where specific obstructions are such as rocks, wrecks, etc, and Looking up: 1. Where the bottom of bridges are so ships' masts, smokestacks, antennas, etc. do not touch. Also building structures, access roads, railroad network, and small docks onshore.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Nice to have
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B	QL0B	Order 1a
Update Frequency	2-3 years	2-3 years	2-3 years	4-5 years
Event type(s)				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI			Channels and anchorages need great detail. General waterways greater than 100' deep require less accuracy.	We handle ships to 69' draft, so with a margin of error, need accuracy up to 100'. Beyond that, need less accuracy other than where things like pipelines and underwater cables are so ships don't anchor there.
Acceptable Horizontal Error	Less than 20 cm	Up to 2 meters	Less than 50 cm	Up to 5 meters
Acceptable Vertical Error	Less than 5 cm	Up to 30 cm	Less than 10 cm	Less than 1 meter
How far onshore needed			As far as there are any bridges and/or any other obstructions such as power lines, pipelines, etc. crossing a waterway.	
How far down the beach profile needed	To MLLW		Below MLLW	
Tide correction requirement			MLLW	MLLW
Cross sections and/or transects meet needs			Partial	
Cross section/transect requirement			25 ft spacing for engineering, 100 ft elsewhere	

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Highly desirable
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have	Highly desirable	Not required	Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Nice to have	Highly desirable	Not required	Nice to have	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Required	Required	Not required	Required	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Required	Required	Not required	Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Required	Required
DTM	Required	Highly desirable	Required	Highly desirable
DEM	Required	Required	Required	Highly desirable
Raw point cloud data	Highly desirable	Nice to have	Required	Not required
Classified point cloud	Highly desirable	Nice to have	Not required	
Edited/cube XYZ		Nice to have	Highly desirable	Not required
Full waveform	Nice to have	Not required	Not required	Required
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Not required
Breaklines required for standard hydro-flattening	Highly desirable	Not required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Not required
Tide Predictions			Required	Required
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Not required
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Required	Not required
Ground control/ground truthing	Required	Nice to have	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Highly desirable	Not required
Aerial and/or satellite imagery	Required	Required	Highly desirable	Not required
Underwater videography			Required	Not required
Bottom texture			Required	Required
Bottom type			Required	Required
Submerged features			Required	Required
Subbottom characteristics			Required	Required
Geologic and seismic data	Nice to have	Not required	Required	Not required
Water column properties - Physical			Nice to have	Not required
Water column properties - Chemical			Nice to have	Not required
Water column properties - Biological			Nice to have	Not required
Currents			Required	Required
Tide/wave heights			Required	Required
Sea ice conditions			Required	Required
Habitat distribution and classification			Highly desirable	Required
Boundaries			Required	Required
Routes			Required	Required
Offshore cadastral			Highly desirable	Nice to have
Lease areas			Not required	Nice to have
Fixed obstructions			Required	Required
Floating observation/navigation systems			Required	Required
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Nice to have	Nice to have	Highly desirable	Required
Wetlands	Highly desirable	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Nice to have	Required	Required	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Required	Nice to have	Required	
Cultural resources	Highly desirable	Highly desirable	Nice to have	
Coastal and riverine structures	Required	Highly desirable	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			
Other				Required
Other description				Overhead obstructions... bridges, power lines, etc.

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	2017 TIN crated from lidar - <20cm vertical accuracy. Port of Long Beach, a local agency, conducts photogrammetric surveys periodically.		Nearshore survey points, bathy lines, NOAA Charts which are updated by the ports of Long Beach and Los Angeles.	NOAA Charts NOAA weather Scripps/CDIP Wave Buoys
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other	Yes		Yes	Yes
Other description	Custom flights, Local agency photogrammetry		Local University UCSD, Local agency bathymetry, Survey data of Port of Long Beach and Port of Los Angeles	CDIP/Scripps wave buoys
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Major	Major
Cost savings/cost reduction	Major	I don't know	Major	Major
Cost avoidance	Moderate	Major	Major	Major
Increased revenues	Minor	None	Major	Major
Mission-driven performance improvements	Moderate	Minor	Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None	Major	Major
Improved response or timeliness	Moderate	None	Major	Major
Improved customer experience	Major	None	Major	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	None	Moderate	Moderate
Environmental	Major	None	Major	Major
Public safety, including life and property	Major	None	Major	Major
Other Current Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other				Major
Other description				Greater safety, efficiency, and reliability of ship movements, with reduced emissions

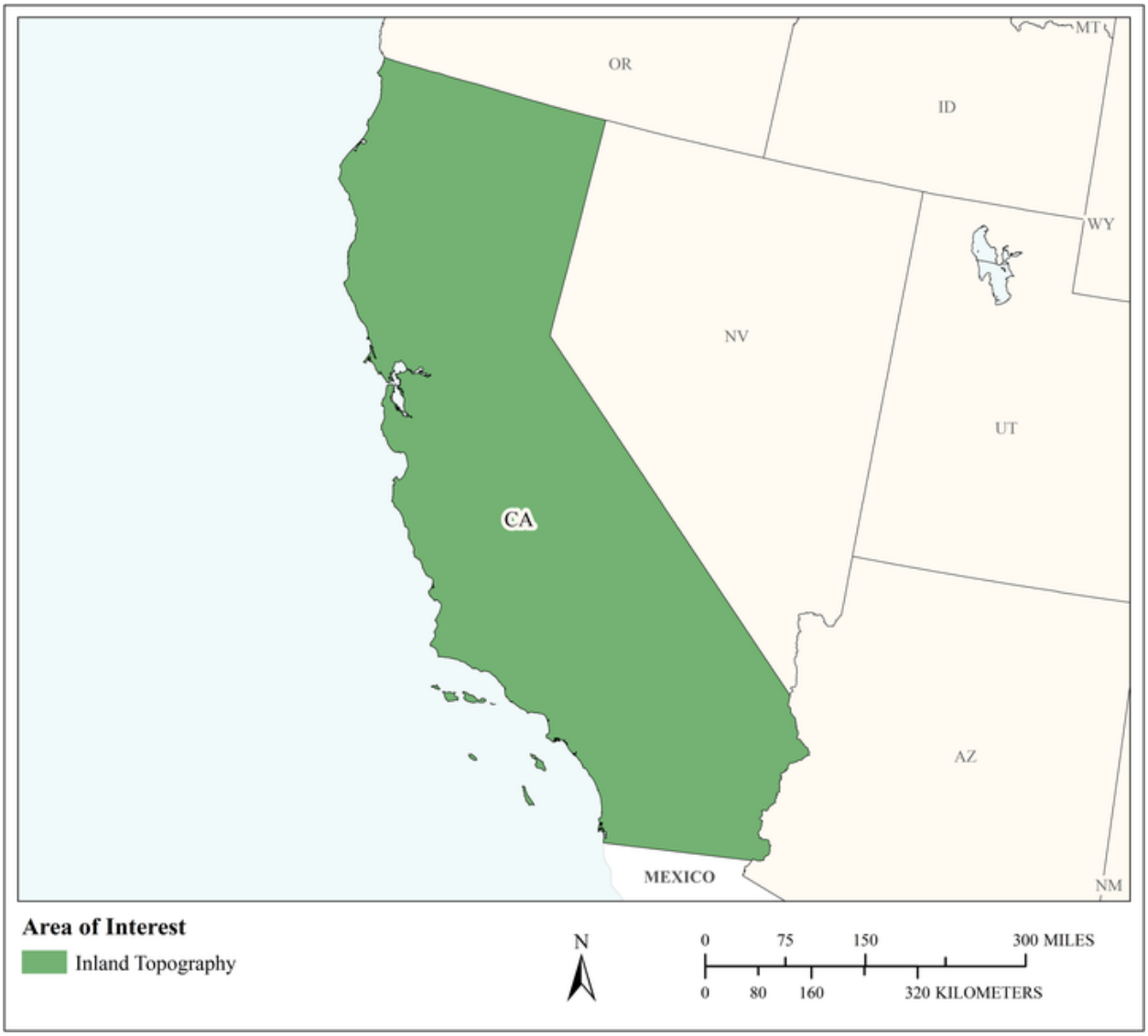
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$68,742	Major	Unable to provide		Major	Unable to provide		None		
Time savings description							Reduced risk of ship grounding.					
Cost savings/cost reduction	Major	Annual dollars saved/realized	$20,000	Major	Unable to provide		Major	Annual dollars saved/realized	$15,000	None		
Cost savings/cost reduction description	Less field work; no contractor needed, acquisition costs could be saved.						Acquisition costs could be saved.					
Cost avoidance	Moderate	Annual dollars saved/realized	$20,000	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	None			Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues description							Increased revenue due to more efficient ship movement due to using science and technology to enable better go/no go decision-making.					
Mission-driven performance improvements	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Mission-driven performance improvements description							More cargo and passengers moved without delay, but delays made when appropriate, based on science and technology.					
Other operational benefits		Annual dollars saved/realized	$20,000				Major	Unable to provide				
Other operational benefits description							Safer and more reliable and efficient ship movements. Reduce emissions due to less waiting.					
Future annual operational benefits added during validation					Annual dollars saved/ realized	$623,007		Annual dollars saved/ realized	$2,869,726			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Value added to products or services description										Reduced risk of oil spills from groundings, and striking bridges and other overhead obstructions.		
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Other customer service benefits	Moderate	Unable to provide								Major	Unable to provide	
Future annual customer service benefits added during validation					Annual dollars saved/ realized	$379,663		Annual dollars saved/ realized	$21,093			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Moderate			Minor			Minor		
Education or outreach description	Restricted access						Minor benefits as access already controlled.					
Environmental	Minor			Moderate			Major			Major		
Environmental description	Restricted access						Access already controlled. The more we know about the bottom the more we can do routine things such as anchor ships better, and avoid groundings.					

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Public safety, including life and property	Moderate	Moderate	Major	Major
Public safety, including life and property description	Area well patrolled to begin with		Access restricted (e.g. no swimming). Ships normally stay in channels and good waterways, but when there is an emergency, responding units can get in shallow, not normally used waters, and the more we know about it the better we can respond.	
Other	Clear line of sight studies		Safer, and more reliable/efficient ship and vessel movements.	
Other benefits	Moderate		Major	
Other description			Ships are getting bigger and deeper draft; tolerances are less... need to know where the bottom is and where the bottom of the overhead obstructions are	

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes		Yes	
Slope maps			Yes	
Aspect maps				
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps			Yes	Yes
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness			Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Aviation Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of in-flight hazards and path obstructions. Aeronautical charting. Runway construction and repair.
MCA Title	Aviation Navigation and Safety
MCA ID	60052
Organization Type	State or U.S. Territorial government
Organization Name	State of California
Sub-Agency or Division	California Department of Transportation
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 21 - Aviation Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes			
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Major			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

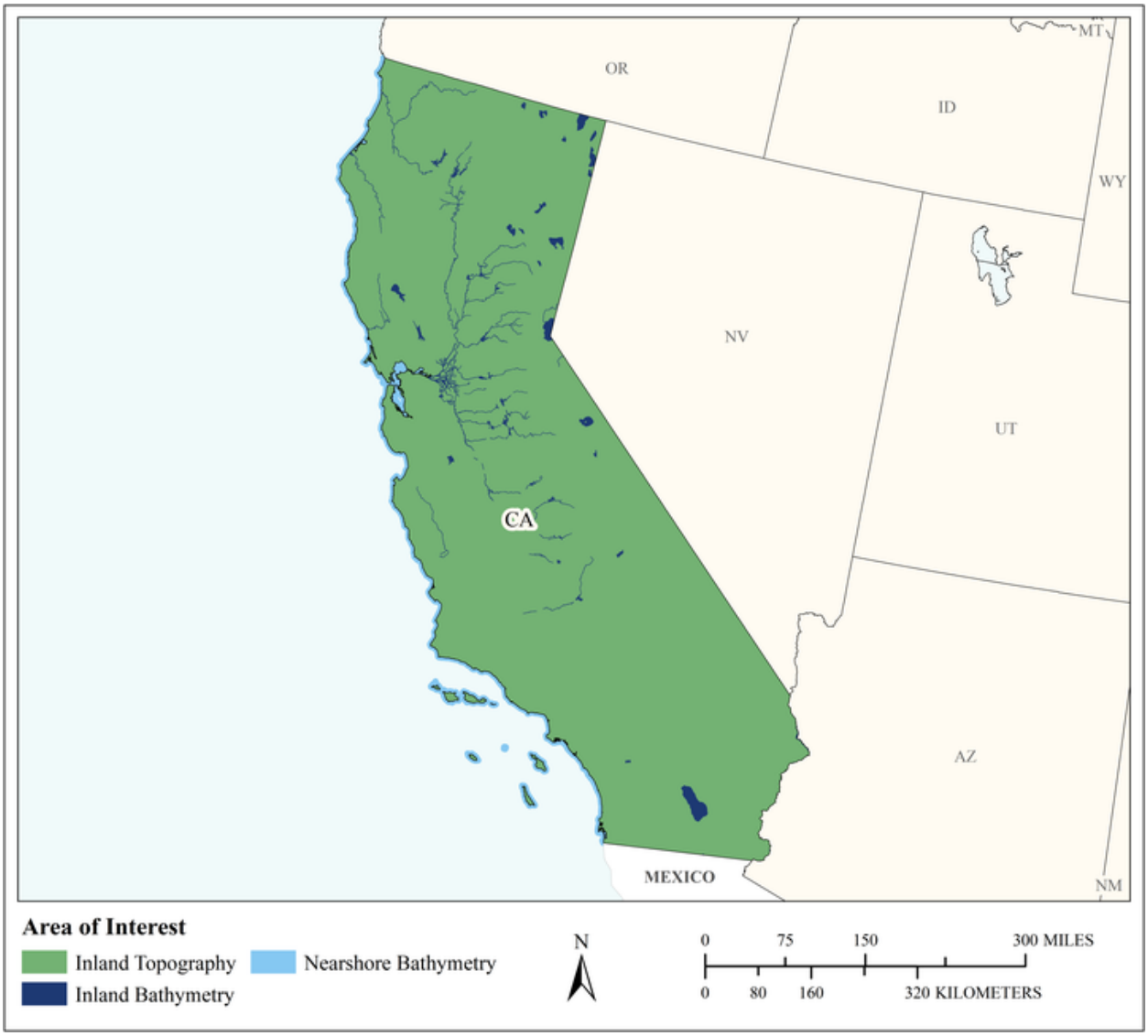
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,495,056									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,862,004									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Moderate											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Designing and Building of Transportation Systems



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	To provide high accuracy elevation data for designing and building transportation systems. Provide lower accuracy elevation data for transportation project planning and hydraulic studies for bridge design.
MCA Title	Designing and Building of Transportation Systems
MCA ID	1371
Organization Type	State or U.S. Territorial government
Organization Name	California Dept. of Transportation
Sub-Agency or Division	
Organization Mission	"Provide a safe, sustainable, integrated and efficient transportation system to enhance California's economy and livability."
Program Name	Project Delivery. "Project Delivery's role is to facilitate the delivery of capital projects on our State Highway system that will improve the movement of people, goods and services across California. Within Project Delivery, the Divisions of Design, Construction, Engineering Services, Environmental Analysis, Project Management and Right of Way and Land Surveys help facilitate the delivery of the Department's capital projects."
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 19 - Land Navigation and Safety
Tertiary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Buildings that are greater than 100 square feet

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B	QL0B	
Update Frequency	Event driven only – Data need to coincide with a specific event.	Event driven only – Data need to coincide with a specific event.	Event driven only – Data need to coincide with a specific event.	
Event type(s)	A funded project or a natural disaster.	A funded project or a natural disaster.	A funded project or a natural disaster.	
Quality Level and/or update frequency variability across AOI	Only interested in Caltrans owned facilities.			
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	
Acceptable Vertical Error	Up to 10 cm	Up to 20 cm	Up to 20 cm	
How far onshore needed			To Mean Higher High Water (MHHW)	
How far down the beach profile needed	Not applicable		To MHHW	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Required	Highly desirable		Required	Highly desirable
Entire AOI under same environmental conditions	Nice to have	Highly desirable	Highly desirable		Required	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable		Required	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Nice to have	
DTM	Required	Required	Required	
DEM	Not required	Nice to have	Nice to have	
Raw point cloud data	Nice to have	Nice to have	Nice to have	
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Required	Highly desirable	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Nice to have	Highly desirable	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Not required	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Not required	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates	Nice to have	Nice to have	Not required	
Land use/land cover	Highly desirable	Nice to have	Highly desirable	
Wetlands	Highly desirable	Nice to have	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Nice to have	Highly desirable	
Cultural resources	Highly desirable	Nice to have	Highly desirable	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Photogrammetric topographic mapping at NMAS, 1"=50', 2-foot contours - Project driven dates LiDAR based topographic mapping at NMAS, 2-foot contours - Project driven dates	0.5' at 95% confidence level - Project driven dates	1.0' at 95% confidence level	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI	Yes			
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes	Yes	Yes	
Other description	Caltrans creates it thru my Office	We create it	We create our own data	

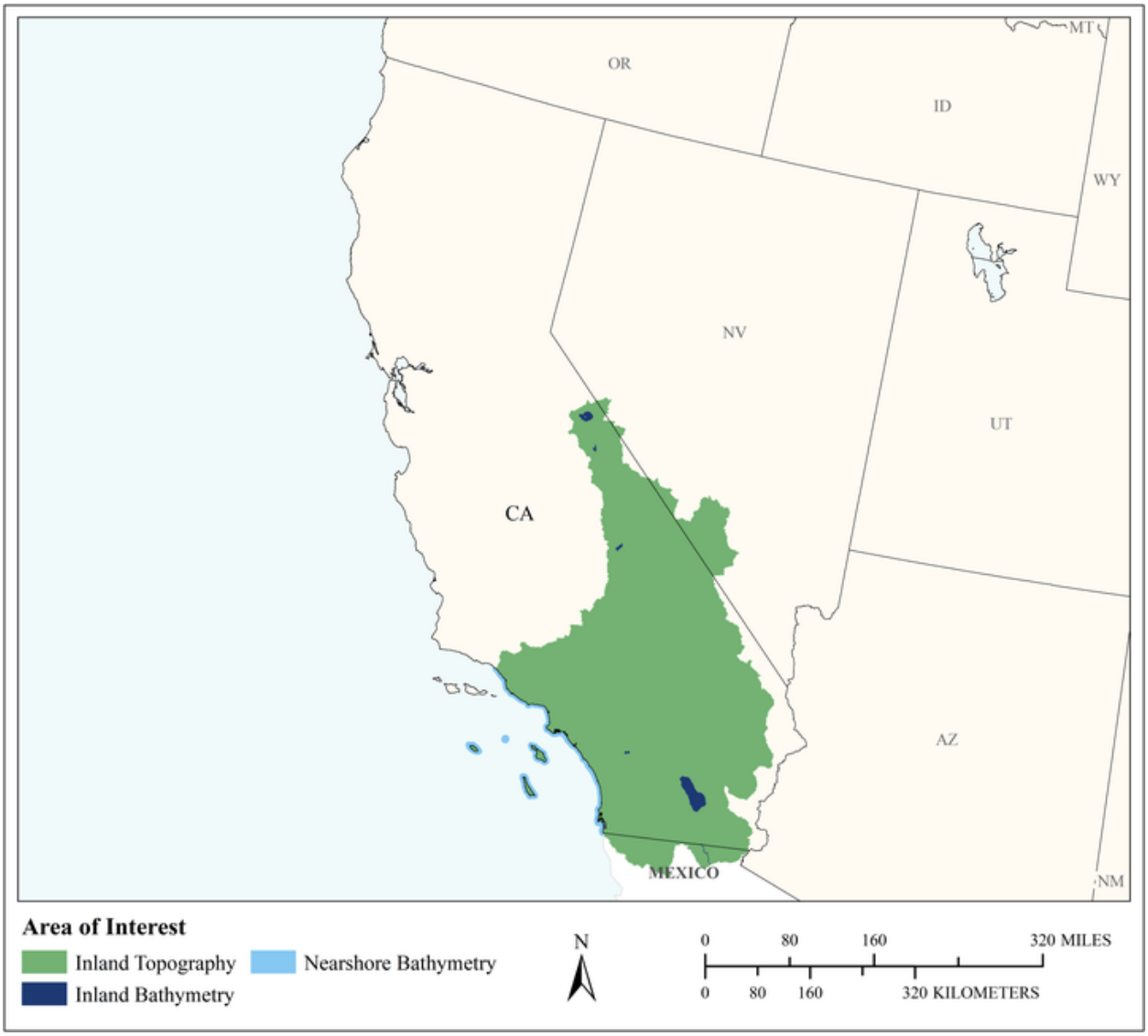
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Major	
Cost savings/cost reduction	Major	Major	Major	
Cost avoidance	I don't know	Major	Major	
Increased revenues	I don't know	None	None	
Mission-driven performance improvements	I don't know	Major	Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Major	Major	
Improved response or timeliness	Major	Major	Major	
Improved customer experience	Moderate	Major	Major	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	None	Minor	
Environmental	Minor	Moderate	Minor	
Public safety, including life and property	Moderate	Moderate	I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$195,975	Major	Annual dollars saved/realized	$180,900	Major	Unable to provide				
Time savings description				No longer need field crews to pick up bathymetric data.								
Cost savings/cost reduction	Major	Annual dollars saved/realized	$100,000	Major	Annual dollars saved/realized	$750,000	Major	Unable to provide				
Cost avoidance	Major	Annual dollars saved/realized	$660,000	Moderate	Unable to provide		Major	Unable to provide				
Increased revenues	I don't know	Unable to provide		Minor	Unable to provide		None					
Mission-driven performance improvements	Major	Annual percent improvement	30%	Major	Annual percent improvement	55%	Major	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			Minor			None					
Environmental	I don't know			Minor			Moderate					
Public safety, including life and property	Moderate			Moderate			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement	Yes	Yes	Yes	
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Emergency Planning and Hazard Assessment



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)	One or more Hydrologic Units (HUC4s)	Nearshore areas along the coast (including the Great Lakes) off one or more Hydrologic Units (HUC4s)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Emergency planning and hazard assessment (coastal flooding and sea level, landslide, risk, flooding, search and rescue, etc.). General regional planning and development
MCA Title	Emergency Planning and Hazard Assessment
MCA ID	22318
Organization Type	Regional, County, City, or other local government
Organization Name	Los Angeles County, CA
Sub-Agency or Division	
Organization Mission	All functions of a county government (e.g. planning, emergency services, public health, parks and recreation, etc.)
Program Name	Multiple programs and departments
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Tertiary Business Use	BU 17 - Wildfire Management, Planning, and Response

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Not required
Other	Required
Other description	Near coastal outfalls and navigable channels

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Individual street trees, structures ~300 sq ft in size, and other infrastructure and facilities.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL1B	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 30 cm	Up to 30 cm	Up to 30 cm	
Acceptable Vertical Error	Up to 20 cm	Up to 20 cm	Up to 20 cm	
How far onshore needed			To Mean Higher High Water (MHHW)	
How far down the beach profile needed	To MLLW		To MLLW	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable		Highly desirable		Nice to have	Highly desirable
Entire AOI under same environmental conditions	Nice to have		Nice to have		Nice to have	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable		Highly desirable		Nice to have	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable		Highly desirable		Nice to have	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know		I don't know		I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have		Highly desirable	
DTM	Required	Highly desirable	Highly desirable	
DEM	Highly desirable	Highly desirable	Highly desirable	
Raw point cloud data	Nice to have	Nice to have	Nice to have	
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ				
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Nice to have	Required	
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable		Highly desirable	
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Highly desirable	Highly desirable		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Nice to have		
Cultural resources	Highly desirable	Nice to have		
Coastal and riverine structures	Highly desirable	Nice to have	Highly desirable	
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	I believe we have Q2 data, obtained by the county with support from USGS.	No data currently available	NOAA Coastal LiDAR	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI			Yes	
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	We use our own acquisition			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Inland bathy data not available	I don't know	

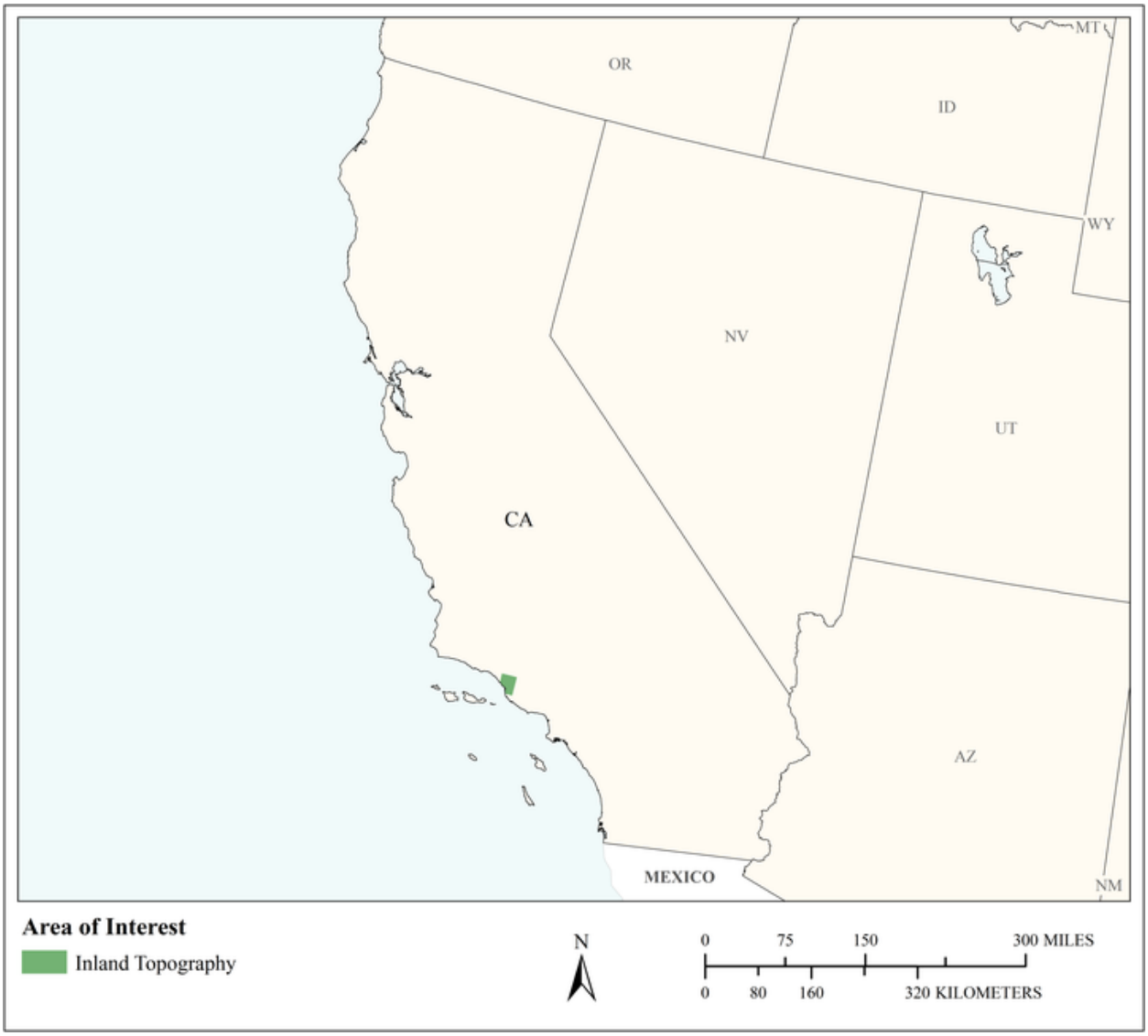
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost savings/cost reduction	Moderate	Inland bathy data not available	I don't know	
Cost avoidance	Moderate	Inland bathy data not available	I don't know	
Increased revenues	I don't know	Inland bathy data not available	I don't know	
Mission-driven performance improvements	Moderate	Inland bathy data not available	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available	Major	
Improved response or timeliness	Moderate	Inland bathy data not available	Moderate	
Improved customer experience	Moderate	Inland bathy data not available	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Inland bathy data not available	I don't know	
Environmental	Moderate	Inland bathy data not available	I don't know	
Public safety, including life and property	Moderate	Inland bathy data not available	I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know			I don't know					
Environmental	I don't know			I don't know			I don't know					
Public safety, including life and property	I don't know			I don't know			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes	Yes	Yes	
Curvature maps	Yes	Yes	Yes	
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes	Yes	Yes	
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Regional Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Custom description			
Sub Area Requirements	USGS 7.5 min quads: Ventura, Saticoy, Northern half of Oxnard & Oxnard OE W, Southern half of Matilija & Ojai			

MCA Description	Response
Mission Critical Activity	Planning
MCA Title	Regional Planning
MCA ID	22342
Organization Type	Regional, County, City, or other local government
Organization Name	City of San Buenaventura
Sub-Agency or Division	
Organization Mission	I have not found a formal mission statement, but being a local government, I imagine it is to enhance the safety and well being of its residents
Program Name	City GIS
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Tertiary Business Use	BU 22 - Infrastructure and Construction Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Infrastructure - signs, sewer manholes, water valves, buildings - roof forms, stair wells, topography surrounding each building

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI	Urbanized areas require more frequent updates			
Acceptable Horizontal Error	Less than 20 cm			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed	To MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Other	Highly desirable					
Other description	No restrictions					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required			
Ground control/ground truthing	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			
Other	Highly desirable			
Other description	Contours 1-2'			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	https://www.arcgis.com/home/item.html?id=d1ba09f2e15f43998f7461fcc9f6c0dc			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know			

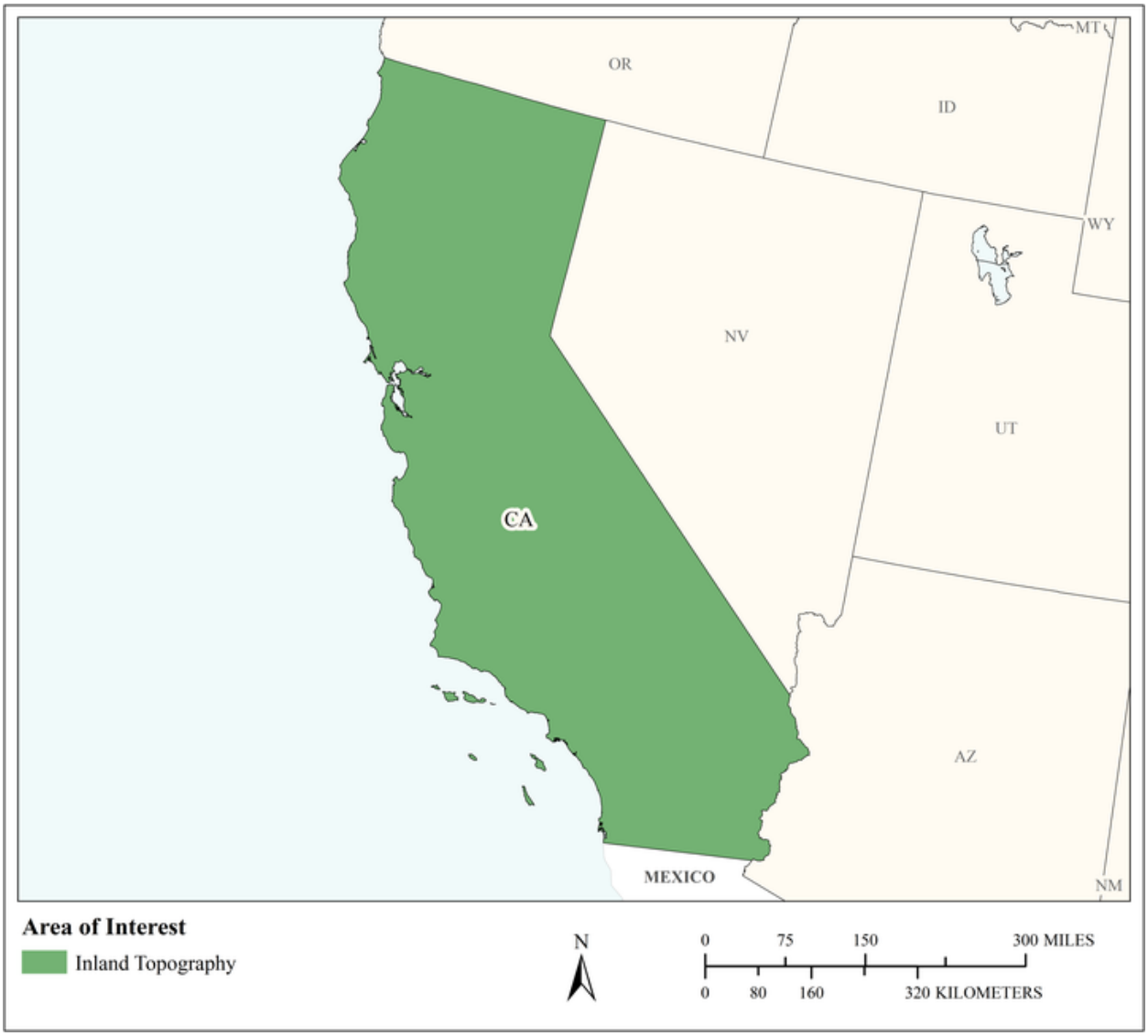
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost savings/cost reduction	I don't know			
Cost avoidance	I don't know			
Increased revenues	I don't know			
Mission-driven performance improvements	I don't know			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			
Improved response or timeliness	Minor			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Moderate			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide										
Cost savings/cost reduction	I don't know	Unable to provide										
Cost avoidance	I don't know	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	I don't know	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved response or timeliness description	We used the lidar to document building forms prior to the Thomas Fire since plans did not exist.											
Improved customer experience	Minor	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Health and Human Services



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Health emergency response. Habitat modeling and disease prevention. Defining boundaries for health advisories for swimming and fishing. Marine-based bioproducts and pharmaceuticals. Public health and safety. Prevention of waterborne diseases.
MCA Title	Health and Human Services
MCA ID	60053
Organization Type	State or U.S. Territorial government
Organization Name	State of California
Sub-Agency or Division	California Department of Public Health
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 24 - Health and Human Services
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Not required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required			
DTM	Required			
DEM	Highly desirable			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Nice to have			
Wetlands	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Not required			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			

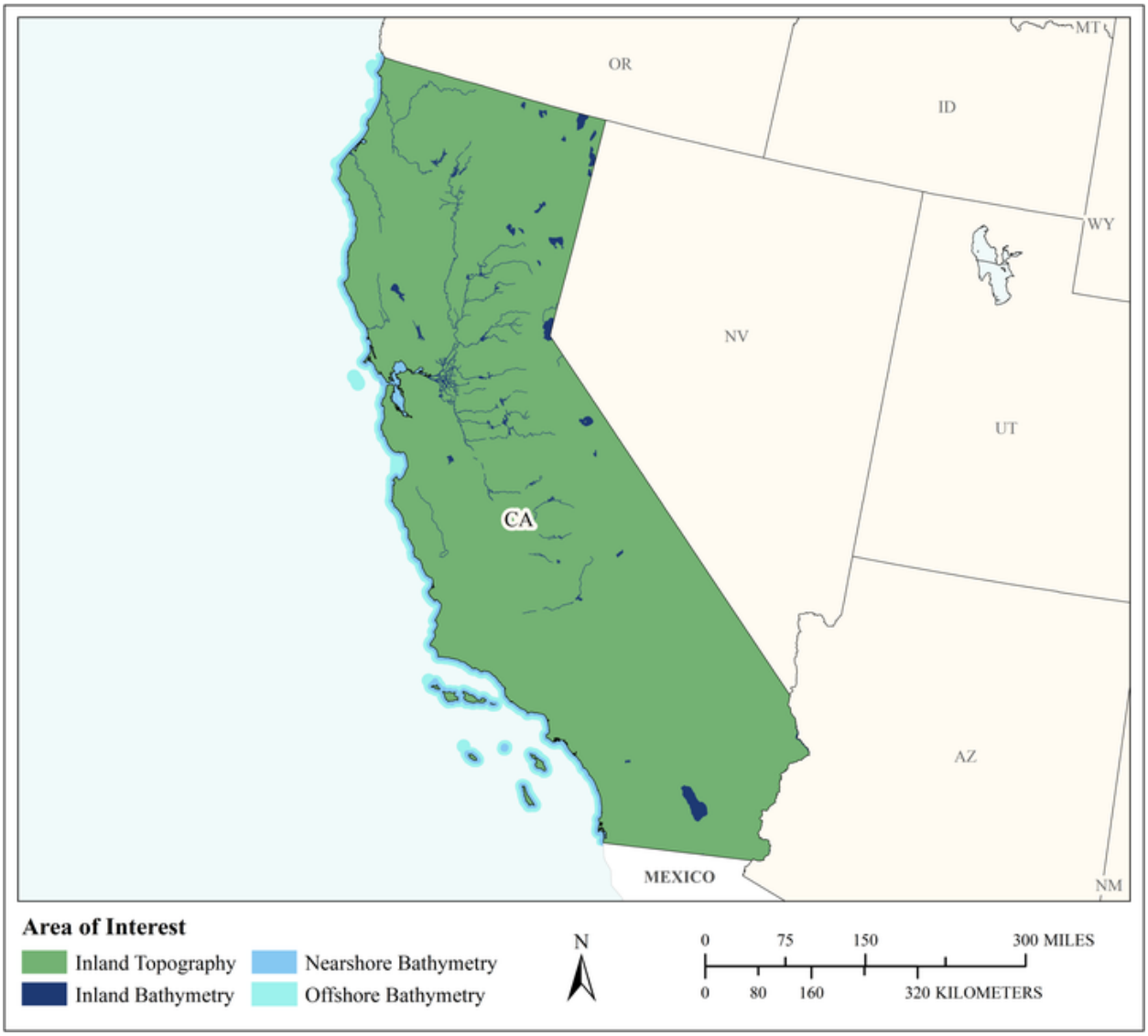
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Moderate			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$56,428									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide										
Improved response or timeliness	Minor	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$7									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Moderate											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Education K12 and Beyond, Basic Research



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Development of 3-D visualizations to help students understand the Earth they live on. Understanding of continental-scale climate change impacts. Ocean science. Ocean education. Scientific research. Data dissemination. Development of training simulators.
MCA Title	Education K12 and Beyond, Basic Research
MCA ID	60054
Organization Type	State or U.S. Territorial government
Organization Name	State of California
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 26 - Education K12 and Beyond, Basic Research
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL1B	QL2B	Order 1a
Update Frequency	2-3 years	4-5 years	4-5 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Nice to have	Not required	Highly desirable	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Required	Nice to have	Not required	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required	Highly desirable	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Required	Required
DTM	Required	Highly desirable	Required	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Required	Required	Required	Required
Classified point cloud	Required	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Nice to have	Nice to have
Ground control/ground truthing	Highly desirable	Highly desirable	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Highly desirable
Underwater videography			Nice to have	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Highly desirable	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Highly desirable
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Required	Highly desirable	Highly desirable	Nice to have
Wetlands	Required	Highly desirable	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Nice to have	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Major	Minor
Cost savings/cost reduction	Major	Minor	Moderate	Minor
Cost avoidance	Major	Minor	Major	Moderate
Increased revenues	Minor	None	Minor	None
Mission-driven performance improvements	Major	Moderate	Major	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Major	Moderate

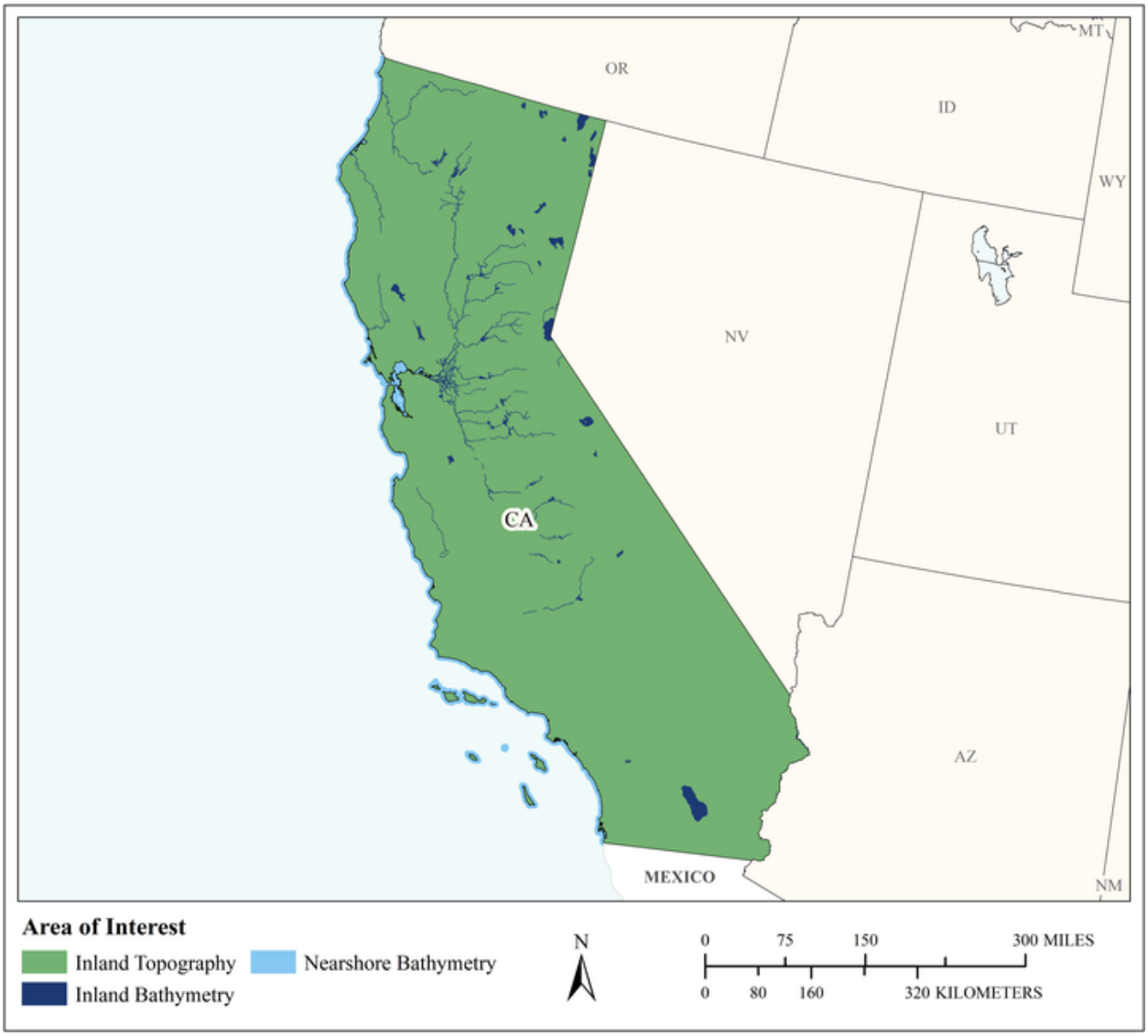
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	Minor	Minor
Improved customer experience	Major	Minor	Moderate	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major	Major	Major
Environmental	Major	Minor	Minor	Minor
Public safety, including life and property	Major	Moderate	Minor	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major			Major		
Environmental	Major			Major			Major			Minor		
Public safety, including life and property	Major			Major			Minor			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes			Yes
Aspect maps	Yes			Yes
Curvature maps	Yes			
Cross sections	Yes		Yes	Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Recreation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Planning and development of recreational facilities such as rafting, boating, swimming, diving, and fishing areas; ski slopes; and golf courses. Location- based products and services such as maps and guides. Tourism. Trail and vista site planning. Orienteering.
MCA Title	Recreation
MCA ID	60055
Organization Type	State or U.S. Territorial government
Organization Name	State of California
Sub-Agency or Division	California Department of Parks and Recreation
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 27 - Recreation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required	Highly desirable		Not required	Not required
Entire AOI under same environmental conditions	Required	Not required	Highly desirable		Not required	Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Nice to have		Nice to have	Not required
DEM for entire AOI needs to be seamless	Required	Nice to have	Nice to have		Nice to have	Not required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	
DTM	Nice to have	Highly desirable	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Nice to have	Not required	
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Nice to have	
Full waveform	Not required	Nice to have	Not required	
Bathymetric Attributed Grid (BAG)		Highly desirable	Nice to have	
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Not required	Nice to have	Not required	
Ground control/ground truthing	Nice to have	Nice to have	Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required	Required	Not required	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Not required	Highly desirable	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Not required	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Not required	Highly desirable	Highly desirable	
Land use/land cover	Nice to have	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Not required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Minor	
Cost savings/cost reduction	Moderate	Minor	Minor	
Cost avoidance	Major	Minor	Minor	
Increased revenues	None	Minor	Minor	
Mission-driven performance improvements	Major	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor	Minor	

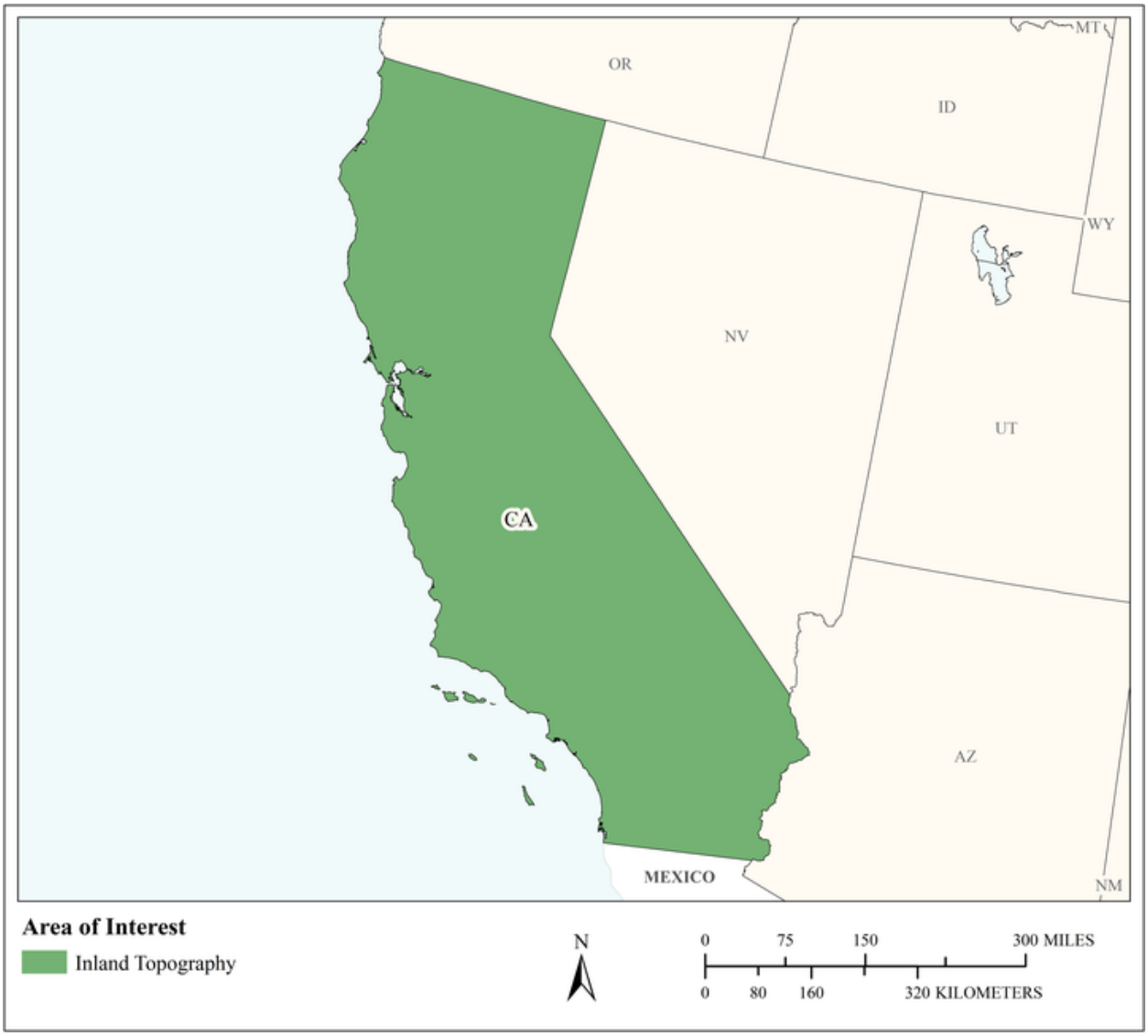
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Minor	Minor	
Improved customer experience	Moderate	Minor	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	
Environmental	Major	Minor	Minor	
Public safety, including life and property	Major	Minor	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	None			Moderate	Unable to provide		Moderate	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$36,288		Annual dollars saved/ realized	$21,853		Annual dollars saved/ realized	$105,180			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Major					
Environmental	Moderate			Major			Major					
Public safety, including life and property	Moderate			Moderate			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes		
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Telecommunications



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Telecommunication tower site selection. Design of radio and radar systems. Interference analysis. Path profiles. Undersea telecommunication route selection and deployment.
MCA Title	Telecommunications
MCA ID	60056
Organization Type	State or U.S. Territorial government
Organization Name	State of California
Sub-Agency or Division	California Public Utilities Commission
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 28 - Telecommunications
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Highly desirable			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

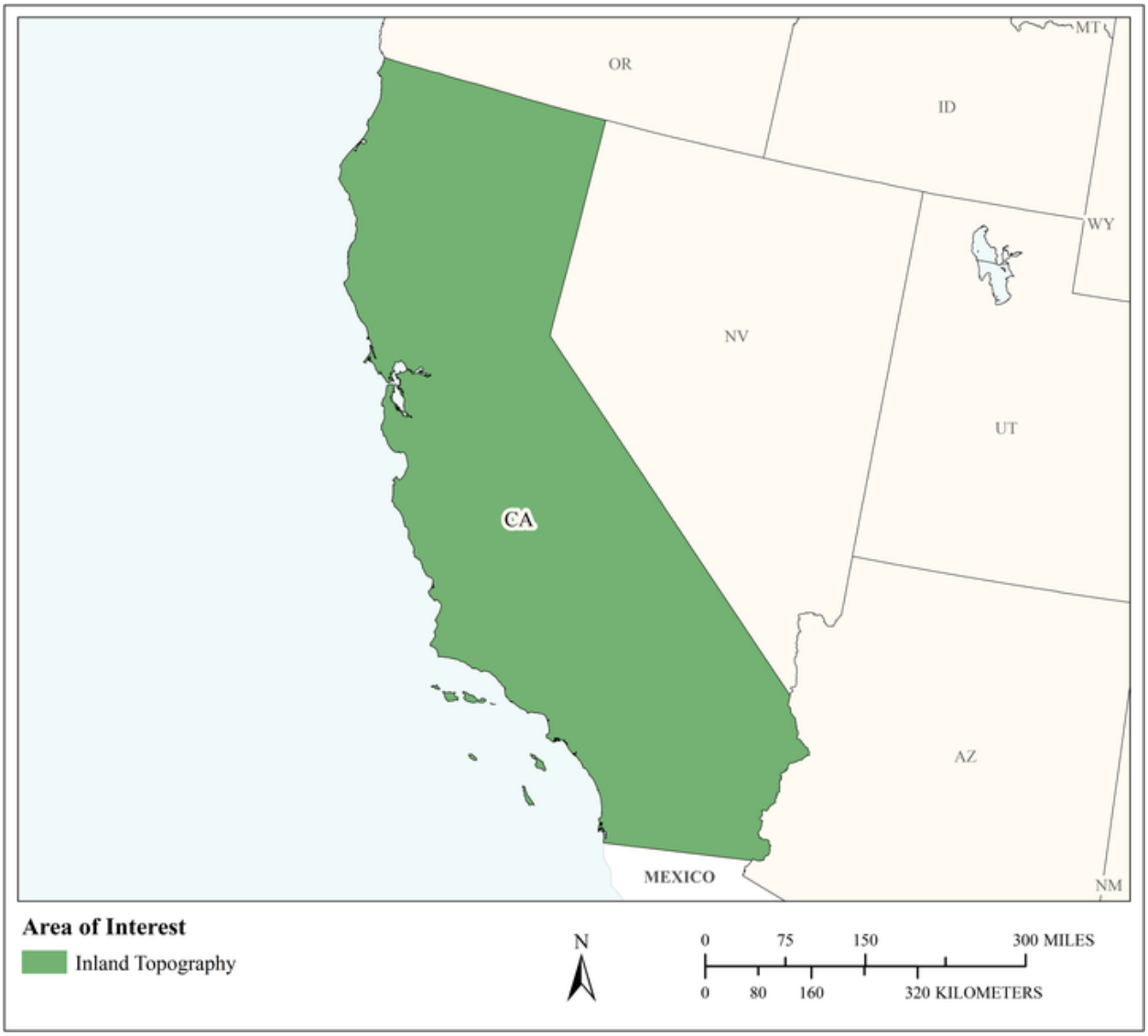
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Military



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Tactical military operations. Strategic defense. Amphibious landings and logistics over-the-shore. Operation of ships and submarines. Weapons system testing. Management of flight facilities and offshore launch or target areas.
MCA Title	Military
MCA ID	60057
Organization Type	State or U.S. Territorial government
Organization Name	State of California
Sub-Agency or Division	California National Guard
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 29 - Military
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	I don't know
Tops of vegetation	I don't know
Tops of submerged structures, objects	I don't know
Tops of submerged vegetation	I don't know
Subcanopy of vegetation/understory	I don't know
River/lake bottom	I don't know
Nearshore elevation (<10 m deep)	I don't know
Sea surface	I don't know
Ocean/sea bottom (>10 m deep)	I don't know

General Geographic Area and Size	
Average geographic extent of day-to-day area	
Smallest 3D features needed	
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	I don't know			
Update Frequency	I don't know			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	I don't know			
Acceptable Vertical Error	I don't know			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	I don't know
Hydro-enforcement	I don't know
Hydro-conditioning	I don't know
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	I don't know					
Entire AOI under same environmental conditions	I don't know					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	I don't know					
DEM for entire AOI needs to be seamless	I don't know					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	I don't know			
DTM	I don't know			
DEM	I don't know			
Raw point cloud data	I don't know			
Classified point cloud	I don't know			
Edited/cube XYZ				
Full waveform	I don't know			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	I don't know			
Additional breaklines for hydro-enforcement of culverts	I don't know			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	I don't know			
Ground control/ground truthing	I don't know			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	I don't know			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	I don't know			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	I don't know			
Land use/land cover	I don't know			
Wetlands	I don't know			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	I don't know			
Bridges/culverts	I don't know			
Landmark features	I don't know			
Cultural resources	I don't know			
Coastal and riverine structures	I don't know			
Overhead structures				
Lowest Floor Elevation of Buildings	I don't know			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know			
Cost savings/cost reduction	I don't know			
Cost avoidance	I don't know			
Increased revenues	I don't know			
Mission-driven performance improvements	I don't know			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know			

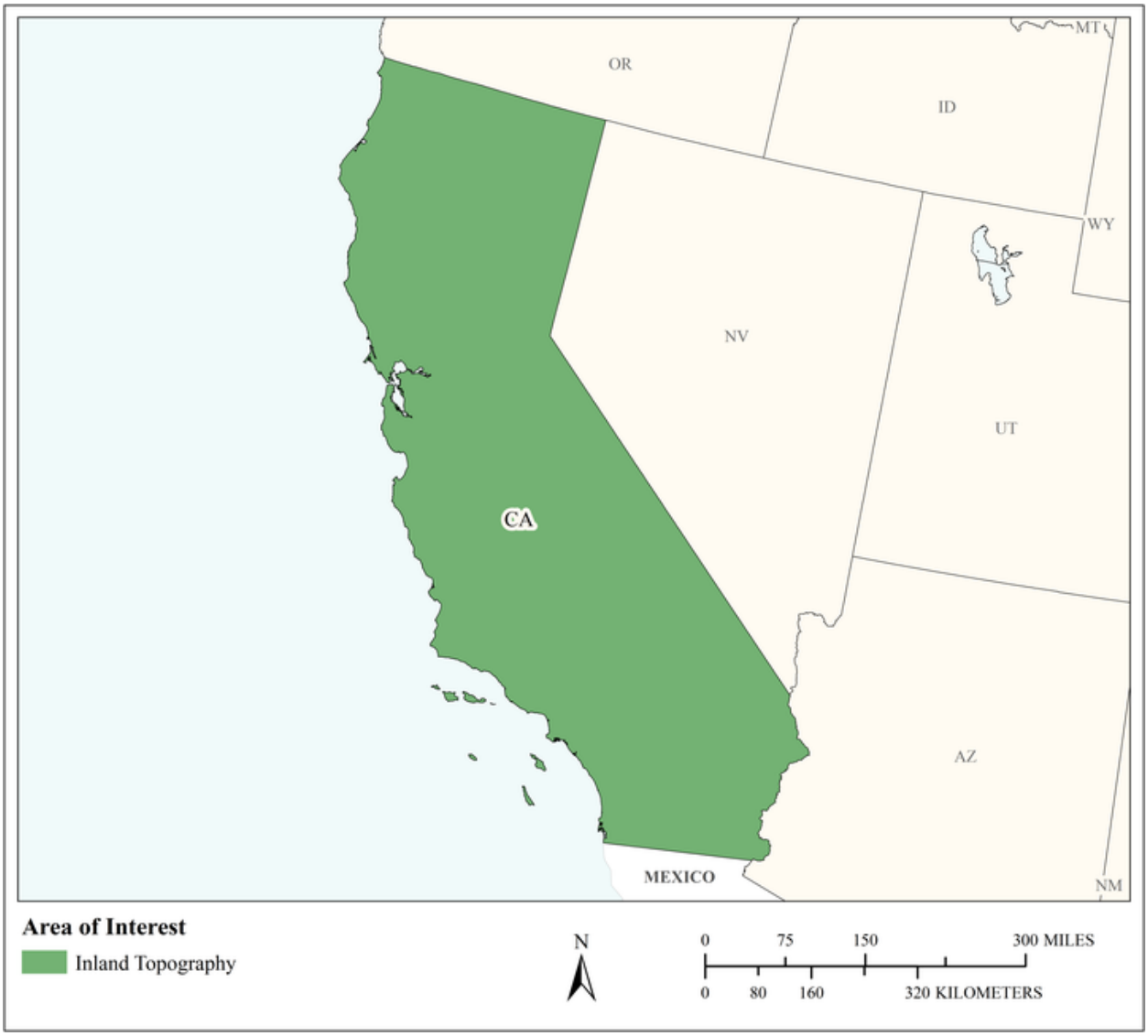
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	I don't know			
Improved customer experience	I don't know			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know			
Environmental	I don't know			
Public safety, including life and property	I don't know			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide										
Cost savings/cost reduction	I don't know	Unable to provide										
Cost avoidance	I don't know	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	I don't know	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide										
Improved response or timeliness	I don't know	Unable to provide										
Improved customer experience	I don't know	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Maritime and Land Boundary Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Delimitation of legal and other coastal boundaries, inland boundaries, and ordinary high water lines (OHWL).
MCA Title	Maritime and Land Boundary Management
MCA ID	60058
Organization Type	State or U.S. Territorial government
Organization Name	State of California
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 30 - Maritime and Land Boundary Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Highly desirable			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Moderate	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$177,957									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$682,296									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Minor											
Public safety, including life and property	None											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

Colorado

Current status of elevation data for Colorado

The State of Colorado currently has approximately 100% or 104,000 square miles of the state covered by lidar, pending donated data or in progress acquisitions at Quality Level 2 (QL2) or higher. The state's goal is to have 100% coverage completed within the next five years. The state seeks partnerships with federal and local agencies when planning lidar projects.

Importance of elevation data to Colorado

Elevation data are used by the Colorado Water Conservation Board (CWCB), Colorado Geological Survey (CGS), Department of Natural Resources (DNR), and Colorado Department of Transportation (CDOT) among many other agencies within the state. Many private contractors and local agencies also utilize the elevation data. The data are most commonly used for planning, risk management, hazard evaluation, and post-incident recovery efforts. Elevation data are needed for Emergency Action Plans, for high and significant hazard dams, which require inundation mapping via modeling for dam break scenarios. Specific project uses include mapping of floodplains, debris flows, landslides, potentially active faults, abandoned mine land features, as well as wildfire risk analysis.

High-level summary of elevation data requirements

QL2 data suffice for most projects; however, on special projects such as mapping active landslide areas, QL1 data provide higher resolution that is required when performing change detection and delineating active versus inactive zones. When planning within high-risk areas such as near major airports QL1 data are desired. CDOT also has requirements along highways where ultra-high density lidar is required and utilized for inventory and roadway surface evaluation.

High-level summary of benefits that would come from higher resolution elevation data

Over time, the state would encourage the collection of higher level lidar in urbanized, high-risk, and special need projects such as transportation corridors.

Additional comments

Colorado's main goal over the next five years will be to complete the collection of lidar data for the entire state as well as keep the data current in rapidly changing areas.

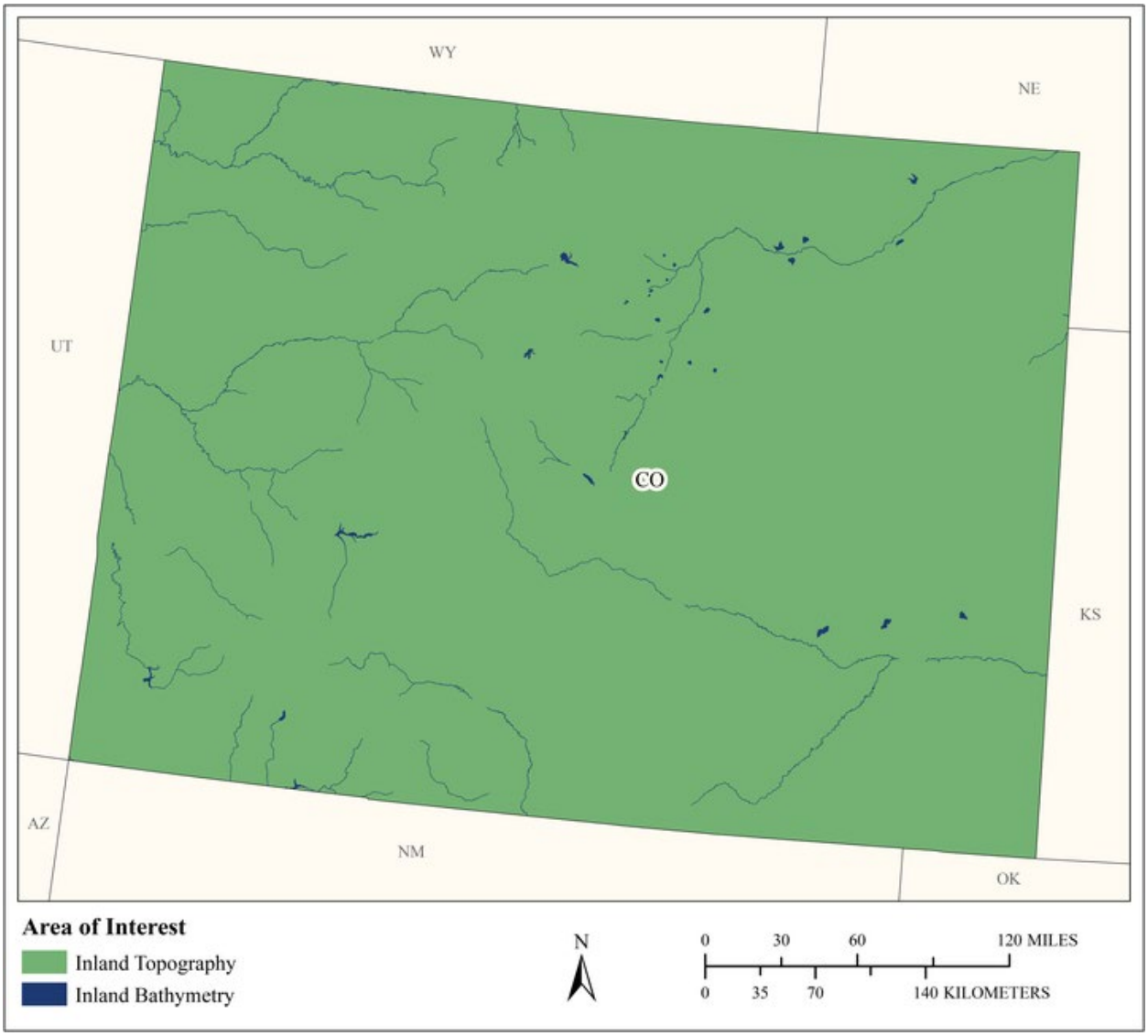
The State of Colorado has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data and inland bathymetry. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 10 – Geologic Assessment	Colorado Geological Survey	21873	Geologic Hazard Mapping, Geologic Mapping, Mineral Resource Identification and Groundwater Resource Mapping and Modeling	Inland Topo	QL2	4-5 years	$10,222,311	$21,708	Minor	Minor	Major
				Inland Bathy	QL1B	6-10 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Major
BU 13 – Oil and Gas Resources	Colorado Oil & Gas Conservation Commission	22163	Environmental and Regulatory Site Assessments for Oil and Gas Activities	Inland Topo	QL2	2-3 years	Unable to quantify	Unable to quantify	Minor	Minor	Moderate
BU 15 – Flood Risk Management	Colorado Division of Water Resources	1174	Emergency Action Plan Development for Dam Safety	Inland Topo	QL2	(a) 4-5 years (b) 6-10 years	$45,225	Unable to quantify	None	Minor	Moderate
				Inland Bathy	QL4B	>10 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 15 – Flood Risk Management	Colorado Office of Information Technology	1414	Data Discovery and Distribution	Inland Topo	QL1	2-3 years	Unable to quantify	Unable to quantify	Major	Moderate	Major
BU 18 – Homeland Security	Colorado North Central All-Hazards Region	1349	Emergency Planning, Mitigation, Response and Recovery - Risk Assessment and Critical Infrastructure Analysis	Inland Topo	QL2	2-3 years	Unable to quantify	Unable to quantify	I don't know	Minor	Moderate
				Inland Bathy	Cross sections and/or transects meet needs	2-3 years	Unable to quantify	Unable to quantify	None	None	Moderate
BU 18 – Homeland Security	San Miguel County, Colorado	22124	Emergency Planning, Mitigation, Response and Recovery - Risk Assessment and Critical Infrastructure Analysis	Inland Topo	QL2	2-3 years	Unable to quantify	Unable to quantify	Moderate	Major	Major

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 19 – Land Navigation	CODOT	1351	DOT Asset Data Inventory and Management	Inland Topo	QL2	Annually	Unable to quantify	Unable to quantify	Moderate	Major	Major
BU 23 – Urban and Regional Planning	Denver Regional Council of Governments	1376	Urban and Regional Planning	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	I don't know	I don't know	Moderate
				Inland Bathy	Cross sections and/or transects meet needs	6-10 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

MCA Title: Geologic Hazard Mapping, Geologic Mapping, Mineral Resource Identification and Groundwater Resource Mapping and Modeling



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Nice to have		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Geologic hazard mapping, geologic mapping, mineral resource identification and ground-water resource mapping and modeling. Extensive use of elevation data for geologic mapping program to delineate geologic hazard areas, river terraces, ancient river courses, bedrock (roughness,). Also used for mineral resources, including – Abandoned Mine Lands (AML) inventory. The Division of Reclamation Mining & Safety acquires lidar. Data are used to locate faults and site seismometers – bare earth is a critical layer. Inland bathy would be handy for flood mapping and reservoir bottoms.
MCA Title	Geologic Hazard Mapping, Geologic Mapping, Mineral Resource Identification and Groundwater Resource Mapping and Modeling
MCA ID	21873
Organization Type	State or U.S. Territorial government
Organization Name	Colorado Geological Survey
Sub-Agency or Division	
Organization Mission	The Colorado Geological Survey (CGS) is a state government agency within the Colorado School of Mines whose science-driven mission is to: Help reduce the impact of geologic hazards on the citizens of Colorado Promote responsible economic development of mineral and energy resources Provide geologic insight into water resources Provide geologic advice and information to a variety of constituencies By providing sound information and new knowledge, the Colorado Geological Survey contributes to economic growth and improvement in the quality of life for Colorado's citizens.
Program Name	Geologic Hazards Program
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Mine dumps (2m across)

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B		
Update Frequency	4-5 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 40 cm	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Required	Nice to have		
Classified point cloud	Required	Highly desirable		
Edited/cube XYZ		Nice to have		
Full waveform	Highly desirable	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Highly desirable		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Nice to have	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required	Required		
Land use/land cover	Nice to have	Highly desirable		
Wetlands	Not required	Highly desirable		
Estuaries				
Inland surface water features	Not required	Required		
Bridges/culverts	Not required	Highly desirable		
Landmark features	Not required	Nice to have		
Cultural resources	Not required	Nice to have		
Coastal and riverine structures	Not required	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Using QL2 data where available. Will fill in gaps with photogrammetric DEMs created in house or 10m NED.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	We have our own internal server and also through Coloradohazardmapping.com			

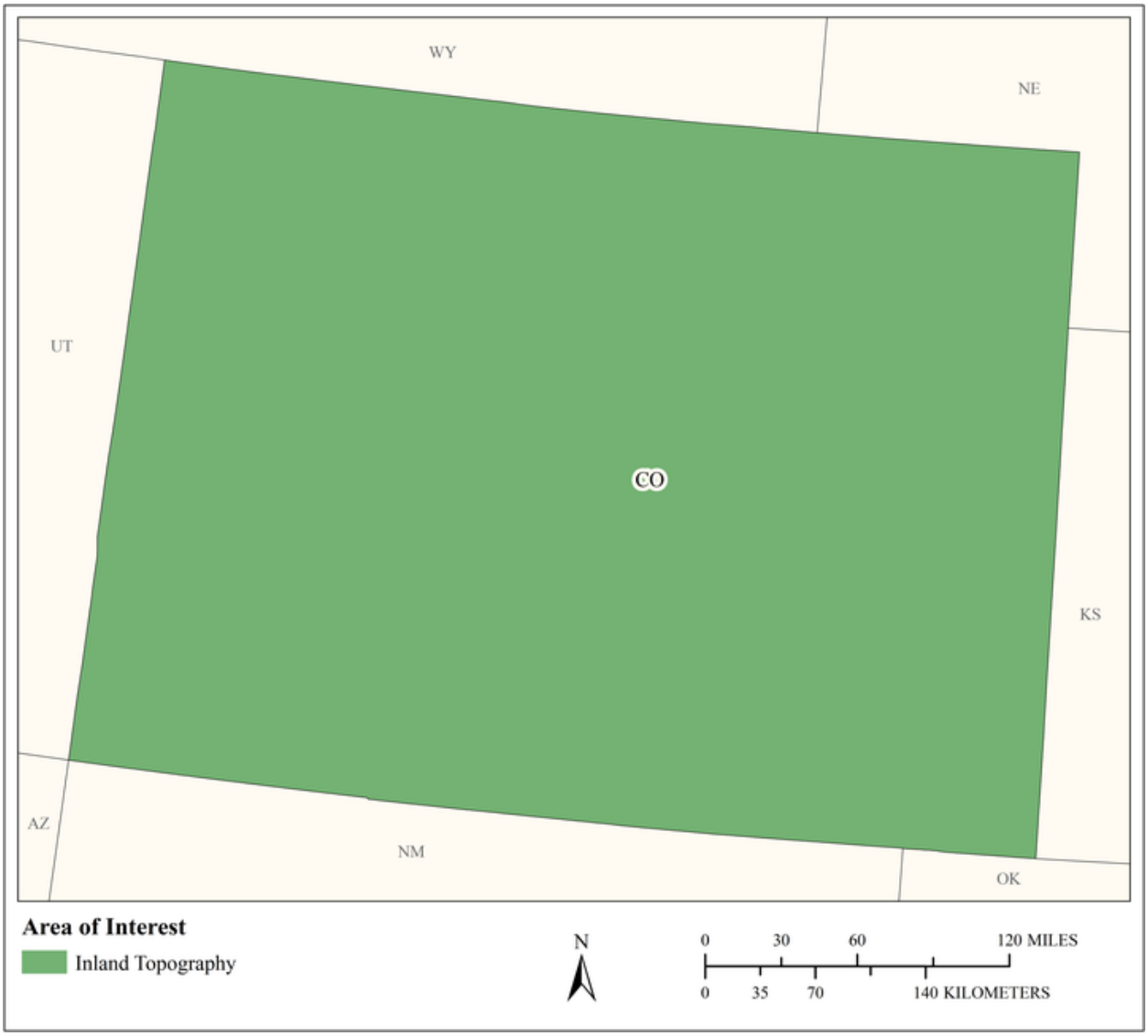
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Minor		
Cost savings/cost reduction	Minor	Minor		
Cost avoidance	I don't know	Minor		
Increased revenues	None	None		
Mission-driven performance improvements	Major	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate		
Improved response or timeliness	Minor	Minor		
Improved customer experience	Minor	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Moderate		
Environmental	None	Moderate		
Public safety, including life and property	Major	Major		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$21,708	Major	Unable to provide							
Time savings description	Better data = better models for debris flow and landslide modeling and mapping. Field work saved by having lidar.											
Cost savings/cost reduction	Major	Annual dollars saved/realized	$200,000	Minor	Unable to provide							
Cost avoidance	Major	Annual dollars saved/realized	$10,000,603	Minor	Unable to provide							
Increased revenues	I don't know	Unable to provide		None								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness	Major	Annual dollars saved/realized	$21,708	Major	Unable to provide							
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide							
Other customer service benefits	Minor	Unable to provide										
Other customer service benefits description												
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Moderate								
Environmental	Minor			Moderate								
Public safety, including life and property	Major			Major								
Other												
Other benefits	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Environmental and Regulatory Site Assessments for Oil and Gas Activities



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Environmental impact assessment and mitigation. Regulatory compliance. Facility siting to ensure public safety and longer term drilling plans - especially in areas of urbanization and mixed-use development. Flooding issues that impact oil and gas sites. Operators must tie down tanks in floodplains, etc. Elevation data help ID floodplains and for siting new oil & gas sites in vulnerable areas. Evaluation of sites required for permitting. Reclamation work helps to restore land to pre-disturbance state.
MCA Title	Environmental and Regulatory Site Assessments for Oil and Gas Activities
MCA ID	22163
Organization Type	State or U.S. Territorial government
Organization Name	Colorado Oil & Gas Conservation Commission
Sub-Agency or Division	
Organization Mission	The Colorado Oil and Gas Conservation Commission (COGCC) is charged with fostering the responsible development of Colorado's oil and gas natural resources in a manner consistent with the protection of public health, safety, and welfare, including the environment and wildlife resources. Our agency seeks to serve, solicit participation from, and maintain working relationships with all those having an interest in Colorado's oil and gas natural resources.
Program Name	Field Inspection Unit, Environmental Unit, Engineering Unit, Orphan Well Program
Total Annual Program Budget	
Primary Business Use	BU 13 - Oil and Gas Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Wellsite berms that may be on the order of a few meters width; tie-downs for tanks and other wellsite equipment that may be required for regulatory compliance; pits for containing produced water or well-cuttings.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	I don't know			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Nice to have					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	10 m hillshade NED DEM we last updated in 2014			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor			
Cost savings/cost reduction	None			
Cost avoidance	None			
Increased revenues	None			
Mission-driven performance improvements	Minor			

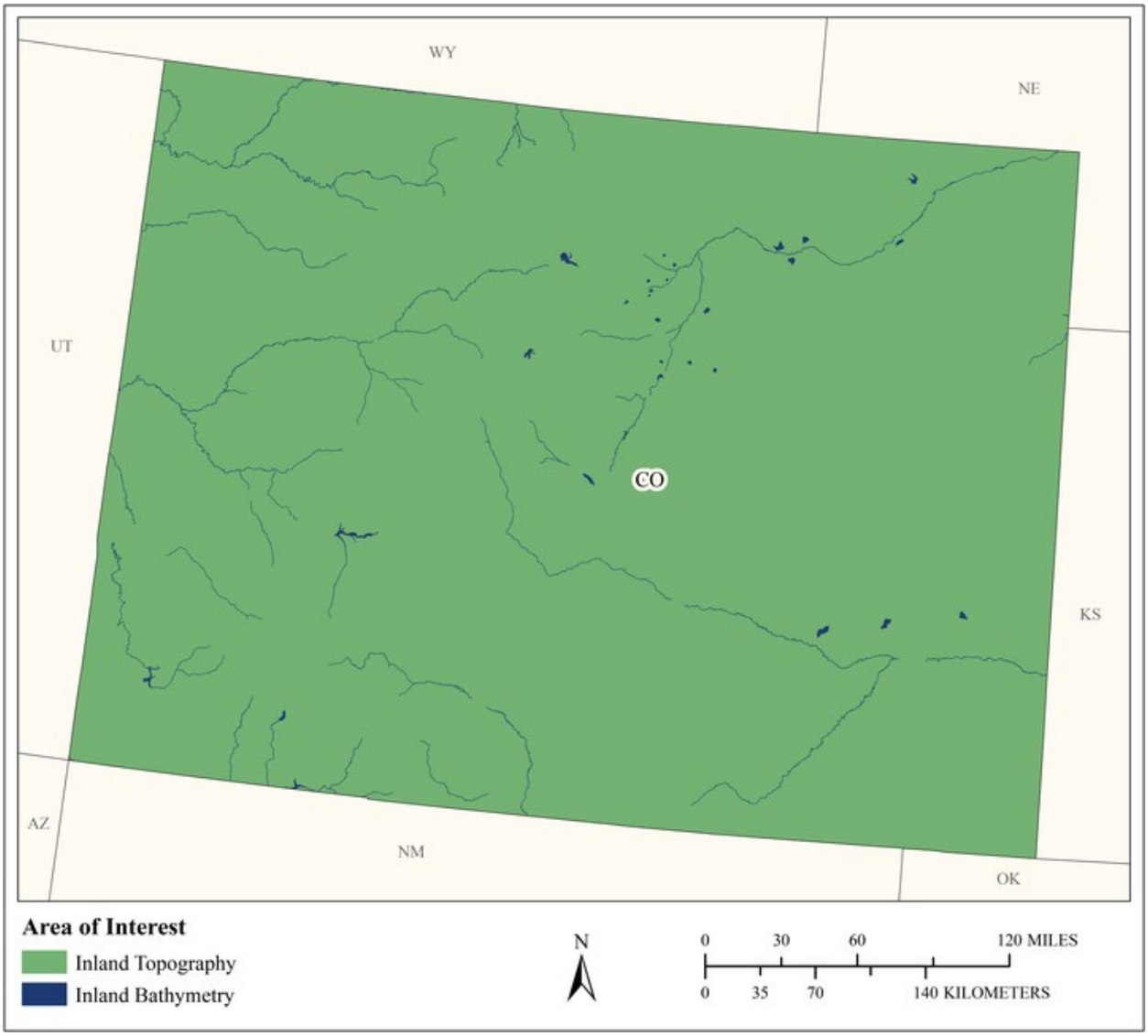
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			
Improved response or timeliness	None			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Cost savings/cost reduction	Minor	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Minor	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Emergency Action Plan Development for Dam Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Highly desirable		
Geographic Area Requirements	Area split by varying quality level or update frequency	One or more states, territories, or counties		
Sub Area Requirements	Colorado			

MCA Description	Response
Mission Critical Activity	One of the missions of the Colorado Division of Water Resources is to ensure public safety through safe dams and properly permitted and constructed water wells. Elevation data are needed for Emergency Action Plans (EAPs) for high and significant hazard dams – these require inundation mapping via H&H modeling for dam break scenarios. 2013 lidar is currently being used. Program includes homeowner notification in the event of a break. Monitor well elevations are needed for collecting ground water elevations for water supply.
MCA Title	Emergency Action Plan Development for Dam Safety
MCA ID	1174
Organization Type	State or U.S. Territorial government
Organization Name	Colorado Division of Water Resources
Sub-Agency or Division	
Organization Mission	To provide competent and dependable distribution of water in accordance with statutes, decrees and interstate compacts. To ensure public safety through safe dams and properly permitted and constructed water wells. To maintain and provide accurate and timely information concerning water. To promote stewardship of all human, fiscal and natural resources. To serve the public through the generation of creative solutions to problems. To help the public understand complex water issues. To promote stability in the use of the state's limited water resources. To apply modern technology to its greatest advantage.
Program Name	Colorado Dam Safety Program and the Well Permitting Program
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 01 - Water Supply and Quality
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	We're mostly interested in man made structures...buildings, houses, infrastructure.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required

Inland Bathy Feature Size Requirements	Response
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Not required
51 - 100 ft	Not required
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Not required
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL4B		
Update Frequency	(a) 4-5 years (b) 6-10 years	>10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI	Front Range of Colorado (East of I-25 corridor) may need to be updated every 4-5 years due to development and growth.			
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need		
Acceptable Vertical Error	Up to 40 cm	Greater than 1 meter		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Not required			Not required	
Entire AOI under same environmental conditions	Nice to have	Not required			Not required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have			Nice to have	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Highly desirable		
DTM	Highly desirable	Highly desirable		
DEM	Required	Highly desirable		
Raw point cloud data	Not required	Not required		
Classified point cloud	Nice to have	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Not required		
Ground control/ground truthing	Not required	Not required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required	Nice to have		
Land use/land cover	Nice to have	Nice to have		
Wetlands	Not required	Not required		
Estuaries				
Inland surface water features	Required	Highly desirable		
Bridges/culverts	Highly desirable	Nice to have		
Landmark features	Not required	Not required		
Cultural resources	Not required	Not required		
Coastal and riverine structures	Not required	Not required		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We use a mix of the 10m DEM for non-collected LIDAR areas and where we have LIDAR it is QL2 level quality with a 1m DEM product.	We are not currently using bathymetric data.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State repositories used	Colorado's Office of Information Technology (OIT) houses and serves up our already collected LIDAR data. They work with the Colorado Water Conservation Board (CWCB) to implement the collection and dissemination of LIDAR data in Colorado.			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor	Inland bathy data not available		
Cost savings/cost reduction	Minor	Inland bathy data not available		
Cost avoidance	Minor	Inland bathy data not available		
Increased revenues	None	Inland bathy data not available		
Mission-driven performance improvements	Major	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	Inland bathy data not available		
Improved response or timeliness	Minor	Inland bathy data not available		
Improved customer experience	Minor	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	Inland bathy data not available		
Environmental	None	Inland bathy data not available		

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Public safety, including life and property	Major	Inland bathy data not available		

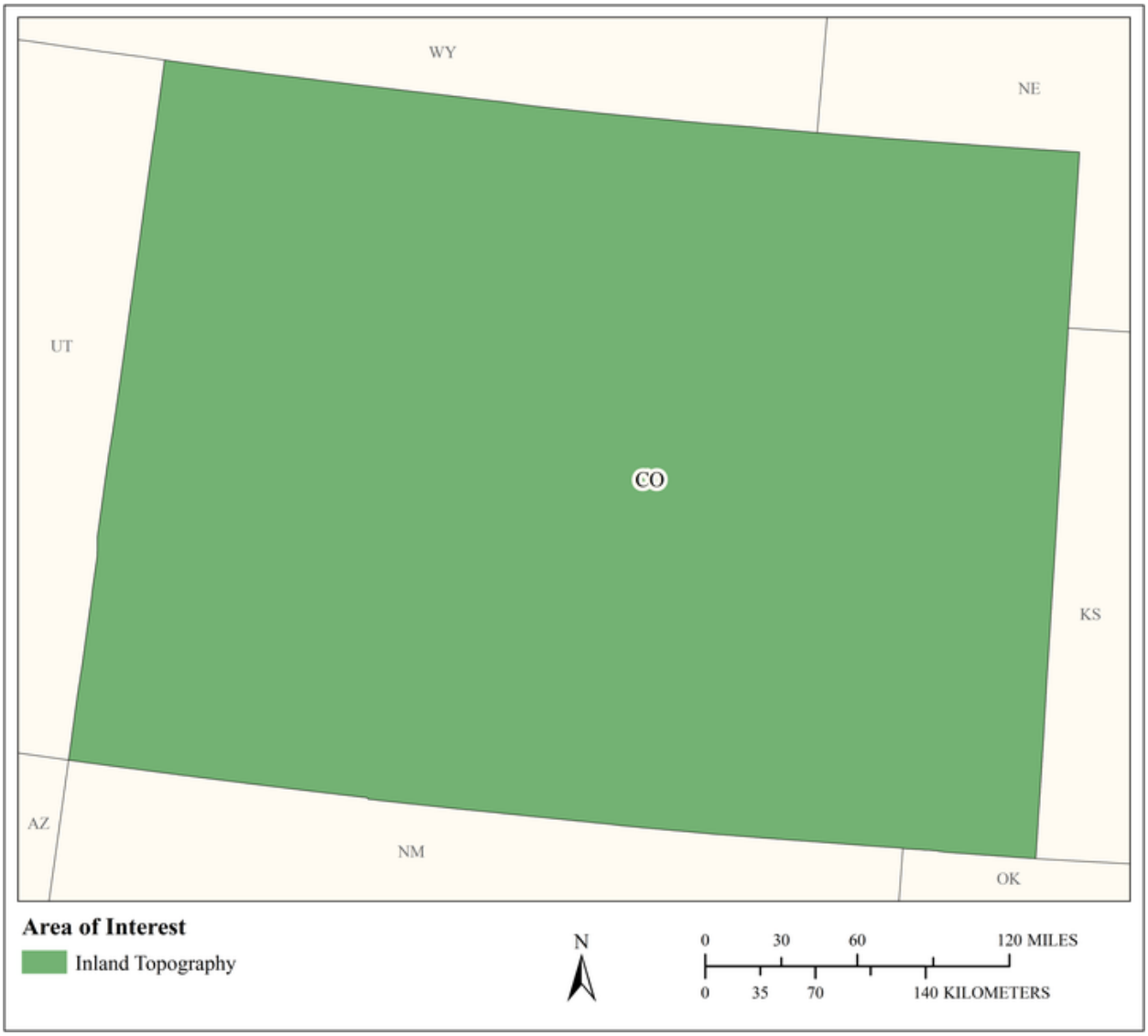
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Minor	Annual dollars saved/realized	$45,225	I don't know	Unable to provide							
Time savings description	We use the best available data. Processes would not change with the use of more accurate data. Potential reduction in field visits due to increased reliability of elevations for critical infrastructure. More consistent, accurate elevation data leads to more consistency in the mapping we provide to emergency managers. Our well permitting staff would no longer have to interpolate surface elevations from 1:24k USGS maps.											
Cost savings/cost reduction	None			I don't know	Unable to provide							
Cost savings/cost reduction description	We already use free publicly available data. Acquisition is not an issue.											
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide							
Cost avoidance description	Not applicable to our MCA. Could potentially inform the public about local Dam Hazards which may lead to smart growth planning and a reduction to property loss due to disaster. We only use free publicly available, already processed data.											
Increased revenues	None			I don't know	Unable to provide							
Increased revenues description	Not applicable to our MCA.											
Mission-driven performance improvements	Moderate	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements description	Reliable, accurate and consistent elevation data Statewide would standardize the production of EAP mapping and well permit elevation determination. More accurate results in our flood mapping would allow emergency managers to make more precise decisions and well permits could make more accurate aquifer determinations.											
Other operational benefits	Minor	Unable to provide		Minor	Unable to provide							
Other operational benefits description	Standardizing our elevation base for modeling and permitting would lead to more consistent results Statewide. Standardization of Flood Mapping.			Volume Calculations. Potential use for water volume / stage storage calculations.								
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		I don't know	Unable to provide							
Value added to products or services description	Improved flood mapping may promote smarter growth. More accurate aquifer picks may lead to better water quality in water wells. Not applicable to our MCA.											
Improved response or timeliness	Moderate	Unable to provide		I don't know	Unable to provide							

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Improved response or timeliness description	Not applicable to our MCA. Potential to improve evacuation plans for emergency managers. More accurate flooding delineations and more accurate aquifer determinations.											
Improved customer experience	Minor	Unable to provide		I don't know	Unable to provide							
Improved customer experience description	Not applicable to our MCA. More accurate data lead to better customer confidence.											
Other customer service benefits	Moderate	Unable to provide										
Other customer service benefits description	Better sub surface aquifer picks due to better surface elevation may lead to better water quality for drinking water wells. More accurate surface elevation information for well permitting.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			I don't know								
Education or outreach description	Not applicable to our MCA.											
Environmental	Minor			I don't know								
Environmental description	Better water quality for drinking water wells due to better screening of sub surface aquifers.											
Public safety, including life and property	Moderate			I don't know								
Public safety, including life and property description	More accurate flood plain mapping and groundwater management.											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Data Discovery and Distribution



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Data discovery and distribution supporting state agencies, local government, and private firms within the state. A Colorado BAA is under consideration.
MCA Title	Data Discovery and Distribution
MCA ID	1414
Organization Type	State or U.S. Territorial government
Organization Name	Colorado Office of Information Technology
Sub-Agency or Division	
Organization Mission	Coordination, collection and distribution of GIS enterprise data sets.
Program Name	Office of Information Technology
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 01 - Water Supply and Quality
Tertiary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Road signs

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Required			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	3 DEP, QL2, 2011 - 2018			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	State of Colorado OIT data repository			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Moderate			
Mission-driven performance improvements	Major			

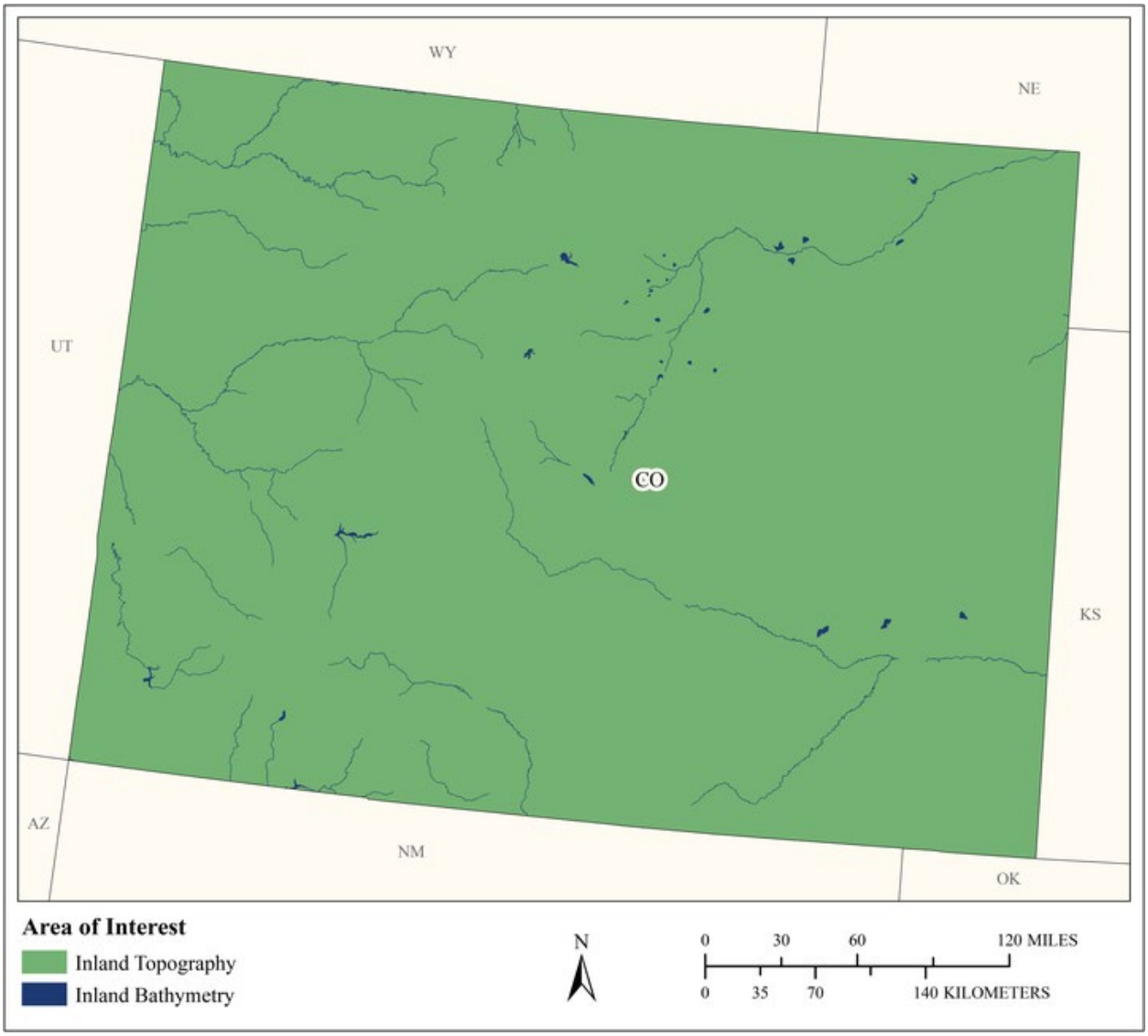
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Moderate			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Cost savings/cost reduction	Minor	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	Moderate	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Moderate											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Emergency Planning, Mitigation, Response and Recovery - Risk Assessment and Critical Infrastructure Analysis



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Highly desirable		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Ensuring public safety for residents and visitors, with attention to life safety and property. Emergency Planning, Mitigation, Response and Recovery, Risk Assessment and Critical Infrastructure Analysis. Elevation data are needed for public safety pre-planning, hazardous materials response, dam Emergency Action Plans (EAPs) for evacuation planning, fire operations plans, hazard mitigation plans.
MCA Title	Emergency Planning, Mitigation, Response and Recovery - Risk Assessment and Critical Infrastructure Analysis
MCA ID	1349
Organization Type	Regional, County, City, or other local government
Organization Name	Colorado North Central All-Hazards Region
Sub-Agency or Division	
Organization Mission	Emergency Planning, Project Implementation, Communications, Training/Exercise and Committee Management. GIS is one of our Regional Committees and current projects include a regional data repository and the development of a regional situational awareness tool using ESRI products.
Program Name	North Central All-Hazards Emergency Management Region
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	BU 17 - Wildfire Management, Planning, and Response
Tertiary Business Use	BU 15 - Flood Risk Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	We are interested in all for homeland security and emergency management; however, our number one priority is survey level features.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	Cross sections and/or transects meet needs		
Update Frequency	2-3 years and certain events.	2-3 years and certain events.		
Event type(s)	Dam break, wildfire, flood, tornado, other natural hazard events.	Dam break, wildfire, flood, tornado, other natural hazard events.		
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	I don't know	Up to 1 meter		
Acceptable Vertical Error	I don't know	I don't know		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial	Yes		
Cross section/transect requirement	I don't know.	I don't know		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Required	Required		
Classified point cloud	Highly desirable	Highly desirable		
Edited/cube XYZ		Highly desirable		
Full waveform	Highly desirable	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required	Not required		
Land use/land cover	Required	Highly desirable		
Wetlands	Not required	Not required		
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Nice to have	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Not required	Not required		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	LIDAR flown in 2013 by USGS/FEMA in response to flooding in our area. LAS points are here: https://geodata.co.gov/ 1 ft contours are here: https://data.drcog.org/data?q=contour QL2 New QL2 data also	Best available or none		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State repositories used	State of Colorado OIT data repository			
Other	Yes			
Other description	Locally sourced			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know	Minor		
Cost savings/cost reduction	I don't know	Minor		
Cost avoidance	I don't know	Minor		
Increased revenues	I don't know	Minor		
Mission-driven performance improvements	Moderate	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	None		
Improved response or timeliness	Moderate	Minor		
Improved customer experience	Minor	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	None		
Environmental	Minor	None		
Public safety, including life and property	Moderate	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Minor	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		Minor	Unable to provide							
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide							
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Moderate	Unable to provide		Minor	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		None								
Improved response or timeliness	Moderate	Unable to provide		Moderate	Unable to provide							
Improved customer experience	I don't know	Unable to provide		None								
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			None								
Environmental	Minor			None								
Public safety, including life and property	Moderate			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps				
Curvature maps	Yes	Yes		
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes	Yes		
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Emergency Planning, Mitigation, Response and Recovery - Risk Assessment and Critical Infrastructure Analysis

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements	San Miguel County, CO			

MCA Description	Response
Mission Critical Activity	Ensuring public safety for residents and visitors, with attention to life safety and property. New QL2 lidar data were recently acquired and are being used for public safety, mitigation planning, flood and debris flow modeling, dam inundation modeling, and before and after fire analyses for post fire erosion management.
MCA Title	Emergency Planning, Mitigation, Response and Recovery - Risk Assessment and Critical Infrastructure Analysis
MCA ID	22124
Organization Type	Regional, County, City, or other local government
Organization Name	San Miguel County, Colorado
Sub-Agency or Division	
Organization Mission	The San Miguel County Board of Commissioners works to ensure our residents are healthy and flourishing and that our communities and safe and vibrant by: Providing essential community services Practicing responsible stewardship of our environment Prioritizing long-term fiscal stability, and Partnering with others to enhance the quality of life in San Miguel County and the region.
Program Name	San Miguel Sheriff's Office
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	BU 17 - Wildfire Management, Planning, and Response
Tertiary Business Use	BU 15 - Flood Risk Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Buildings, source areas for debris flows, vegetation types

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	2-3 years			
Event type(s)				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI	More regularly updated and finer resolution for flood and debris flow-prone areas. Less frequent and lower resolution for relatively unchanging landscapes on public lands.			
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need			
Acceptable Vertical Error	Up to 80 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have					
DEM for entire AOI needs to be seamless	Nice to have					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Required			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	BLM 30 meter DEMs. A QL2 lidar project recently delivered for certain parts of the county.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	New county lidar for project area			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None			
Cost savings/cost reduction	None			

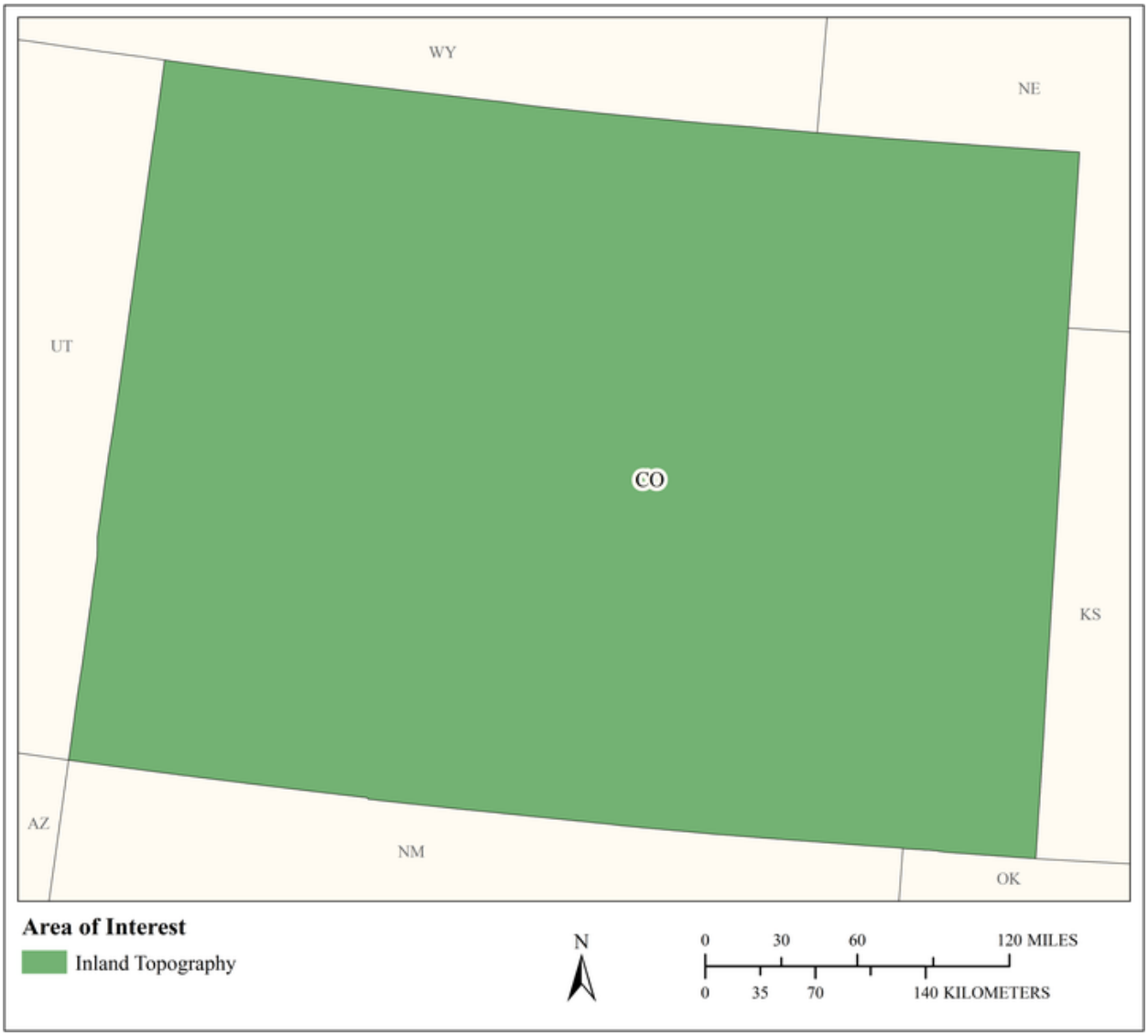
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost avoidance	None			
Increased revenues	None			
Mission-driven performance improvements	None			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None			
Improved response or timeliness	None			
Improved customer experience	None			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	None			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: DOT Asset Data Inventory and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Asset data management. Elevation data can be used for traffic engineering (backslope along roadways for signage, budgeting); geohazard identification (slope for avalanche, rockfall); locating culverts; understanding highway slope/undulation; and many other applications. Some regions use the data for H&H modeling for pre-engineering design. The data also has environmental (wetlands identification) and stormwater uses. Mobile lidar data were recently collected as a pilot project for asset management; got high-resolution data (1600 pts/square meter).
MCA Title	DOT Asset Data Inventory and Management
MCA ID	1351
Organization Type	State or U.S. Territorial government
Organization Name	CODOT
Sub-Agency or Division	
Organization Mission	Working together with our customers we will provide information and recommendations to guide and influence transportation investment decisions by: Challenging current thinking to meet 21st Century needs; Championing systems as well as projects; Linking creative ideas, products and technologies to programs and projects; Collecting data and converting it into useable information; Promoting and encouraging modal options Improving accountability through performance based activities; and Developing and sharing expertise.
Program Name	Transportation Development and Management
Total Annual Program Budget	
Primary Business Use	BU 19 - Land Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Smallest 3D features can be delineator along the roadway. They are posts with reflectors placed in both directions of highways South, North, East, and West.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI	Need to capture data when new structures have been designed or enhanced. Geohazards require greater accuracy also.			
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Less than 5 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Currently we are not using 3D topographic data at a large scale per se. We use 3D topographic data in a few cases over small areas of work. We will like to.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	Don't use enough this data.			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Cost savings/cost reduction	Moderate			
Cost avoidance	Minor			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Major			
Other Current Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other	Major			
Other description	Sharing of the information			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Other operational benefits	Major	Unable to provide										
Other operational benefits description	Overall data collection and interaction with other groups.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Other customer service benefits	Major	Unable to provide										
Other customer service benefits description	Time saving to deliver products.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Education or outreach description	Very important											
Environmental	Major											
Environmental description	Intangible benefits											
Public safety, including life and property	Major											
Public safety, including life and property description	Critical											
Other	Improve quality of life of the roadway users every day											
Other benefits	Major											
Other description	Of the people using the roadways every single day.											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Urban and Regional Planning

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Highly desirable		
Geographic Area Requirements	Respondent provided own shapefile, KML, or geodatabase	Respondent provided own shapefile, KML, or geodatabase		
Sub Area Requirements	Denver Regional Council of Governments	Denver Regional Council of Governments		

MCA Description	Response
Mission Critical Activity	Urban and regional planning. Elevation data are needed for project planning. Projects may include parking lots and trail heads, for which viewshed analysis and line of sight are used. One-foot contours are often used. Elevation data are also needed for water modeling, stormwater drainage sizing, and municipal planning applications.
MCA Title	Urban and Regional Planning
MCA ID	1376
Organization Type	Regional, County, City, or other local government
Organization Name	Denver Regional Council of Governments
Sub-Agency or Division	
Organization Mission	Mission Statement The Denver Regional Council of Governments is a planning organization where local governments collaborate to establish guidelines, set policy and allocate funding in the areas of: Transportation and Personal Mobility Growth and Development Aging and Disability Resources Vision Statement Our region is a diverse network of vibrant, connected, lifelong communities with a broad spectrum of housing, transportation and employment, complemented by world-class natural and built environments.
Program Name	Denver Regional Aerial Photography Project, Denver Regional Planimetrics Project, Various municipal and county programs like emergency management, site plans, construction etc.
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 22 - Infrastructure and Construction Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Features needed for in-house planning

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Nice to have

Inland Bathy Feature Size Requirements	Response
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	Cross sections and/or transects meet needs		
Update Frequency	6-10 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	I don't know		
Acceptable Vertical Error	Up to 20 cm	I don't know		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs		Yes		
Cross section/transect requirement		I don't know		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Nice to have			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Not required		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Required	Required		
Classified point cloud	Required	Required		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Not required		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Not required		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Nice to have		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Not required		
Land use/land cover	Nice to have	Nice to have		
Wetlands	Not required	Not required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have	Highly desirable		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Not required	Not required		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	LIDAR flown in 2013 by USGS/FEMA in response to flooding in our area. LAS points are here: https://geodata.co.gov/ 1 ft contours are here: https://data.drcog.org/data?q=contour QL2 New QL2 data also	None known		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	State of Colorado Office of Information Technology: https://geodata.co.gov/			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Inland bathy data not available		
Cost savings/cost reduction	Moderate	Inland bathy data not available		
Cost avoidance	Moderate	Inland bathy data not available		
Increased revenues	I don't know	Inland bathy data not available		
Mission-driven performance improvements	I don't know	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Inland bathy data not available		
Improved response or timeliness	I don't know	Inland bathy data not available		
Improved customer experience	I don't know	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	Inland bathy data not available		
Environmental	I don't know	Inland bathy data not available		
Public safety, including life and property	Moderate	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide							
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Moderate	Unable to provide		I don't know	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness	Moderate	Unable to provide		Moderate	Unable to provide							
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know								
Environmental	I don't know			I don't know								
Public safety, including life and property	Moderate			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

Connecticut

Current status of elevation data for Connecticut

In December 2014, the Capitol Region Council of Governments (CRCOG), on behalf of all nine regional councils of governments, submitted a grant application to the Office of Policy and Management (OPM) to fund the acquisition of high-quality aerial imagery and lidar through the Regional Performance Incentive Program https://portal.ct.gov/OPM/IGPP/Grants/Regional-Performance-Incentive-Program/Regional-Performance-Incentive-Program. This unique funding strategy arose from OPM's recognition of the need to improve the inefficient and uncoordinated practice of funding imagery acquisitions at regional scales in prior years. In addition, OPM saw opportunity to leverage funding from the Departments of Transportation (DOT) and Emergency Services and Public Protection (DESPP), that were planning to jointly purchase lower quality statewide imagery (12-inch pixel resolution) in the absence of any broader statewide coordination. A much sharper 3-inch pixel resolution was proposed for CRCOG's base deliverable in order to satisfy the needs of all users and avoid duplicative acquisitions by entities who require high-resolution imagery. CRCOG's grant application was awarded by OPM in 2015, with funding contributions from DOT and DESPP. Shortly thereafter, CRCOG released a request for proposals and began the selection process. Sanborn Map Company was selected as the vendor for this project. In 2017, the State of Connecticut took delivery of statewide coverage of lidar based elevation data and orthophotos. Pertinent elevation project related facts include: USGS Quality Level 2 (QL2), 2 points per sq. meter, captured in March and April 2016 (leaf off), and tide coordinated. Deliverables included:

- statewide QL2 lidar point cloud as LAS files with ground/non-ground classification and hydro-flattened;
- bare earth 1-meter DEM tiles in GeoTIFF format;
- contour lines (1 and 5 feet);
- hydro breaklines; and
- intensity images in GeoTIFF format.

The data for this is freely available. More information on the 2016 flight (including data access) can be found at: http://www.cteco.uconn.edu/data/flight2016/index.htm.

Information on previous known elevation data acquisition efforts can be found at: http://www.cteco.uconn.edu/data/lidar/info_lidar.htm.

It should be noted that individual municipalities (or regional organizations) may also have their own sources of elevation data. However, it is not expected that these are widespread, and they may not be freely available/easily accessible.

We should also note that there are many important applications for bathymetric data (see below) for coastal Connecticut. A program similar to the one pursued by CRCOG has not yet emerged. However, the data and programs are very important for public and private coastal applications in the state.

Importance of elevation data to Connecticut

Elevation data play a significant role in many statewide, NGO, municipal, and academic interests. Governments (at the state, regional, and local levels) rely on this data to support:

- regulatory permitting;
- resource and infrastructure management; and
- various engineering and planning level analyses.

These terrestrial applications can more specifically include, but not be limited to: projects such as road, railway, and transportation projects; urban planning, construction, and development; floodplain mapping; hazard and emergency response planning; open–space acquisition, etc.

Connecticut is a coastal state, so also has considerable need for bathymetric data to support coastal zone management including beach stabilization, habitat protection, navigation, and energy production. These data are particularly important to the offshore wind energy sector as the industry needs to map large swaths of leased areas for environmental permitting and to evaluate the effect of wind towers on transit routes. Higher resolution bathymetry is required to safeguard the environment and improve the safety and efficiency of navigation.

Coastal applications (such as port operations and navigation for military, commercial and recreational uses) benefit greatly from coastal bathymetric data as does other Connecticut priority ocean programs like the marine highway system which alleviates impacts of trucking on roads and make fuller use of smaller ports.

Academic institutions, in addition to frequently supporting various aspects of the efforts listed above, also have a vested interest in land elevation and bathymentric data to support technology transfer, research and scientific investigations into many environmental, urban planning, coastal/resilience, and geological investigations. These may range from small-scale education-based approaches to wide-ranging grant-funded tasks.

High-level summary of elevation data requirements

In general, topographic QL2 may be sufficient for most planning level and scientific analyses across the state. QL1 might be beneficial where projects requiring detailed engineering work may benefit from higher pulse densities. The scale of the effort involved may trigger whether QL1 or QL2 is even feasible. (Large scale efforts covering larger geographies, or geographies where the overall change in elevation is comparatively small (such as the coastal plain) may be more likely to afford/need/leverage higher cost data whereas smaller scale areas may not make as must cost/benefit sense.) In cases where nearshore bathymetry may be needed, QL2 should suffice.

High-level summary of benefits that would come from higher resolution elevation data

Data collected through statewide efforts or partnerships can often be shared at no cost to other entities such as towns, NGOs, etc. This can limit overall redundant data capture and/or focus new acquisitions to certain, specific areas/formats.

Entities such as municipal government organizations, cities/towns, NGOs, etc., typically leverage data collected through large scale statewide projects to help serve local/regional needs. By having access to elevation data accurate enough to support engineering design and environmental modeling, smaller organizations will be less likely to spend out-of-pocket. It may also limit the need for field visits or focus those visits on specific tasks resulting in overall operational efficiencies.

If large-scale statewide data are made available for download through state agency or federal sites/portals, when groups/organizations need to distribute it to consultants or partners who are supporting tasks, connections to self-serving data can be provided thus eliminating the effort required for staff to package it and also reducing time delays in receiving it.

Higher resolution/more accurate data can enable users to make more informed decisions such as where to locate infrastructure or undertake certain remediation/mitigation (or where to avoid them.) Similarly, it can more readily be relied on to provide detail to research investigations and studies by providing more

clarity and understanding of a particular site or location and reducing error estimates when compared to coarser data.

The State of Connecticut has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

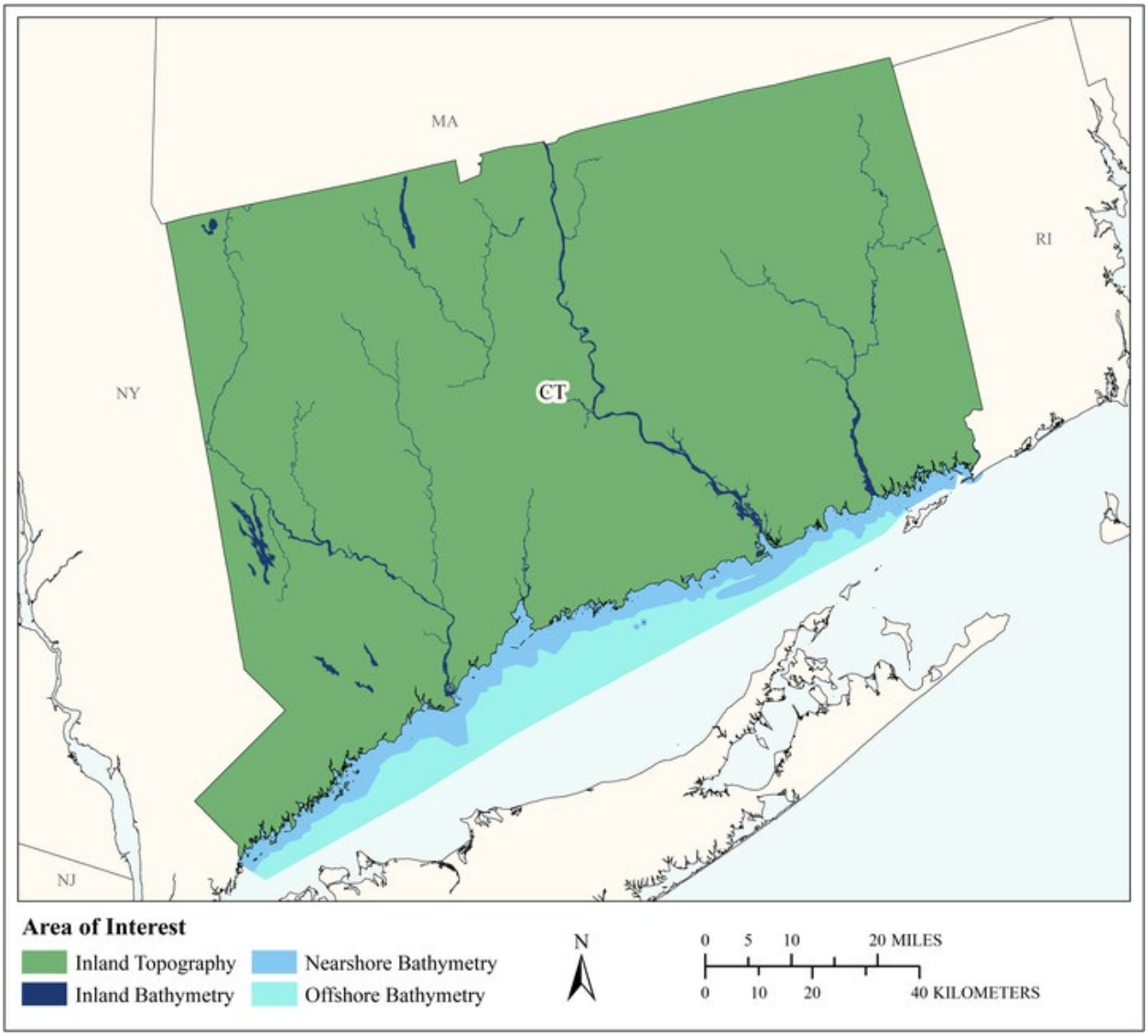
MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	State of Connecticut	60059	Water Supply and Quality	Inland Topo	QL2	4-5 years	$27,567	$7,384	Moderate	Major	Moderate
				Inland Bathy	QL1B	6-10 years	$119,258	$12,462	Moderate	Major	Moderate
				Nearshore Bathy	QL1B	4-5 years	$8,291	$13,659	Moderate	Moderate	Moderate
				Offshore Bathy	Order 1a	4-5 years	$410	$2,054	Minor	Major	Major
BU 02 – Riverine Ecosystem Management	State of Connecticut	60060	Riverine Ecosystem Management	Inland Topo	QL1 HD	6-10 years	$7,610	$760	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$4,051	$285	Major	Major	Major
				Nearshore Bathy	QL0B	2-3 years	$25,145	$19,215	Moderate	Moderate	Moderate
BU 03 – Coastal Zone Management	CT Dept of Energy & Environmental Protection	1449	Environmental Management	Inland Topo	QL1	4-5 years	$256,332	$44,812	Minor	Major	Major
				Inland Bathy	QL2B	4-5 years	$109,998	$64,486	Minor	Major	Major
				Nearshore Bathy	QL2B	4-5 years	$56,308	$95,251	Minor	Moderate	Moderate
				Offshore Bathy	Order 1b	6-10 years	$25,735	$5,138	Minor	Moderate	Moderate
BU 04 – Forest Resource Management	State of Connecticut	60061	Forest Resources Management	Inland Topo	QL1	2-3 years	$19,657	$28,496	Major	Major	Major
BU 06 – Natural Resource Management	State of Connecticut	60062	Natural Resources Conservation	Inland Topo	QL1 HD	4-5 years	$195,012	$716,144	Major	Major	Major
				Inland Bathy	QL0B	6-10 years	$26,431	$1,189	Major	Major	Major
				Nearshore Bathy	QL1B	6-10 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate
				Offshore Bathy	Cross sections and/or transects meet needs	4-5 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
BU 07 – Wildlife and Habitat Management	State of Connecticut	60063	Wildlife and Habitat Management	Inland Topo	QL2	4-5 years	$1,184	$3,420	Moderate	Major	Moderate
				Inland Bathy	QL2B	4-5 years	$9,491	$5,737	Moderate	Moderate	Moderate
				Nearshore Bathy	QL0B	4-5 years	$248	$14	Moderate	Major	Moderate
				Offshore Bathy	Special Order	4-5 years	$324	$22	Moderate	Major	Major
BU 08 – Agriculture	State of Connecticut	60064	Agriculture and Precision Farming	Inland Topo	QL2	2-3 years	$5,756	$4,563	Major	Major	Minor
				Inland Bathy	QL4B	4-5 years	$10,085	$4,563	Moderate	Major	Major

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 09 – Fisheries Management and Aquaculture	State of Connecticut	60065	Fisheries Management and Aquaculture	Inland Topo	QL2	2-3 years	$5,082	$11,039	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	6-10 years	$9,948	$4,527	Major	Major	Moderate
				Nearshore Bathy	QL0B	6-10 years	$39,494	$2,900	Moderate	Major	Minor
				Offshore Bathy	Special Order	6-10 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Minor
BU 10 – Geologic Assessment	University of Connecticut	1415	Geologic Mapping and Analysis and Cultural Resources Preservation and Conservation	Inland Topo	QL1	2-3 years	$517,467	$9,133	Major	None	None
				Inland Bathy	QL2B	2-3 years	$6,847	$7,523	I don't know	I don't know	I don't know
				Nearshore Bathy	QL1B	2-3 years	$9,090	$14,625	I don't know	I don't know	I don't know
BU 10 – Geologic Assessment	Connecticut Metropolitan Council of Governments	21523	Hazard Mitigation Planning	Inland Topo	QL2	4-5 years	$14,929	$262	Moderate	Major	Major
				Inland Bathy	Cross sections and/or transects meet needs	4-5 years	$197	$217	Minor	Minor	Minor
				Nearshore Bathy	QL1B	4-5 years	$1,209	$1,946	Minor	Moderate	Minor
BU 10 – Geologic Assessment	CT DEEP, Geological Survey	22418	Geologic Mapping	Inland Topo	QL2	4-5 years	$517,293	$9,080	Moderate	Major	Moderate
				Inland Bathy	QL3B	6-10 years	$6,847	$7,523	Moderate	Major	Minor
				Nearshore Bathy	QL3B	4-5 years	$9,090	$14,625	Moderate	Moderate	Moderate
				Offshore Bathy	Special Order	6-10 years	$481,461	Unable to quantify	I don't know	Moderate	Minor
BU 12 – Renewable Energy Resources	State of Connecticut	60066	Renewable Energy Resources	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	None
				Inland Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Offshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 14 – Cultural Resource Management	State of Connecticut	60067	Cultural Resources Preservation and Management	Inland Topo	QL1	4-5 years	$911	$796	Minor	Minor	Minor
BU 15 – Flood Risk Management	State of Connecticut	60068	Flood Risk Management	Inland Topo	QL2	4-5 years	$698,083	$122,142	Major	Moderate	Major
				Inland Bathy	QL1B	4-5 years	$48,493	$54,446	Moderate	Moderate	Major
				Nearshore Bathy	QL2B	4-5 years	$47,598	$35,277	Major	Moderate	Major

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 16 – Sea Level Rise and Subsidence	State of Connecticut	60069	Sea Level Rise and Subsidence	Inland Topo	QL1 HD	4-5 years	$261,757	Unable to quantify	Moderate	Moderate	Moderate
				Nearshore Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Minor
BU 18 – Homeland Security	State of Connecticut	60070	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management	Inland Topo	QL2	4-5 years	$146,671	$2,592	Major	Moderate	Major
				Inland Bathy	QL0B	4-5 years	$41,306	$2,635	Major	Moderate	Major
				Nearshore Bathy	QL1B	6-10 years	$2,315	$66	Moderate	Moderate	Major
BU 19 – Land Navigation	State of Connecticut	60071	Land Navigation and Safety	Inland Topo	QL0	2-3 years	$64,407	$5,201	Minor	Major	Major
				Inland Bathy	QL0B	2-3 years	$2,747	$28	Minor	Moderate	Moderate
				Nearshore Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	None	Moderate	Moderate
BU 20 – Marine and Riverine Navigation	State of Connecticut	60072	Marine and Riverine Navigation and Safety	Inland Bathy	QL0B	2-3 years	$90,691	$11,936	Moderate	Moderate	Moderate
				Nearshore Bathy	QL0B	2-3 years	$192,714	$6,524	Minor	Major	Major
				Offshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 22 – Infrastructure Management	CT DOT, State of CT	1419	Transportation Engineering	Inland Topo	QL1	4-5 years	$2,686,832	Unable to quantify	Minor	Major	Major
				Inland Bathy	QL1B	4-5 years	$75,279	$7,816	Minor	Major	Major
				Nearshore Bathy	QL2B	2-3 years	$5,253	$722	Minor	Major	Major
BU 22 – Infrastructure Management	City of Torrington	22330	Local Flood Protection and Infrastructure Mapping	Inland Topo	QL1 HD	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 23 – Urban and Regional Planning	State of Connecticut	60073	Urban and Regional Planning	Inland Topo	QL1	4-5 years	$1,337,744	$154,443	Moderate	Major	Major
BU 26 – Education and Basic Research	University of Connecticut	21745	Education and Research	Inland Topo	QL1 HD	As often as possible	$26,127	$62,453	Major	Major	I don't know
				Inland Bathy	QL1B	4-5 years	$6,832	Unable to quantify	Major	Major	Major
BU 28 – Telecom-munications	State of Connecticut	60074	Telecommunications	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 30 – Maritime and Land Boundary Management	State of Connecticut	60075	Maritime and Land Boundary Management	Inland Topo	QL1	6-10 years	$5,594	$21,450	Moderate	Minor	None
				Inland Bathy	QL2B	6-10 years	$4,198	Unable to quantify	Major	Major	Moderate
				Nearshore Bathy	QL0B	2-3 years	$57,748	Unable to quantify	Moderate	Major	Moderate

MCA Title: Water Supply and Quality



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Fate and transport of contaminants. Pollution risk mitigation. Runoff and sedimentation analyses. Point- or non-point source pollution modeling. Management of contaminants and marine debris - point, non-point, vessel, and atmospheric pollution; spills; trash.
MCA Title	Water Supply and Quality
MCA ID	60059
Organization Type	State or U.S. Territorial government
Organization Name	State of Connecticut
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL1B	Order 1a
Update Frequency	4-5 years	6-10 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Nice to have	Highly desirable	Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable	Required	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Nice to have	Required
DTM	Required	Highly desirable	Nice to have	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Nice to have	Nice to have	Nice to have	Nice to have
Classified point cloud	Highly desirable	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Nice to have
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Nice to have	Required
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Required
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Highly desirable
Bottom type			Nice to have	Highly desirable
Submerged features			Nice to have	Highly desirable
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Nice to have	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Not required
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Highly desirable
Floating observation/navigation systems			Nice to have	Highly desirable
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Nice to have
Wetlands	Highly desirable	Highly desirable	Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Moderate	Moderate
Cost savings/cost reduction	Major	Minor	Moderate	Moderate
Cost avoidance	Major	Minor	Minor	Moderate
Increased revenues	Minor	None	Minor	Minor
Mission-driven performance improvements	Major	Minor	Minor	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Moderate	Minor

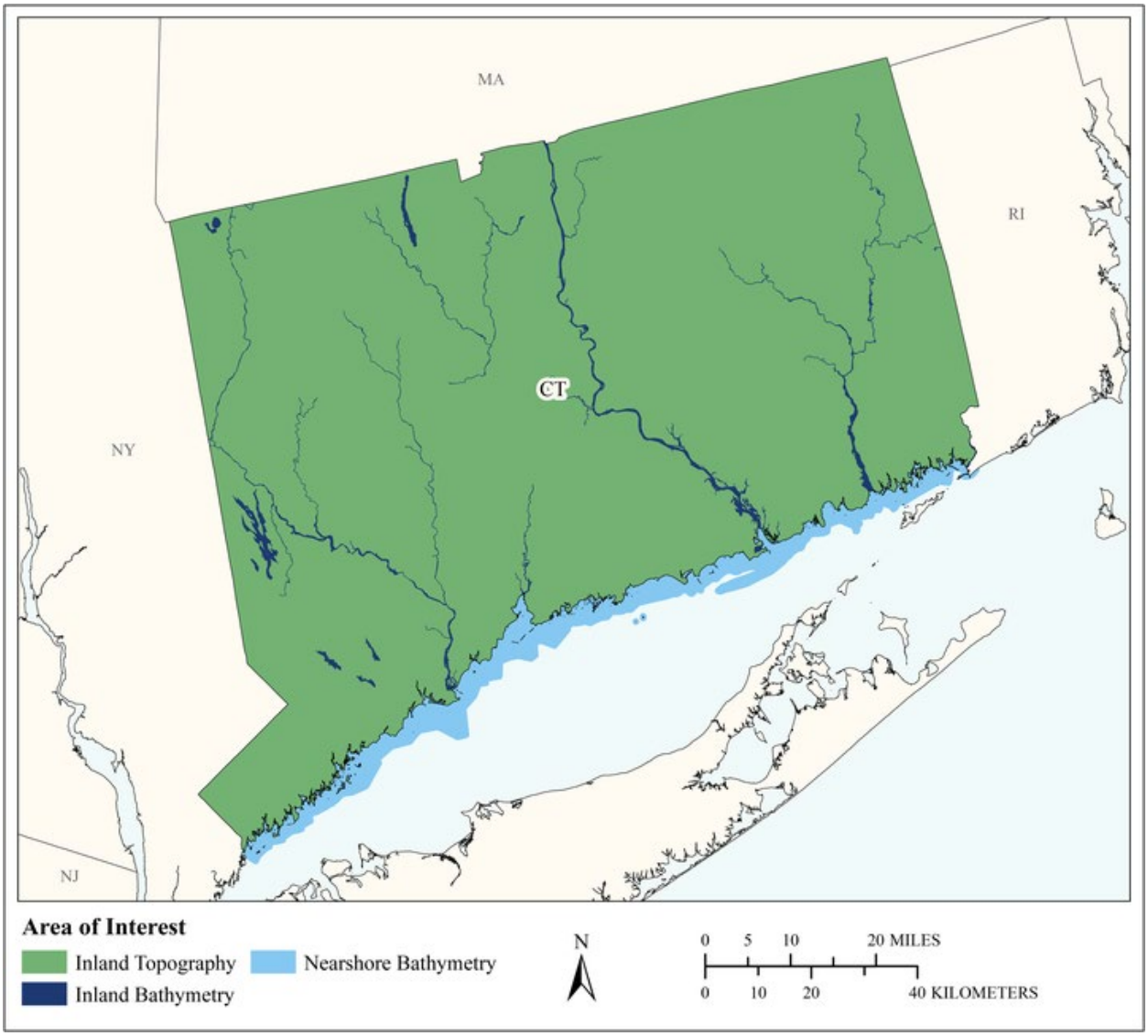
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	Moderate	Moderate
Improved customer experience	Major	Minor	Moderate	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	Minor
Environmental	Major	Moderate	Moderate	Minor
Public safety, including life and property	Major	Minor	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide		None		
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		None		
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$27,567		Annual dollars saved/ realized	$119,258		Annual dollars saved/ realized	$8,291		Annual dollars saved/ realized	$410
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$7,384		Annual dollars saved/ realized	$12,462		Annual dollars saved/ realized	$13,659		Annual dollars saved/ realized	$2,054
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate			Minor		
Environmental	Major			Major			Moderate			Major		
Public safety, including life and property	Moderate			Moderate			Moderate			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes		Yes	Yes
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes	Yes	
Hydrologic Flow Accumulation Grids	Yes	Yes	Yes	
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Riverine Ecosystem Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Stream channel analysis and mapping. Stream bank erosion analysis. Aquatic and terrestrial species habitat management. Environmental management.
MCA Title	Riverine Ecosystem Management
MCA ID	60060
Organization Type	State or U.S. Territorial government
Organization Name	State of Connecticut
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B	QL0B	
Update Frequency	6-10 years	4-5 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable		Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Required		Highly desirable	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Required	Required		Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	
DTM	Required	Highly desirable	Required	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Nice to have	Nice to have	
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Not required	Nice to have	
Full waveform	Nice to have	Nice to have	Highly desirable	
Bathymetric Attributed Grid (BAG)		Not required	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Nice to have	
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Highly desirable	Required	
Underwater videography			Not required	
Bottom texture			Highly desirable	
Bottom type			Required	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Nice to have	Nice to have	Not required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates	Nice to have	Nice to have	Highly desirable	
Land use/land cover	Highly desirable	Nice to have	Required	
Wetlands	Highly desirable	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have	Not required	
Cultural resources	Nice to have	Nice to have	Not required	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	
Cost savings/cost reduction	Moderate	Minor	Moderate	
Cost avoidance	Moderate	None	None	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	None	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Minor	

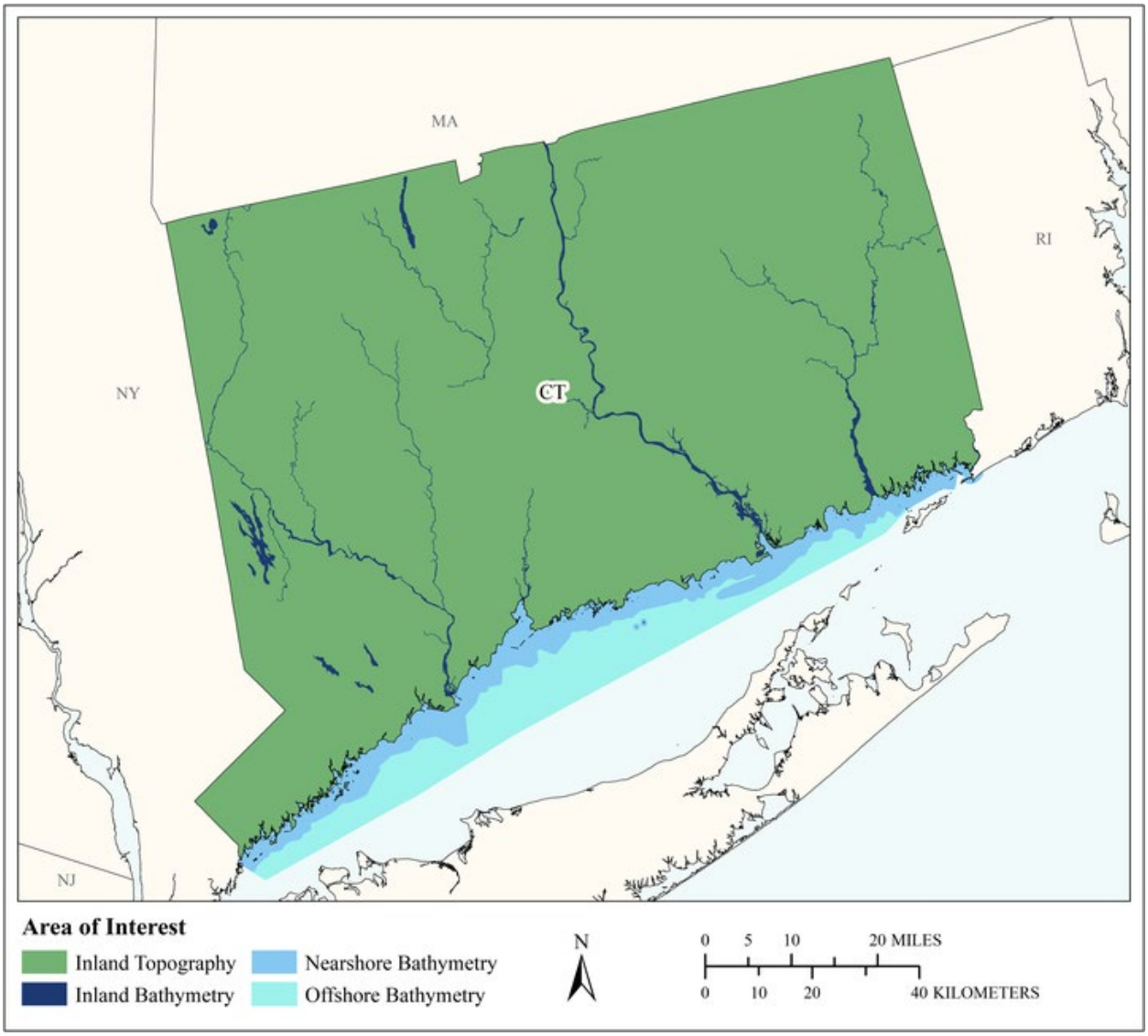
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Moderate	Minor	
Improved customer experience	Major	Minor	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Minor	
Environmental	Major	Major	Moderate	
Public safety, including life and property	Major	Moderate	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$7,610		Annual dollars saved/ realized	$4,051		Annual dollars saved/ realized	$25,145			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$760		Annual dollars saved/ realized	$285		Annual dollars saved/ realized	$19,215			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate					
Environmental	Major			Major			Moderate					
Public safety, including life and property	Major			Major			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps			Yes	
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints			Yes	
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Environmental Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Environmental management. Includes H&H modeling for floodplain management, regulatory work, land management, forest management, and biological and geological resource surveys. Also jurisdictional boundaries, remediation, enforcement, coastal zone management, regulatory plan reviews, etc. Elevation data are a fundamental data layer to all activities. Regulations may cite percent slope, specific elevations, tide lines, etc. Any changes or mapping improvements are relevant to environmental management areas. The shellfish industry is an important user of bathymetry. A new industry is the nearshore kelp industry. 95% of bathymetry uses fall within the 0 – 30m depth range, which is currently the least well mapped currently. Many additional Business Uses are included in this MCA.
MCA Title	Environmental Management
MCA ID	1449
Organization Type	State or U.S. Territorial government
Organization Name	CT Dept of Energy & Environmental Protection
Sub-Agency or Division	
Organization Mission	Environmental Protection
Program Name	CT Dept of Energy & Environmental Protection
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Coastal features

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required

Inland Bathy Feature Size Requirements	Response
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B	QL2B	Order 1b
Update Frequency	4-5 years	4-5 years	4-5 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI			QL0B would be nice to have, QL2B is acceptable	
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	Up to 5 meters
Acceptable Vertical Error	Up to 10 cm	Up to 40 cm	Up to 30 cm	Less than 1 meter
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed	Below MLLW		To MLLW	
Tide correction requirement			MLLW	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Required	Required	Highly desirable
DTM	Required	Required	Required	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Nice to have	Nice to have	Nice to have	Highly desirable
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Not required	Not required	Nice to have
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Highly desirable	Required	Highly desirable

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)			Required	Nice to have
Tide Predictions			Required	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Highly desirable	Required	Required	Highly desirable
Ground control/ground truthing	Required	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Required
Nautical and/or navigation charts			Highly desirable	Nice to have
Acoustic imagery of the seafloor			Required	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Highly desirable
Underwater videography			Highly desirable	Nice to have
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Nice to have
Geologic and seismic data	Highly desirable	Required	Highly desirable	Nice to have
Water column properties - Physical			Highly desirable	Nice to have
Water column properties - Chemical			Highly desirable	Nice to have
Water column properties - Biological			Highly desirable	Nice to have
Currents			Highly desirable	Nice to have
Tide/wave heights			Highly desirable	Nice to have
Sea ice conditions			Highly desirable	Nice to have
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Highly desirable	Nice to have
Routes			Highly desirable	Nice to have
Offshore cadastral			Highly desirable	Nice to have
Lease areas			Highly desirable	Nice to have
Fixed obstructions			Highly desirable	Nice to have
Floating observation/navigation systems			Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Required	Required	Highly desirable	Nice to have
Wetlands	Required	Required	Highly desirable	Nice to have
Estuaries			Highly desirable	Nice to have
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Highly desirable	Required		
Landmark features	Nice to have	Nice to have	Highly desirable	
Cultural resources	Highly desirable	Nice to have	Highly desirable	
Coastal and riverine structures	Required	Required	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL2 data from 2016	None available	NOAA hi-Res bathymetry, Long Island Sound Cable Fund LIS Cable Fund, USGS	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	
NCEI			Yes	
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	http://www.cteco.uconn.edu/data/flight2016/info.htm			
Data that meet my needs are not available		Yes		

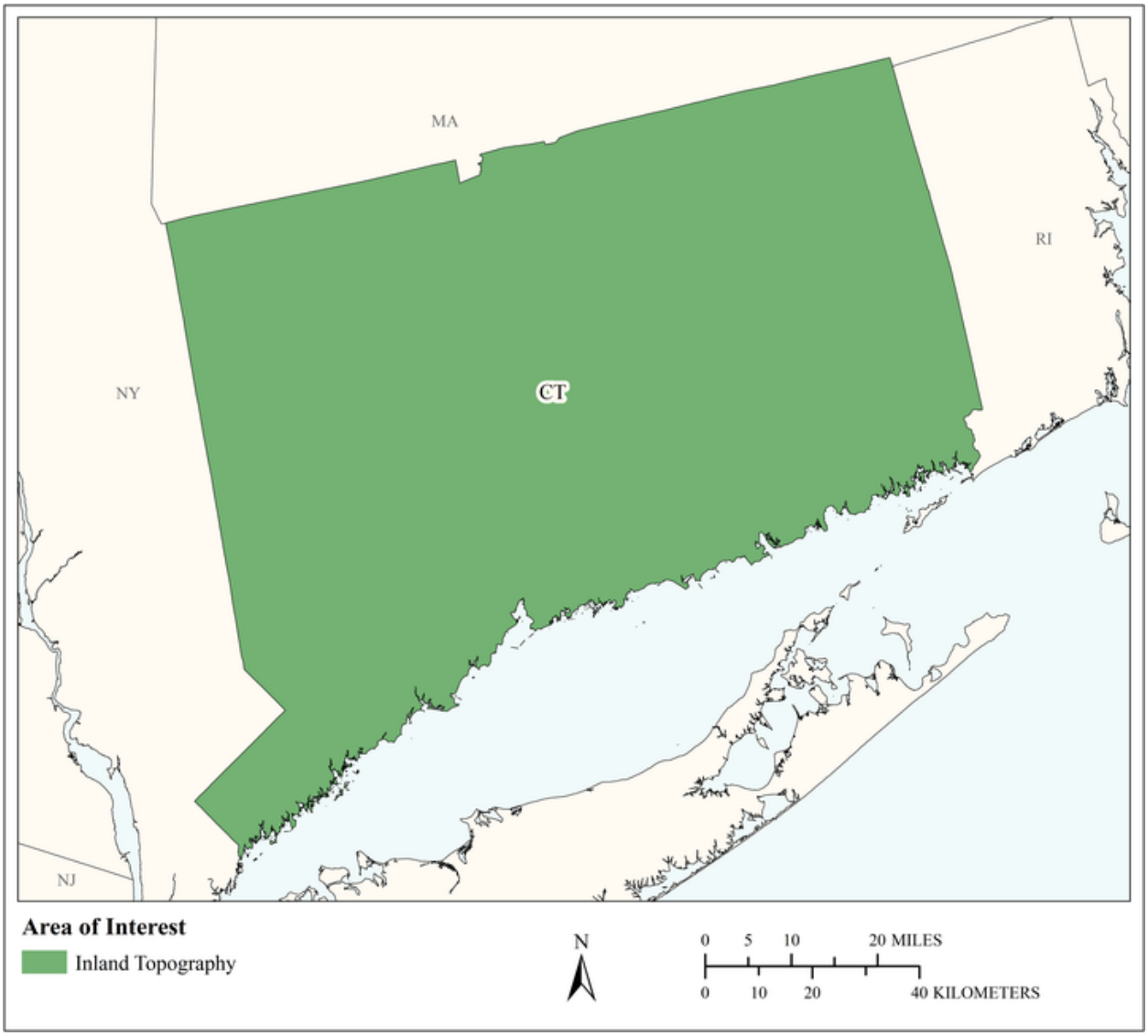
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Inland bathy data not available	Moderate	Moderate
Cost savings/cost reduction	Major	Inland bathy data not available	Moderate	Moderate
Cost avoidance	Major	Inland bathy data not available	Moderate	Minor
Increased revenues	None	Inland bathy data not available	I don't know	None
Mission-driven performance improvements	Moderate	Inland bathy data not available	Moderate	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know	Inland bathy data not available	I don't know	Minor
Improved response or timeliness	I don't know	Inland bathy data not available	I don't know	Minor
Improved customer experience	I don't know	Inland bathy data not available	I don't know	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Inland bathy data not available	I don't know	Minor
Environmental	Moderate	Inland bathy data not available	Moderate	Moderate
Public safety, including life and property	Moderate	Inland bathy data not available	I don't know	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide	
Time savings description	Ability to do work from desk without field work or by limiting time in the field to only necessary visits saves time and money across the board. Amounts likely to vary by task and project. Too variable to reliably estimate here.			Ability to do work from desk without field work or by limiting time in the field to only necessary visits saves time and money across the board. Amounts likely to vary by task and project. Too variable to reliably estimate here.			Ability to do work from desk without field work or by limiting time in the field to only necessary visits saves time and money across the board. Amounts likely to vary by task and project. Too variable to reliably estimate here.					
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction description	Data collected through statewide efforts or partnerships can often be shared at no cost to other entities such as towns, NGOs, etc. Can limit redundant data capture.			Data collected through statewide efforts or partnerships can often be shared at no cost to other entities such as towns, NGOs, etc. Can limit redundant data capture.			Data collected through statewide efforts or partnerships can often be shared at no cost to other entities such as towns, NGOs, etc. Can limit redundant data capture.					
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide	
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$256,332		Annual dollars saved/ realized	$109,998		Annual dollars saved/ realized	$56,308		Annual dollars saved/ realized	$25,735
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide	
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide	
Improved customer experience description	Data can likely be shared via publicly available infrastructure making discovery and access easy.			Data can likely be shared via publicly available infrastructure making discovery and access easy.			Data can likely be shared via publicly available infrastructure making discovery and access easy.					
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$44,812		Annual dollars saved/ realized	$64,486		Annual dollars saved/ realized	$95,251		Annual dollars saved/ realized	$5,138
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			Minor			Minor		
Environmental	Major			Major			Moderate			Moderate		
Public safety, including life and property	Major			Major			Moderate			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes	Yes	Yes	
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness		Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Forest Resources Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Forest health assessment. Determination of standing inventory of forest resources. Prescribed burn planning. Analysis of carbon stocks for trade. Harvest systems planning.
MCA Title	Forest Resources Management
MCA ID	60061
Organization Type	State or U.S. Territorial government
Organization Name	State of Connecticut
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Highly desirable			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

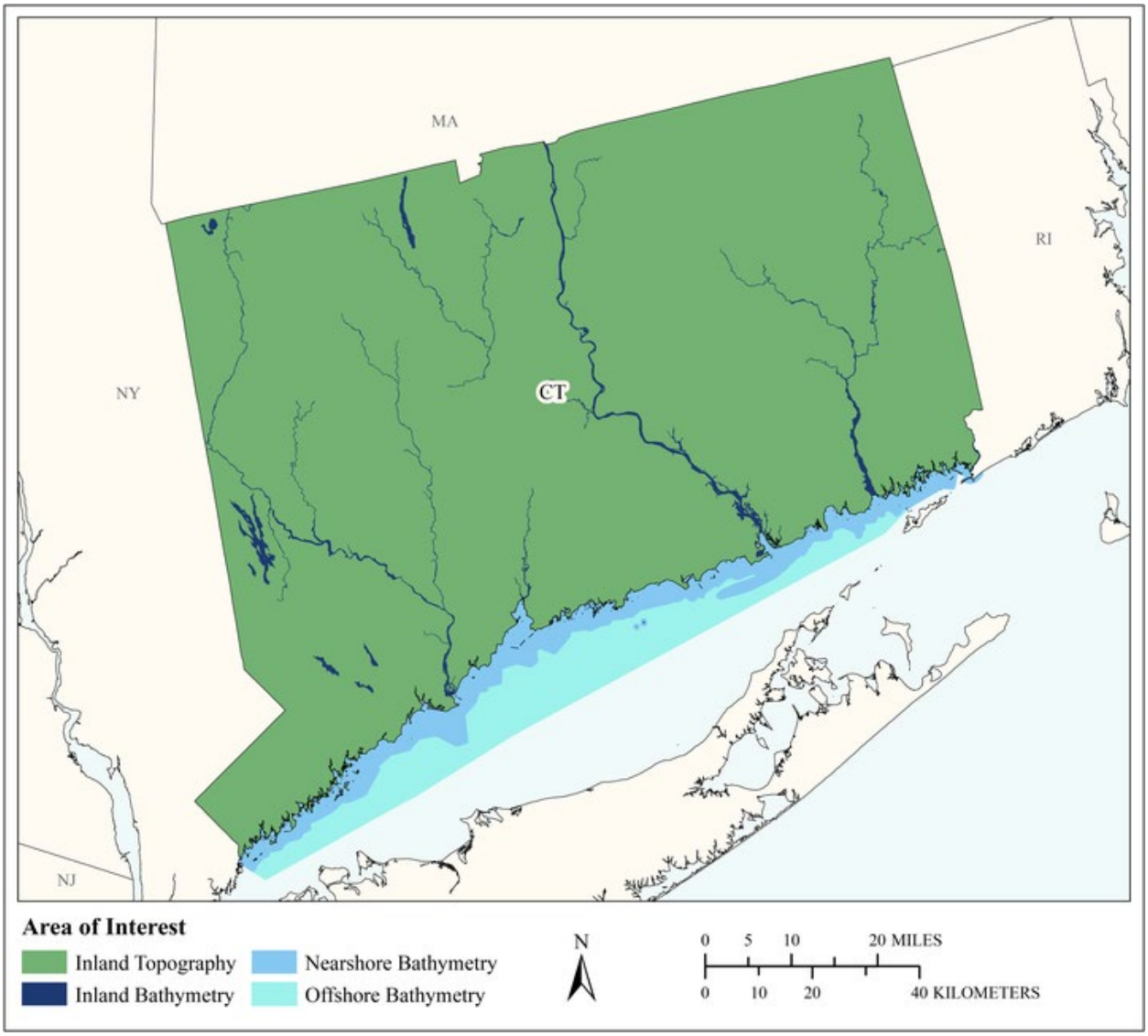
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$19,657									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$28,496									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Natural Resources Conservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation engineering. Soils and wetlands mapping and characterization. Modeling of biological and ecological systems. Erosion control. Rainfall penetration studies, impervious surfaces. Assessment of blue carbon stocks.
MCA Title	Natural Resources Conservation
MCA ID	60062
Organization Type	State or U.S. Territorial government
Organization Name	State of Connecticut
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B	QL1B	Cross sections and/or transects meet needs
Update Frequency	4-5 years	6-10 years	6-10 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				Yes
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Highly desirable	Required	Required	Required	Required
Entire AOI under same environmental conditions	Required	Required	Required	Required	Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Required	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Required	Required	Required	Required
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Highly desirable	Required	Highly desirable
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Nice to have	Highly desirable
Ground control/ground truthing	Required	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Nice to have	Required
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Highly desirable
Underwater videography			Nice to have	Highly desirable
Bottom texture			Nice to have	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Highly desirable	Highly desirable
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Nice to have	Highly desirable
Habitat distribution and classification			Required	Highly desirable
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Highly desirable
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates	Highly desirable	Required	Highly desirable	
Land use/land cover	Required	Required	Highly desirable	Nice to have
Wetlands	Required	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Highly desirable
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Nice to have	Highly desirable	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	Major
Cost savings/cost reduction	Major	Major	Minor	Major
Cost avoidance	Major	Moderate	Minor	I don't know
Increased revenues	Minor	Minor	None	I don't know
Mission-driven performance improvements	Major	Major	Moderate	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Moderate	Major

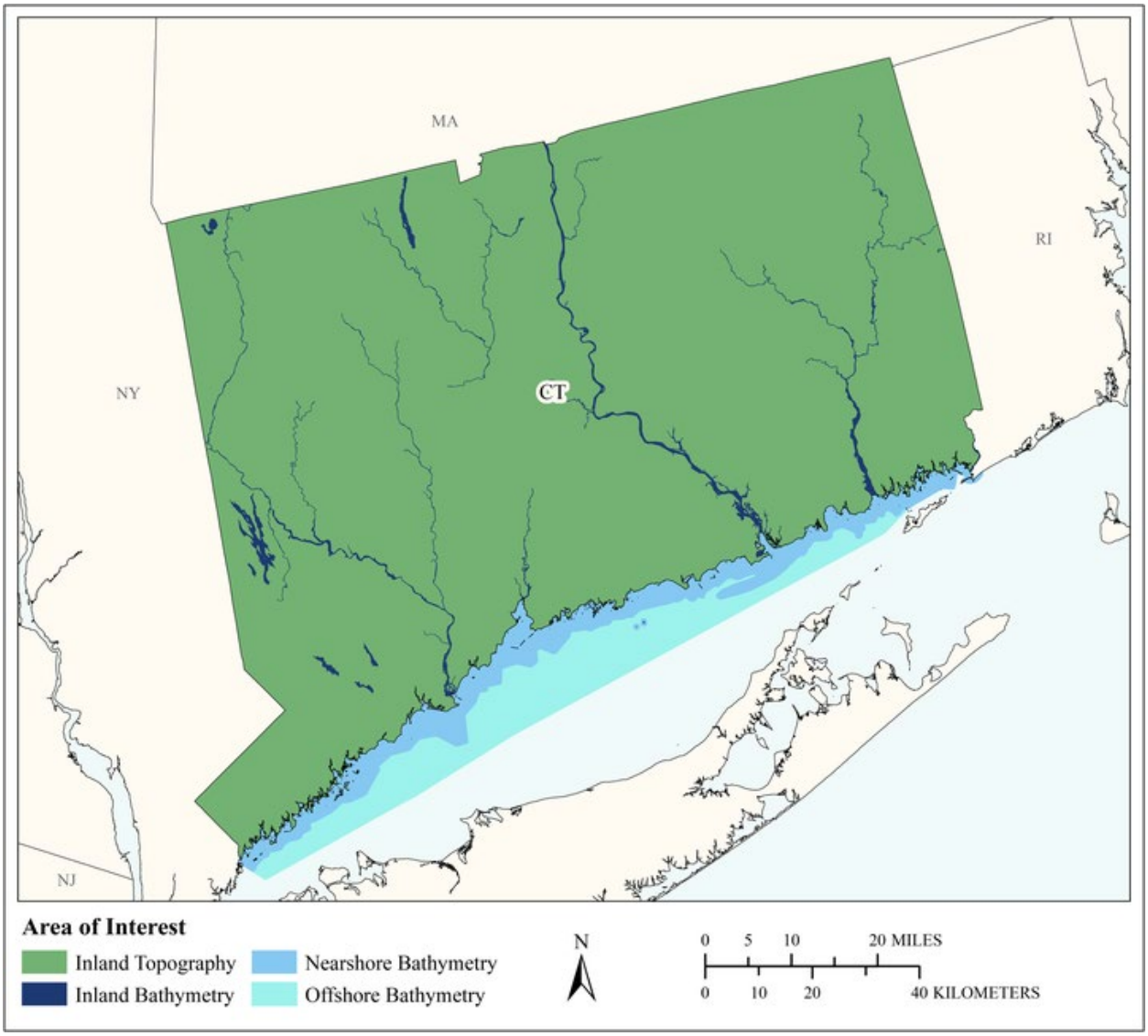
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major	Moderate	Major
Improved customer experience	Major	Moderate	Minor	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Moderate	Major
Environmental	Major	Major	Major	Major
Public safety, including life and property	Major	Moderate	Moderate	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		None			Moderate	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$195,012		Annual dollars saved/ realized	$26,431						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$716,144		Annual dollars saved/ realized	$1,189						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate			Moderate		
Environmental	Major			Major			Major			Major		
Public safety, including life and property	Major			Major			Moderate			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Wildlife and Habitat Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation planning for wildlife refuges and marine sanctuaries. Conservation of critical habitats. Management of diverse migratory bird habitats, coral reef and coral communities, marine mammals, protected fish species, and trust resources.
MCA Title	Wildlife and Habitat Management
MCA ID	60063
Organization Type	State or U.S. Territorial government
Organization Name	State of Connecticut
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B	QL0B	Special Order
Update Frequency	4-5 years	4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 2 meters	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DTM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Nice to have	Nice to have	Highly desirable
Classified point cloud	Highly desirable	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Highly desirable
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Highly desirable	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Not required	Nice to have
Lease areas			Not required	Nice to have
Fixed obstructions			Nice to have	Highly desirable
Floating observation/navigation systems			Nice to have	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Nice to have
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Highly desirable	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Nice to have	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Minor	Moderate
Cost savings/cost reduction	Major	Minor	Minor	Minor
Cost avoidance	Major	Minor	Moderate	Major
Increased revenues	None	Minor	None	None
Mission-driven performance improvements	Moderate	Moderate	Moderate	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate	Minor	Minor

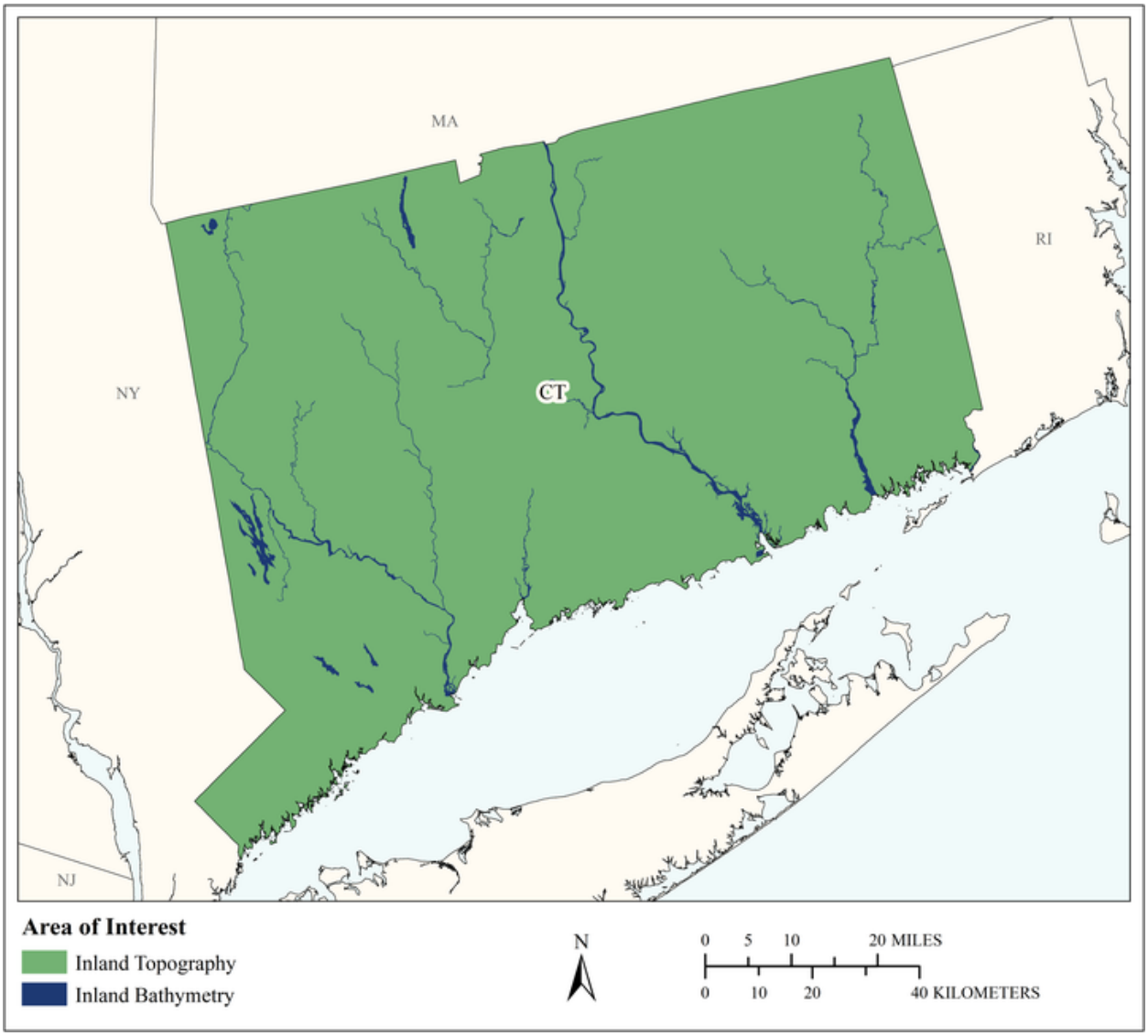
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Minor	Minor	Minor	Minor
Improved customer experience	Minor	Moderate	Minor	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Moderate	Minor	Minor
Environmental	Moderate	Moderate	Moderate	Major
Public safety, including life and property	Minor	Minor	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,184		Annual dollars saved/ realized	$9,491		Annual dollars saved/ realized	$248		Annual dollars saved/ realized	$324
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$3,420		Annual dollars saved/ realized	$5,737		Annual dollars saved/ realized	$14		Annual dollars saved/ realized	$22
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate			Moderate		
Environmental	Major			Moderate			Major			Major		
Public safety, including life and property	Moderate			Moderate			Moderate			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes			Yes
Curvature maps				
Cross sections	Yes			Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Agriculture and Precision Farming



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Farm pond design. Irrigation system design. Detailed site analysis to support precision farming. Analysis of farm sedimentation and runoff. Calibration of fertilizer application, fertilizer management, and irrigation planning. Optimized terraforming.
MCA Title	Agriculture and Precision Farming
MCA ID	60064
Organization Type	State or U.S. Territorial government
Organization Name	State of Connecticut
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 08 - Agriculture and Precision Farming
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Nice to have
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL4B		
Update Frequency	2-3 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 10 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 50 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required			Not required	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Not required	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Not required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level			Up to double the required TVU at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Nice to have	Nice to have		
Edited/cube XYZ		Highly desirable		
Full waveform	Nice to have	Highly desirable		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Required	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Highly desirable		
Land use/land cover	Highly desirable	Required		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Nice to have	Required		
Cultural resources	Nice to have	Highly desirable		
Coastal and riverine structures	Highly desirable	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	None		
Cost savings/cost reduction	Major	I don't know		
Cost avoidance	Major	Moderate		
Increased revenues	None	I don't know		
Mission-driven performance improvements	Moderate	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None		

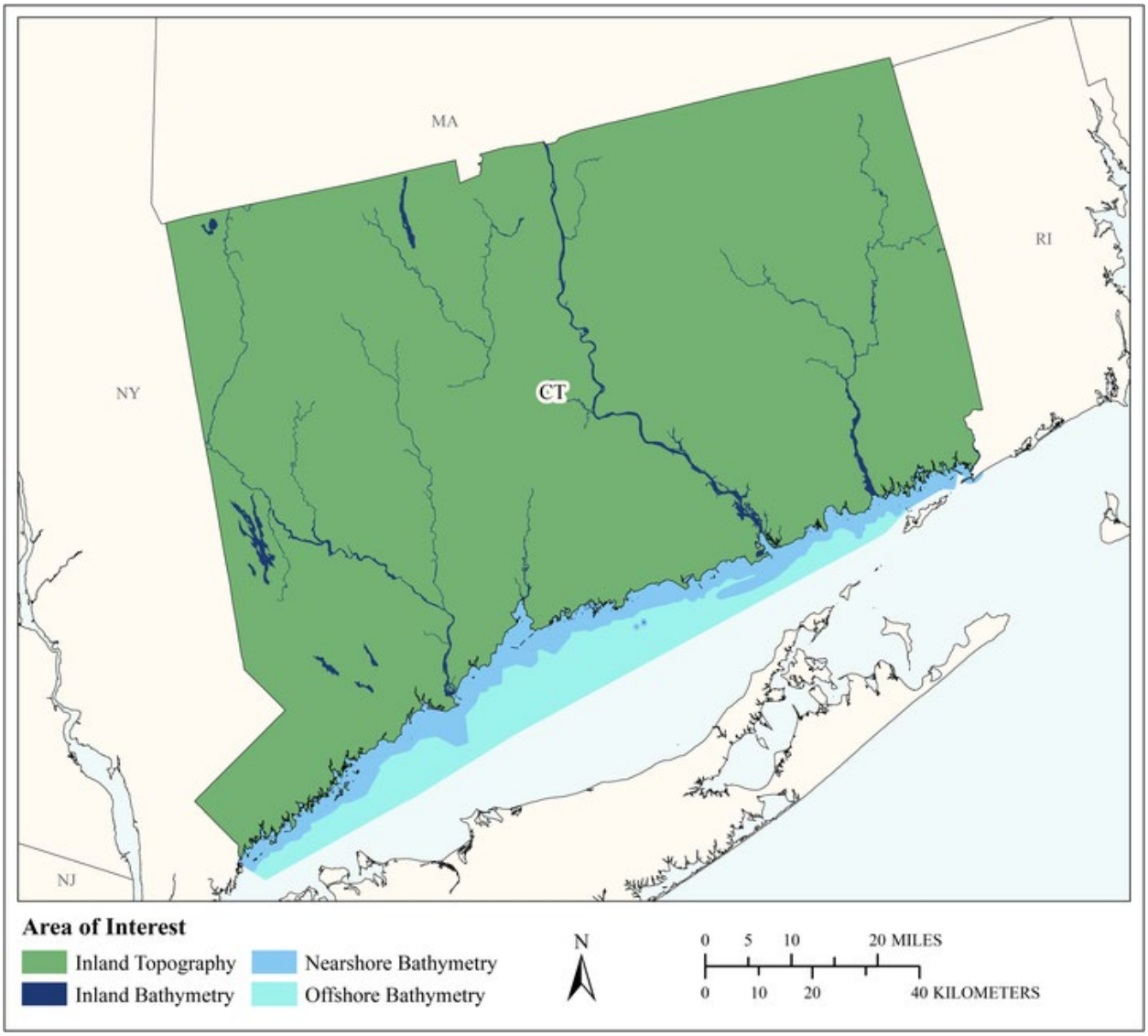
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	None		
Improved customer experience	Moderate	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	None		
Environmental	Major	I don't know		
Public safety, including life and property	Moderate	I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$5,756		Annual dollars saved/ realized	$10,085						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$4,563		Annual dollars saved/ realized	$4,563						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate								
Environmental	Major			Major								
Public safety, including life and property	Minor			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps				
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps		Yes		
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Fisheries Management and Aquaculture



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Management of fisheries. Sustainable aquaculture.
MCA Title	Fisheries Management and Aquaculture
MCA ID	60065
Organization Type	State or U.S. Territorial government
Organization Name	State of Connecticut
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B	QL0B	Special Order
Update Frequency	2-3 years	6-10 years	6-10 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Nice to have	Nice to have	Required	Nice to have
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Required	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Required
DTM	Required	Highly desirable	Highly desirable	Nice to have
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Nice to have	Highly desirable	Nice to have
Classified point cloud	Highly desirable	Nice to have	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Nice to have
Tide Predictions			Not required	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Highly desirable	Required
Ground control/ground truthing	Required	Highly desirable	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Nice to have	Required
Acoustic imagery of the seafloor			Highly desirable	Required
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Required
Underwater videography			Nice to have	Highly desirable
Bottom texture			Nice to have	Required
Bottom type			Highly desirable	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Highly desirable	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Required
Floating observation/navigation systems			Nice to have	Required
Shorelines – current, historic, change rates	Required	Highly desirable	Highly desirable	
Land use/land cover	Required	Highly desirable	Nice to have	Nice to have
Wetlands	Required	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Highly desirable
Inland surface water features	Required	Required	Nice to have	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Not required	
Coastal and riverine structures	Required	Highly desirable	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	Moderate
Cost savings/cost reduction	Major	Moderate	Major	Minor
Cost avoidance	Moderate	Moderate	Minor	Minor
Increased revenues	Moderate	Moderate	Minor	None
Mission-driven performance improvements	Major	Major	Moderate	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Minor	Moderate

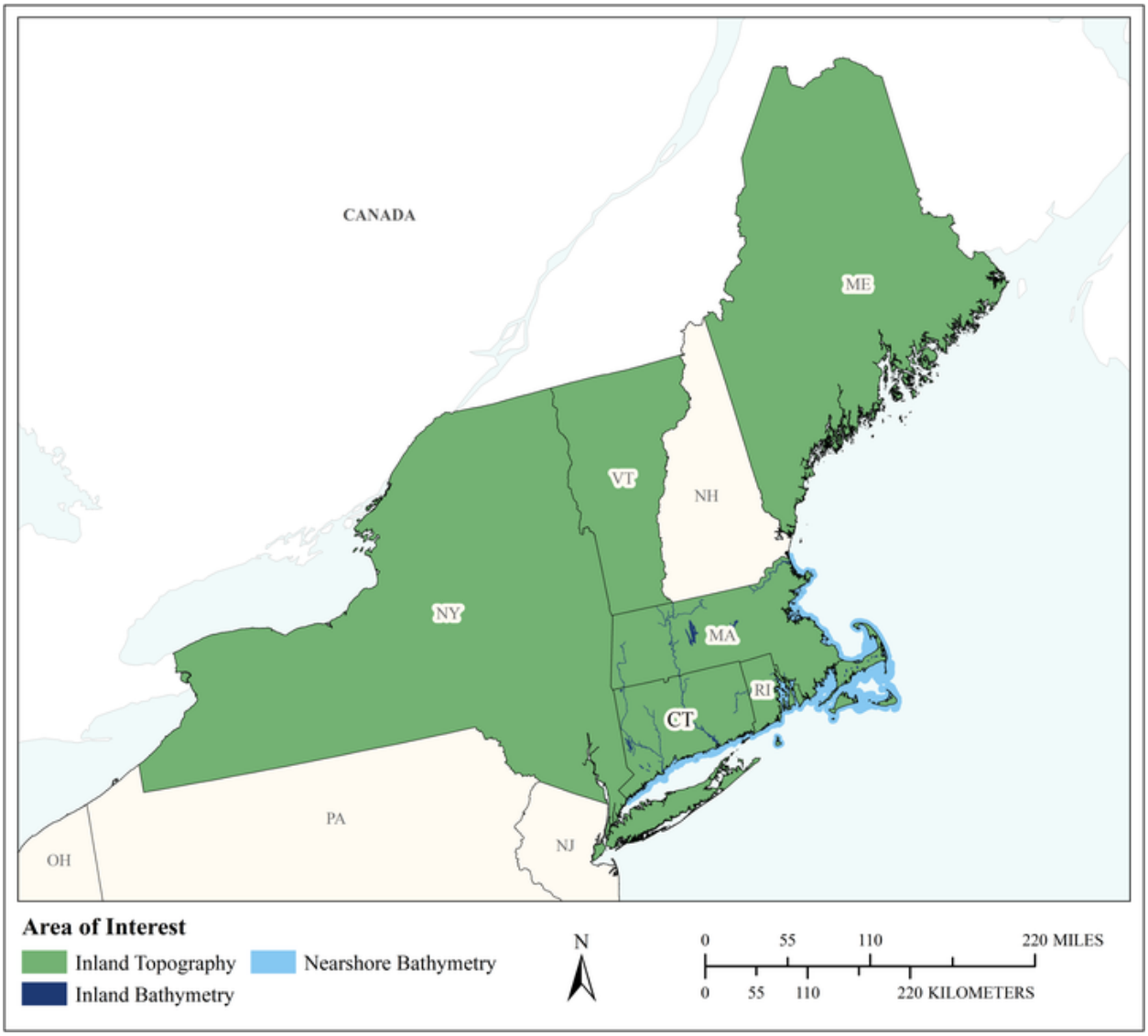
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major	Moderate	Minor
Improved customer experience	Moderate	Major	Minor	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Moderate	Moderate
Environmental	Major	Moderate	Moderate	Minor
Public safety, including life and property	Moderate	Minor	Minor	None

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		None		
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		None		
Increased revenues	Minor	Unable to provide		None			Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$5,082		Annual dollars saved/ realized	$9,948		Annual dollars saved/ realized	$39,494			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$11,039		Annual dollars saved/ realized	$4,527		Annual dollars saved/ realized	$2,900			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Moderate			Moderate		
Environmental	Moderate			Major			Major			Moderate		
Public safety, including life and property	Moderate			Moderate			Minor			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes		Yes	Yes
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic Mapping and Analysis and Cultural Resources Preservation and Conservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Geologic Mapping and Analysis; Cultural Resources Preservation and Conservation
MCA Title	Geologic Mapping and Analysis and Cultural Resources Preservation and Conservation
MCA ID	1415
Organization Type	Academic or Not-for-Profit
Organization Name	University of Connecticut
Sub-Agency or Division	
Organization Mission	Education and Research
Program Name	Center for Integrative Geosciences (BA, BS, MS, PhD) Department of Geography (BA, PhD)
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 14 - Cultural Resources Preservation and Management
Tertiary Business Use	BU 15 - Flood Risk Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Stonewalls, foundations, stone piles, beaver dams, cut-banks, gullies

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Highly desirable
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B	QL1B	
Update Frequency	2-3 years	2-3 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	Up to 1 meter	Up to 1 meter	
Acceptable Vertical Error	Up to 20 cm	Up to 20 cm	Up to 20 cm	
How far onshore needed			To Mean Lower Low Water (MLLW)	
How far down the beach profile needed	To MLLW		To MLLW	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have				Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required				Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable				Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable				Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer				Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Existing QL2 and QL1 datasets.	Best available	Best available	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	
NCEI				
Open Topography	Yes			
NOAA nautical charts			Yes	
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	I don't know	I don't know	
Cost savings/cost reduction	Major	I don't know	I don't know	
Cost avoidance	Major	I don't know	I don't know	

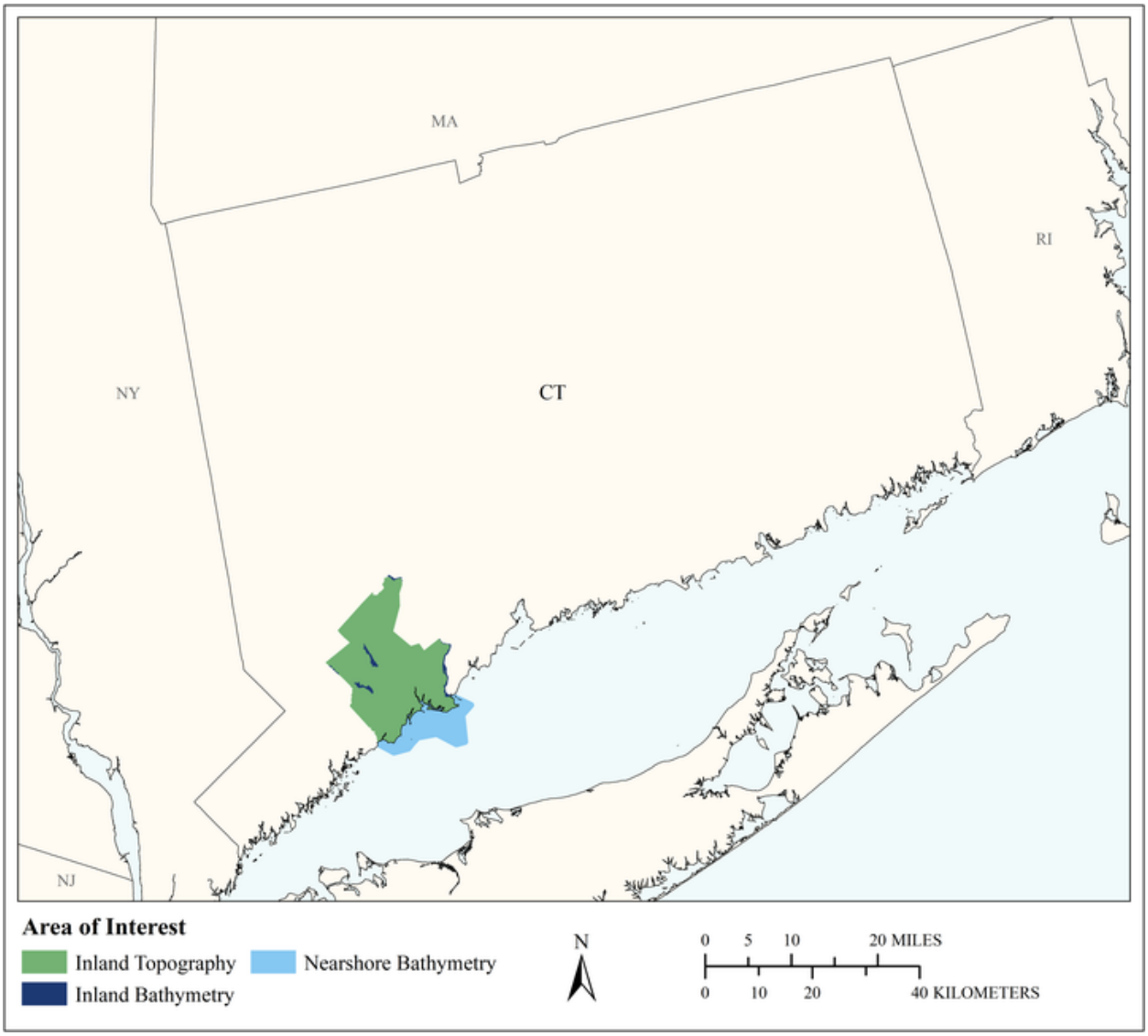
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	None	I don't know	I don't know	
Mission-driven performance improvements	Moderate	I don't know	I don't know	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None	I don't know	I don't know	
Improved response or timeliness	Minor	I don't know	I don't know	
Improved customer experience	None	I don't know	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	I don't know	I don't know	
Environmental	Major	I don't know	I don't know	
Public safety, including life and property	None	I don't know	I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$8,442	I don't know	Unable to provide		I don't know	Unable to provide				
Cost savings/cost reduction	Major	Annual dollars saved/realized	$100,000	I don't know	Unable to provide		I don't know	Unable to provide				
Cost avoidance	Moderate	Annual dollars saved/realized	$10,000	I don't know	Unable to provide		I don't know	Unable to provide				
Increased revenues	None			I don't know	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	Moderate	Annual percent improvement	30%	I don't know	Unable to provide		I don't know	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$399,025		Annual dollars saved/ realized	$6,847		Annual dollars saved/ realized	$9,090			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness	Minor	Annual dollars saved/realized	$1,960	I don't know	Unable to provide		I don't know	Unable to provide				
Improved customer experience	Minor	Annual dollars saved/realized	$603	I don't know	Unable to provide		I don't know	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$6,570		Annual dollars saved/ realized	$7,523		Annual dollars saved/ realized	$14,625			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			I don't know			I don't know					
Environmental	None			I don't know			I don't know					
Public safety, including life and property	None			I don't know			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes	Yes	Yes	
Curvature maps	Yes	Yes	Yes	
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Hazard Mitigation Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Respondent provided own shapefile, KML, or geodatabase	Respondent provided own shapefile, KML, or geodatabase	Respondent provided own shapefile, KML, or geodatabase	
Sub Area Requirements	Connecticut Metropolitan Council of Governments	Connecticut Metropolitan Council of Governments	Connecticut Metropolitan Council of Governments	

MCA Description	Response
Mission Critical Activity	Hazard Mitigation Planning
MCA Title	Hazard Mitigation Planning
MCA ID	21523
Organization Type	Regional, County, City, or other local government
Organization Name	Connecticut Metropolitan Council of Governments
Sub-Agency or Division	
Organization Mission	The Connecticut Metropolitan Council of Governments, or METROCOG, is one of several regional planning organizations authorized by the State of Connecticut. It is a multi-disciplinary planning and policy organization composed of six member communities: Bridgeport, Easton, Fairfield, Monroe, Stratford, and Trumbull. In addition to long-range planning, METROCOG also acts as the federally designated transportation planning agency for the area. However, it is important to note that METROCOG is only an advisory and coordinating body, and it cannot make or enforce laws or ordinances. It exists to ensure that local planning is aligned with state objectives, provide technical expertise, build consensus on critical regional issues that do not stop at municipal boundaries, and create meaningful partnerships between member communities.
Program Name	Land Use Planning
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.

General Geographic Area and Size	
Description of smallest 3D features	FEATURE DESCRIPTION: Runway Taxiway (includes Apron), Air Conditioner Unit, Com Tower/Antenna Building elevation (Roof Spot), Building Footprint, Concrete Pad, Courtyard, Deck/Patios, Foundation, Firewalls, Greenhouse, House, Trailer/Mobile Home, Large above ground tank, Loading Dock, Outbuilding, Railroad Platform, Railroad Platform Shelter, Silo, Smokestack, Building Under Construction, Structural Ruins, Substation Outline Tanks - small tanks only as a pt cell Tower - Generic (if more than 1 type), Water Tower, Microwave Tower, Radio Tower, 4-legged Transmission Tower, Wastewater Treatment Plant, Bridge, FootBridge, Cemetery, Area Under Construction, Catch Basin, Concrete Dam, Culvert, Detention/Retention Basin, Drain Feature, Earth Dam, Floodwall, Sewage Treatment Pool, Paved Surface Driveway, Unpaved Surface Driveway, Wall, Fence, Guide/Guard Rail, Retaining Wall, Stone Wall, Headwall, Canal, Hidden Hydro Island Pond/Lake, Watercourse (centerline), Reservoir (Pond with Dam), River -10ft wide - doubleline-100ft long, Salt Water (Ocean), Stream ->10ft wide-must be 100' long, Marsh/Swamp, SeaWall, Bus shelter, Electric Box, Fire Hydrant, Billboard, General Manhole, Sign, Utility Box, Flag Pole, Statue, Landfill, Buoy, Docks and Boat Ramp, Fixed Dock, Floating Dock, Bulkhead, Pier, Jetty, Paved Parking, Unpaved Parking, Golf Cart Path, Trail, Electrical Substation/Vault, Light Pole, Utility Pole, Util./Light Pole, Rail line, Electric Line, Wire, Poles, Railroad Sign, RR Switch, Median Paved, Alley Paved, Cemetery road, Invisible road, Paved Road, Road Centerline, Unpaved Road, Road Under Construction, Tunnel, Unpaved Cemetery road, Road-Curb Under construction Centerline, Unpaved road centerline, Golf Club or Driving range Boundary, Golf Green, Golf Tee, Golf Sandtrap, Park Bleachers, Park bench, Tracks/Athletic Field, Public Picnic Table, Pool-above Ground, Pool-inground, Public Playground, Athletic Court (Tennis), Baseball Field, Crosswalk (Show outside polygon only), Boardwalk, O/H Walkway, Sidewalk (public), Stairs (public), Traffic Signal with Mast Arm, Parking Meter, Traffic cabinet, Traffic Signal, Shrub Outline, Hedge, Single Coniferous Tree, Single Deciduous Tree, Tree Row, Canopy - Tree Outline, Orchard Outline

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Nice to have
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required

Inland Bathy Feature Size Requirements	Response
½ - 1 acre	Not required
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	Cross sections and/or transects meet needs	QL1B	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	I don't know	The best horizontal accuracy achievable for the vertical accuracy I need	
Acceptable Vertical Error	Up to 20 cm	I don't know	Up to 40 cm	
How far onshore needed			To MHW	
How far down the beach profile needed	To MLLW		To MHW	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs		Yes		
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Highly desirable	Highly desirable		Highly desirable	Nice to have
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable		Highly desirable	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Highly desirable		Required	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable		Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	I don't know		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	
DTM	Required	Required	Highly desirable	
DEM	Required	Required	Highly desirable	
Raw point cloud data	Required	Required	Highly desirable	
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Highly desirable	
Full waveform	Highly desirable	Highly desirable	Highly desirable	
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Required	
Ground control/ground truthing	Required	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Required	
Acoustic imagery of the seafloor			Required	
Aerial and/or satellite imagery	Required	Required	Highly desirable	
Underwater videography			Highly desirable	
Bottom texture			Required	
Bottom type			Required	
Submerged features			Required	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Nice to have	Required	Highly desirable	
Water column properties - Physical			Highly desirable	
Water column properties - Chemical			Highly desirable	
Water column properties - Biological			Highly desirable	
Currents			Highly desirable	
Tide/wave heights			Required	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Highly desirable	
Routes			Required	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Required	
Floating observation/navigation systems			Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Required	Required	Highly desirable	
Wetlands	Required	Required	Highly desirable	
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Required	Required	Highly desirable	
Cultural resources	Required	Required	Highly desirable	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL2 2016 State of Connecticut	Best available	Best available	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast		Yes		
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes	Yes	

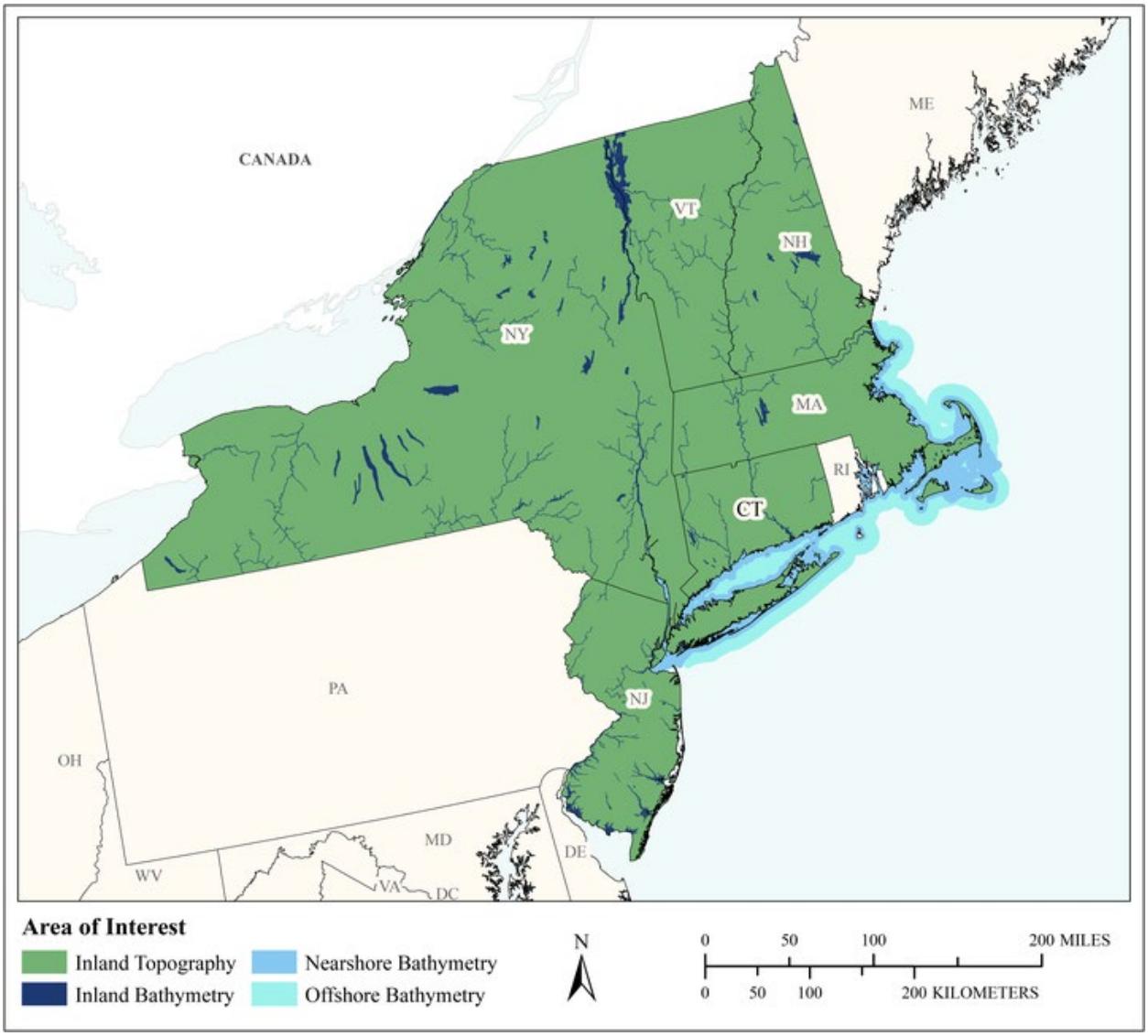
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
State repositories used	Connecticut Environmental Conditions Online: cteco.uconn.edu	Connecticut Environmental Conditions Online. cteco.uconn.edu	Metadata: http://www.cteco.uconn.edu/metadata/dep/document/LIS_BATHYMETRY_FGDC_Plus.htm CT DEEP GIS Data: http://www.ct.gov/deep/cwp/view.asp?a=2698&q=322898&deepNav_GID=1707	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Minor	Minor	
Cost savings/cost reduction	Major	Minor	Minor	
Cost avoidance	Major	Minor	Minor	
Increased revenues	None	Minor	Minor	
Mission-driven performance improvements	Moderate	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor	Minor	
Improved response or timeliness	Minor	Minor	Minor	
Improved customer experience	Moderate	Minor	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	
Environmental	Moderate	Minor	Minor	
Public safety, including life and property	Moderate	Minor	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Cost avoidance	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Cost avoidance description	Entities such as municipal government organizations, cities/towns, NGOs, etc., typically leverage data collected through large scale statewide projects to help serve local/regional needs. By having access to elevation data accurate enough to support engineering design and environmental modeling smaller organizations will be less likely to spend out-of-pocket. It may also limit the need for field visits or focus those visits on specific tasks resulting in overall operational efficiencies.			Entities such as municipal government organizations, cities/towns, NGOs, etc., typically leverage data collected through large scale statewide projects to help serve local/regional needs. By having access to elevation data accurate enough to support engineering design and environmental modeling smaller organizations will be less likely to spend out-of-pocket. It may also limit the need for field visits or focus those visits on specific tasks resulting in overall operational efficiencies.			Entities such as municipal government organizations, cities/towns, NGOs, etc., typically leverage data collected through large scale statewide projects to help serve local/regional needs. By having access to elevation data accurate enough to support engineering design and environmental modeling smaller organizations will be less likely to spend out-of-pocket. It may also limit the need for field visits or focus those visits on specific tasks resulting in overall operational efficiencies.					
Increased revenues	None			Minor	Unable to provide		None					
Mission-driven performance improvements	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$14,929		Annual dollars saved/ realized	$197		Annual dollars saved/ realized	$1,209			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Improved customer experience description	If large scale state-wide data is made available for download through state agency or Federal sites/portals, when consultants or partners need it, those connections can be provided directly eliminating the need for staff to package it and thus reducing delays in receiving it.			If large scale state-wide data is made available for download through state agency or Federal sites/portals, when consultants or partners need it, those connections can be provided directly eliminating the need for staff to package it and thus reducing delays in receiving it.			If large scale state-wide data is made available for download through state agency or Federal sites/portals, when consultants or partners need it, those connections can be provided directly eliminating the need for staff to package it and thus reducing delays in receiving it.					
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$262		Annual dollars saved/ realized	$217		Annual dollars saved/ realized	$1,946			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Minor			Minor					
Environmental	Major			Minor			Moderate					
Public safety, including life and property	Major			Minor			Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Geologic Mapping



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Custom description	Custom description
Sub Area Requirements			Atlantic Coast of Connecticut, Rhode Island, Massachusetts, and New York	7 nm off the Atlantic Coast of Connecticut, Rhode Island, Massachusetts, and New York

MCA Description	Response
Mission Critical Activity	Geologic Mapping, Resource Evaluation, Hazards Mitigation, Infrastructure Siting. Mining and oil and gas resource consulting on land and offshore (not regulatory).
MCA Title	Geologic Mapping
MCA ID	22418
Organization Type	State or U.S. Territorial government
Organization Name	CT DEEP, Geological Survey
Sub-Agency or Division	
Organization Mission	The state geological and natural history survey shall be under the direction of the Commissioner of Energy and Environmental Protection. Said survey shall have for its objects: (1) An examination of the geological formation of the state, with special reference to such economic products as building stones, clays, ores and other mineral substances; (2) an examination of the animal and plant life of the state, with special reference to its economic and educational value; (3) the preparation of special maps to illustrate the resources of the state; (4) the preparation of special reports, with necessary illustrations and maps, which shall embrace both a general and detailed description of the geology and natural history of the state.
Program Name	State Geological Survey
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 13 - Oil and Gas Resources
Tertiary Business Use	BU 11 - Geologic Resource Mining and Extraction

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Large boulders such as glacial erratics. Underwater archaeological artifacts.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL3B	QL3B	Special Order
Update Frequency	4-5 years	6-10 years	4-5 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	I don't know
Acceptable Vertical Error	Up to 20 cm	I don't know	Up to 1 meter	I don't know
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			I don't know	I don't know
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Required
Entire AOI under same environmental conditions	Required	Required	Required	Required	Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Required	Required	Required	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Required	Required	Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Nice to have	Nice to have
DTM	Required	Highly desirable	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Highly desirable	Nice to have	Nice to have
Classified point cloud	Highly desirable	Highly desirable	Nice to have	
Edited/cube XYZ		Required	Highly desirable	Required
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	Highly desirable
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Required	Required
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Highly desirable	Highly desirable
Bottom texture			Required	Required
Bottom type			Required	Required
Submerged features			Required	Required
Subbottom characteristics			Required	Required
Geologic and seismic data	Required	Required	Required	Required
Water column properties - Physical			Highly desirable	Required
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Nice to have
Sea ice conditions			Highly desirable	Nice to have
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Highly desirable	Highly desirable
Routes			Highly desirable	Highly desirable
Offshore cadastral			Highly desirable	Highly desirable
Lease areas			Required	Required
Fixed obstructions			Required	Required
Floating observation/navigation systems			Highly desirable	Required
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Required	Required	Required	Required
Wetlands	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required	Required	Required	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Statewide 2016 Coast 2012 Extent Dates March 11, 2016 through April 16, 2016 Area 5240 sq mi Tiles 23,381 Acquired By Capitol Region Council of Government (project info) Flown By Sanborn Projection Connecticut State Plane NAD83 (2011) feet, NAVD88 feet Classified Point Cloud Yes DEM 1m Intensity Yes Breakline Data Yes Imagery: Statewide, 4-band orthoimagery tiles with 3 inch pixel resolution in GeoTIFF and MrSID formats Elevation: Statewide QL2 Lidar point cloud as LAS files with ground/non-ground classification and hydro flattened Bare earth 1 meter DEM tiles in GeoTIFF format Contours lines (1 and 5 feet) Hydro break lines Intensity images in GeoTIFF format FDGC/USGS compliant metadata	Title: Connecticut Lake Bathymetry Polygon Originators: State of Connecticut, Department of Environmental Protection (data compiler, editor, and publisher) Publisher: State of Connecticut, Department of Environmental Protection Publication place: Hartford, Connecticut USA Publication date: 2003 Edition: 2011 Data type: vector digital data Data location: http://www.ct.gov/deep Other citation details: The State of Connecticut, Department of Environmental Protection is the collector of the data (compiler), the creator and maintainer of the data layer (editor), and producer (publisher) of this information for use. Quality level unknown	Project dependent, NOAA	Project dependent, NOAA
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast			Yes	Yes
NCEI			Yes	Yes
Open Topography				
NOAA nautical charts				

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	CT Dept of Energy and Environmental Protection internal servers & www.cteco.uconn.edu	CT Dept of Energy and Environmental Protection		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	None	Minor	I don't know
Cost savings/cost reduction	Major	None	Minor	I don't know
Cost avoidance	Major	None	Minor	I don't know
Increased revenues	I don't know	I don't know	Minor	I don't know
Mission-driven performance improvements	Major	None	Minor	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None	Minor	I don't know
Improved response or timeliness	Major	I don't know	Minor	I don't know
Improved customer experience	Major	I don't know	Minor	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor	Minor	I don't know
Environmental	Major	Minor	Moderate	I don't know
Public safety, including life and property	Moderate	I don't know	Minor	I don't know

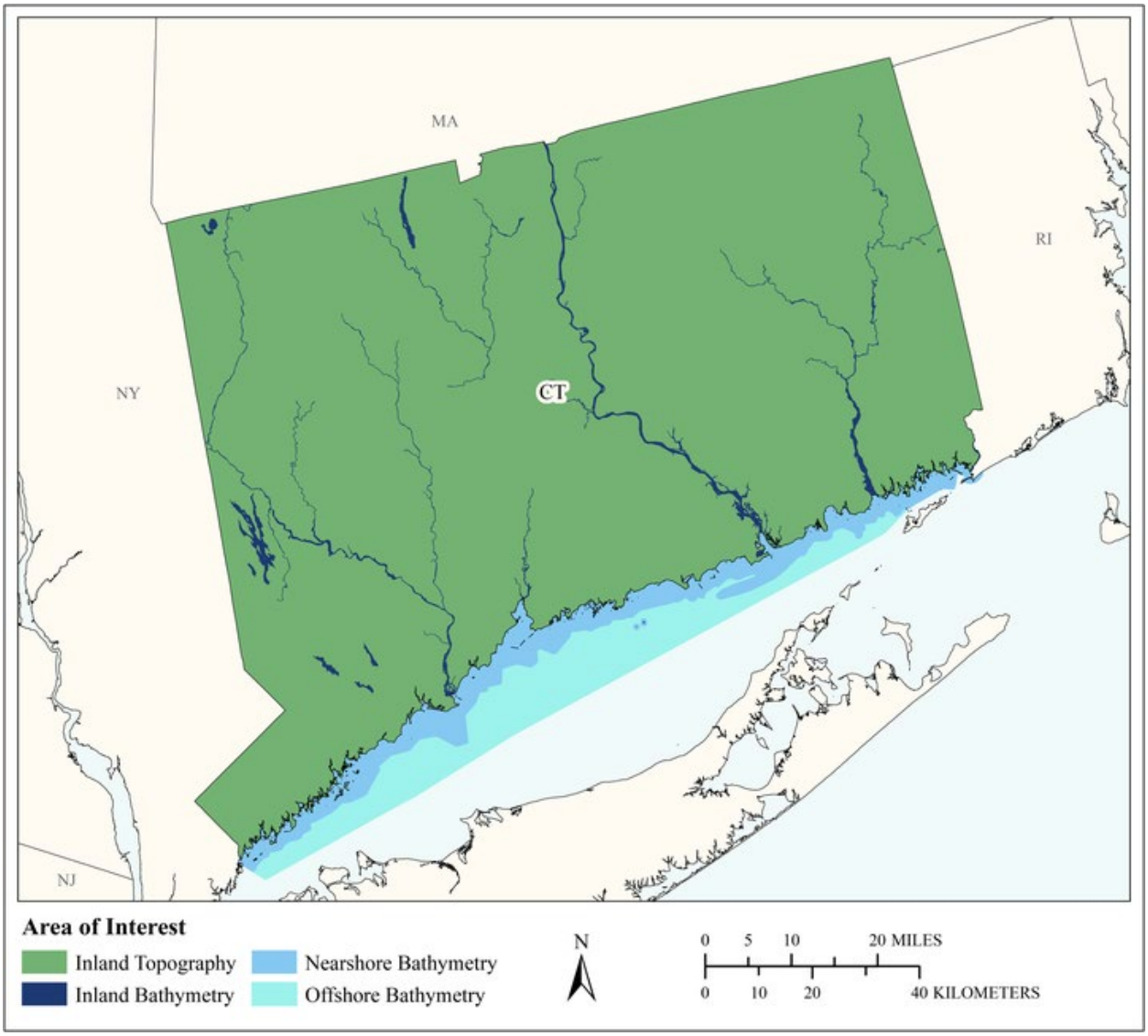
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Time savings description	We update our mining inventory and geologic sites database every 5 years. 3D imagery and lidar data is used to plan fieldwork, so saves time. Imagery and lidar DEMS are used to cross-check and improve geologic mapping. Good imagery and lidar data improve field planning, outcrop identification, and geologic site work. 3D imagery and lidar data is used to plan fieldwork, so saves time.						Better data improves ability to perform mission, time savings, faster response to inquiries to office, etc. Difficult to quantify.			Better data improves ability to perform mission, time savings, faster response to inquiries to office, etc. Difficult to quantify.		
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance description	Not our role. Applications in development.											
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide	
Increased revenues description	Pipeline infrastructure planning increases capacity of fuel delivery.											
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Mission-driven performance improvements description							Better data improves ability to perform mission, time savings, faster response to inquiries to office, etc. Difficult to quantify.			Better data improves ability to perform mission, time savings, faster response to inquiries to office, etc. Difficult to quantify.		
Other operational benefits	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Other operational benefits description				Integration of bathymetric data with geologic and geophysical data for mapping.			Better characterization of coastal erosion hazards.					
Future annual operational benefits added during validation		Annual dollars saved/ realized	$517,293		Annual dollars saved/ realized	$6,847		Annual dollars saved/ realized	$9,090		Annual dollars saved/ realized	$481,461
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Value added to products or services description	Landslide hazards, bedrock fracture mapping, subsidence. Outdoor education and recreation planning.											
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness description	Landslide hazards, bedrock fracture mapping, subsidence.						Better data improves ability to perform mission, time savings, faster response to inquiries to office, etc. Difficult to quantify.			Better data improves ability to perform mission, time savings, faster response to inquiries to office, etc. Difficult to quantify.		
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$9,080		Annual dollars saved/ realized	$7,523		Annual dollars saved/ realized	$14,625			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate			I don't know		
Environmental	Major			Major			Moderate			Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Public safety, including life and property	Moderate	Minor	Moderate	Minor
Other				
Other benefits	Moderate			
Other description	Improved geologic mapping and landscape analyses			

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes	Yes	Yes	Yes
Curvature maps				
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes		Yes	
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes	Yes	Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Renewable Energy Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Alternate energy development – solar, tidal, wind, wave, and ocean current. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Low head power potential for hydropower.
MCA Title	Renewable Energy Resources
MCA ID	60066
Organization Type	State or U.S. Territorial government
Organization Name	State of Connecticut
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	I don't know
Rivers and Streams	
Less than 10 ft	I don't know
10 - 50 ft	I don't know
51 - 100 ft	I don't know
101 - 500 ft	I don't know
501 - 2,500 ft	I don't know
Greater than 2,500 ft	I don't know
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	I don't know
½ - 1 acre	I don't know
1.1 – 2 acres	I don't know
2.1 – 5 acres	I don't know

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	I don't know
Greater than 10 acres	I don't know

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	I don't know	I don't know	I don't know
Update Frequency	6-10 years	I don't know	I don't know	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	I don't know	I don't know	I don't know
Acceptable Vertical Error	Up to 20 cm	I don't know	I don't know	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					I don't know	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	I don't know	I don't know	I don't know	I don't know	I don't know
Entire AOI under same environmental conditions	Highly desirable	I don't know	I don't know	I don't know	I don't know	I don't know
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	I don't know	I don't know	I don't know	I don't know	I don't know
DEM for entire AOI needs to be seamless	Highly desirable	I don't know	I don't know	I don't know	I don't know	I don't know
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	I don't know	I don't know	I don't know
DTM	Required	I don't know	I don't know	I don't know
DEM	Required	I don't know	I don't know	I don't know
Raw point cloud data	Highly desirable	I don't know	I don't know	I don't know
Classified point cloud	Highly desirable	I don't know	I don't know	
Edited/cube XYZ		I don't know	I don't know	I don't know
Full waveform	Nice to have	I don't know	I don't know	I don't know
Bathymetric Attributed Grid (BAG)		I don't know	I don't know	I don't know
Breaklines required for standard hydro-flattening	Nice to have	I don't know		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			I don't know	I don't know
Tide Predictions			I don't know	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			I don't know	I don't know
Intensity imagery/sidescan imagery	Not required	I don't know	I don't know	I don't know
Ground control/ground truthing	Highly desirable	I don't know	I don't know	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			I don't know	I don't know
Nautical and/or navigation charts			I don't know	I don't know
Acoustic imagery of the seafloor			I don't know	I don't know
Aerial and/or satellite imagery	Highly desirable	I don't know	I don't know	I don't know
Underwater videography			I don't know	I don't know
Bottom texture			I don't know	I don't know
Bottom type			I don't know	I don't know
Submerged features			I don't know	I don't know
Subbottom characteristics			I don't know	I don't know
Geologic and seismic data	Not required	I don't know	I don't know	I don't know
Water column properties - Physical			I don't know	I don't know
Water column properties - Chemical			I don't know	I don't know
Water column properties - Biological			I don't know	I don't know
Currents			I don't know	I don't know
Tide/wave heights			I don't know	I don't know
Sea ice conditions			I don't know	I don't know
Habitat distribution and classification			I don't know	I don't know
Boundaries			I don't know	I don't know
Routes			I don't know	I don't know
Offshore cadastral			I don't know	I don't know
Lease areas			I don't know	I don't know
Fixed obstructions			I don't know	I don't know
Floating observation/navigation systems			I don't know	I don't know
Shorelines – current, historic, change rates	Nice to have	I don't know	I don't know	
Land use/land cover	Highly desirable	I don't know	I don't know	I don't know
Wetlands	Nice to have	I don't know	I don't know	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			I don't know	I don't know
Inland surface water features	Nice to have	I don't know	I don't know	
Bridges/culverts	Nice to have	I don't know		
Landmark features	Nice to have	I don't know	I don't know	
Cultural resources	Not required	I don't know	I don't know	
Coastal and riverine structures	Nice to have	I don't know	I don't know	
Overhead structures			I don't know	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	I don't know	I don't know	I don't know
Cost savings/cost reduction	Moderate	I don't know	I don't know	I don't know
Cost avoidance	Moderate	I don't know	I don't know	I don't know
Increased revenues	None	I don't know	I don't know	I don't know
Mission-driven performance improvements	Minor	I don't know	I don't know	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	I don't know	I don't know	I don't know

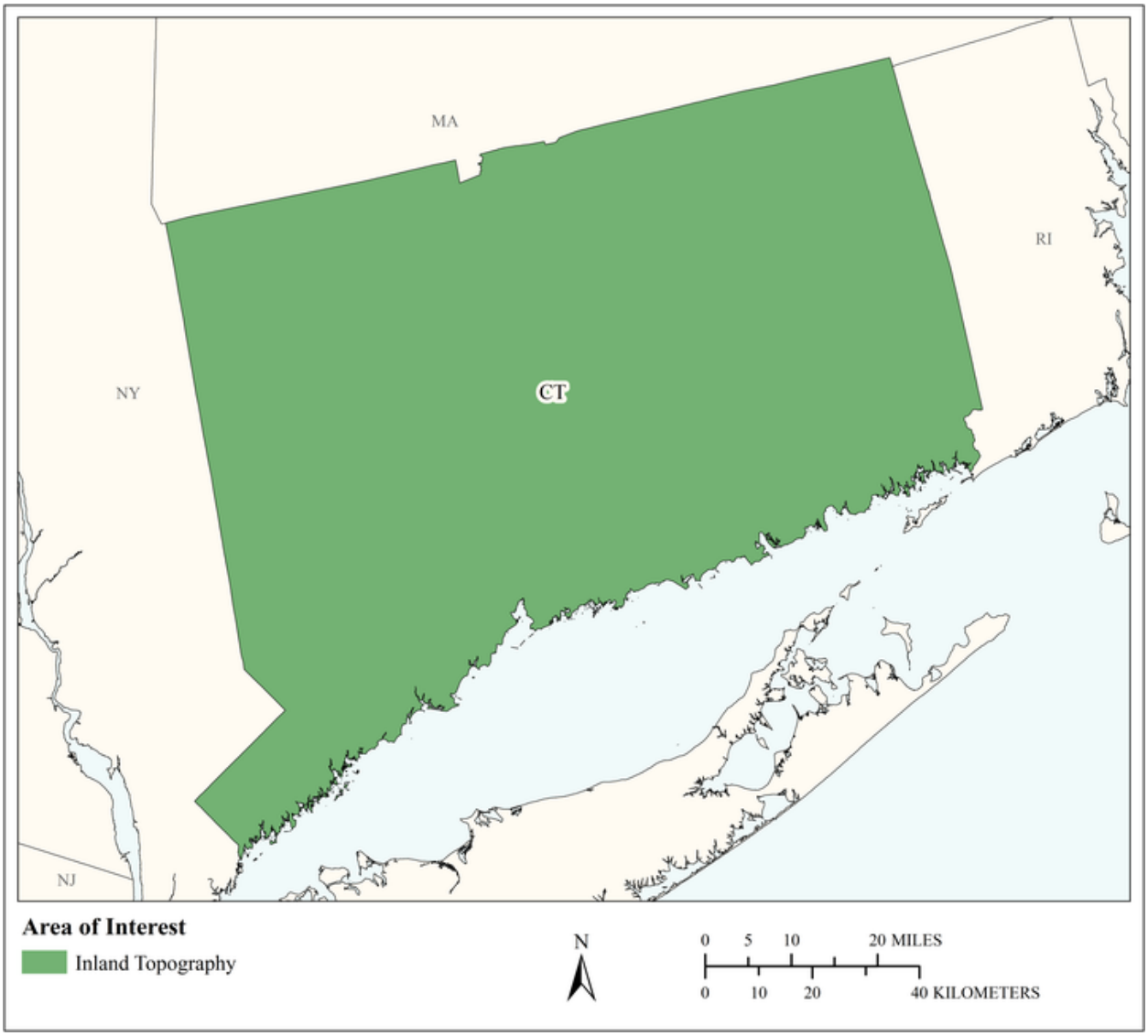
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor	I don't know	I don't know	I don't know
Improved customer experience	Minor	I don't know	I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	I don't know	I don't know	I don't know
Environmental	Minor	I don't know	I don't know	I don't know
Public safety, including life and property	Minor	I don't know	I don't know	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Minor	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			I don't know			I don't know			I don't know		
Environmental	Minor			I don't know			I don't know			I don't know		
Public safety, including life and property	None			I don't know			I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Cultural Resources Preservation and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Discovery and analysis of underwater archaeological and historical cultural sites. Site protection and preservation planning. Discovery and analysis of Native American and other historical cultural sites and subsistence activities. Stone wall mapping for property records.
MCA Title	Cultural Resources Preservation and Management
MCA ID	60067
Organization Type	State or U.S. Territorial government
Organization Name	State of Connecticut
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Nice to have					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have					
DEM for entire AOI needs to be seamless	Nice to have					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Moderate			
Cost avoidance	Minor			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			

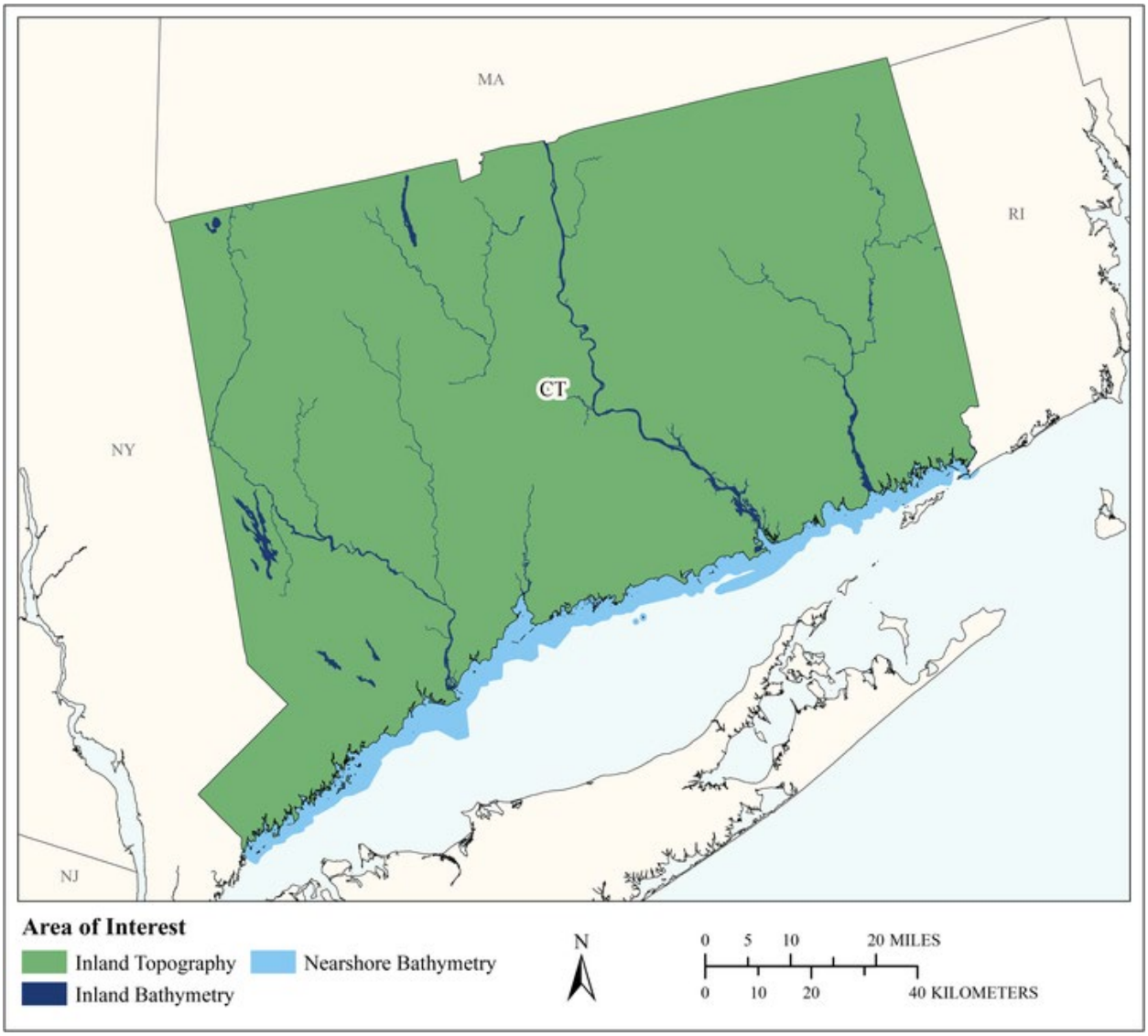
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Cost savings/cost reduction	Minor	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Moderate	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$911									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$796									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	Minor											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Flood Risk Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Flood risk modeling and mapping of riverine and coastal areas. Dam/dike/levee safety analysis. Emergency management. Flood forecasts.
MCA Title	Flood Risk Management
MCA ID	60068
Organization Type	State or U.S. Territorial government
Organization Name	State of Connecticut
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL2B	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Highly desirable	
DTM	Required	Required	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	
Classified point cloud	Required	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Not required	
Geologic and seismic data	Nice to have	Nice to have	Not required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Highly desirable	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Not required	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Minor	
Cost savings/cost reduction	Major	Minor	Minor	
Cost avoidance	Major	Moderate	Minor	
Increased revenues	Minor	Minor	None	
Mission-driven performance improvements	Major	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Minor	

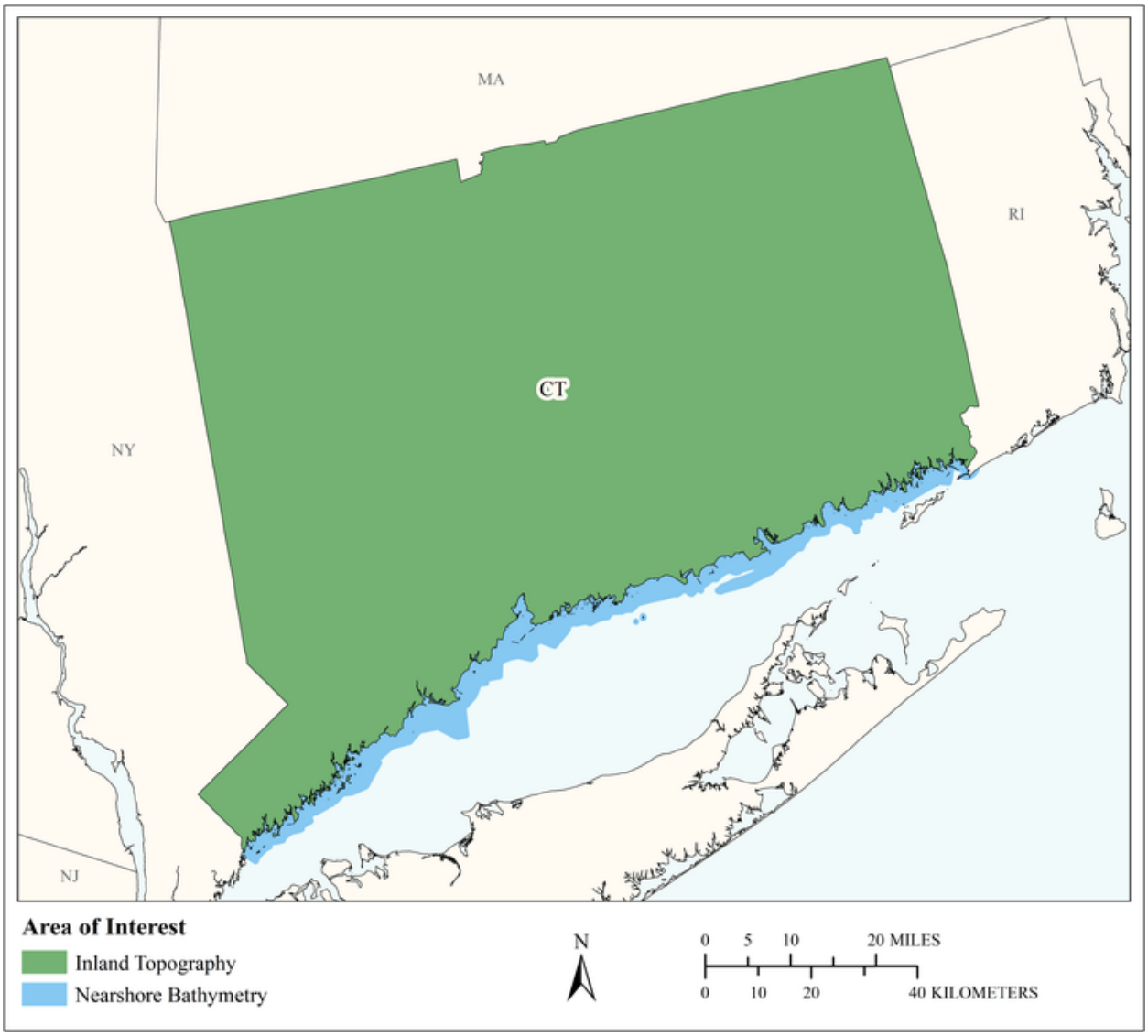
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	Minor	
Improved customer experience	Major	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor	Minor	
Environmental	Major	Moderate	Moderate	
Public safety, including life and property	Major	Moderate	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	Minor	Unable to provide		None			Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$698,083		Annual dollars saved/ realized	$48,493		Annual dollars saved/ realized	$47,598			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$122,142		Annual dollars saved/ realized	$54,446		Annual dollars saved/ realized	$35,277			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate			Major					
Environmental	Moderate			Moderate			Moderate					
Public safety, including life and property	Major			Major			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Sea Level Rise and Subsidence



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Modeling and mapping the effects of sea level rise or subsidence. Population and economic vulnerability assessments. Coastal inundation and infrastructure assessment.
MCA Title	Sea Level Rise and Subsidence
MCA ID	60069
Organization Type	State or U.S. Territorial government
Organization Name	State of Connecticut
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 16 - Sea Level Rise and Subsidence
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD		QL2B	
Update Frequency	4-5 years		2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter		Up to 5 meters	
Acceptable Vertical Error	Up to 20 cm		Up to 40 cm	
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have		Required			Required
Entire AOI under same environmental conditions	Highly desirable		Required			Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Required			Required
DEM for entire AOI needs to be seamless	Required		Required			Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable		Highly desirable	
DTM	Required		Highly desirable	
DEM	Required		Required	
Raw point cloud data	Highly desirable		Nice to have	
Classified point cloud	Required		Highly desirable	
Edited/cube XYZ			Not required	
Full waveform	Not required		Not required	
Bathymetric Attributed Grid (BAG)			Not required	
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable		Highly desirable	
Ground control/ground truthing	Required		Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required		Required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have		Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Required	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Required		Highly desirable	
Land use/land cover	Required		Highly desirable	
Wetlands	Required		Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required		Required	
Bridges/culverts	Required			
Landmark features	Highly desirable		Nice to have	
Cultural resources	Nice to have		Nice to have	
Coastal and riverine structures	Required		Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes		Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Major	
Cost savings/cost reduction	Major		Major	
Cost avoidance	Major		Major	
Increased revenues	None		Minor	
Mission-driven performance improvements	Major		Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		Major	

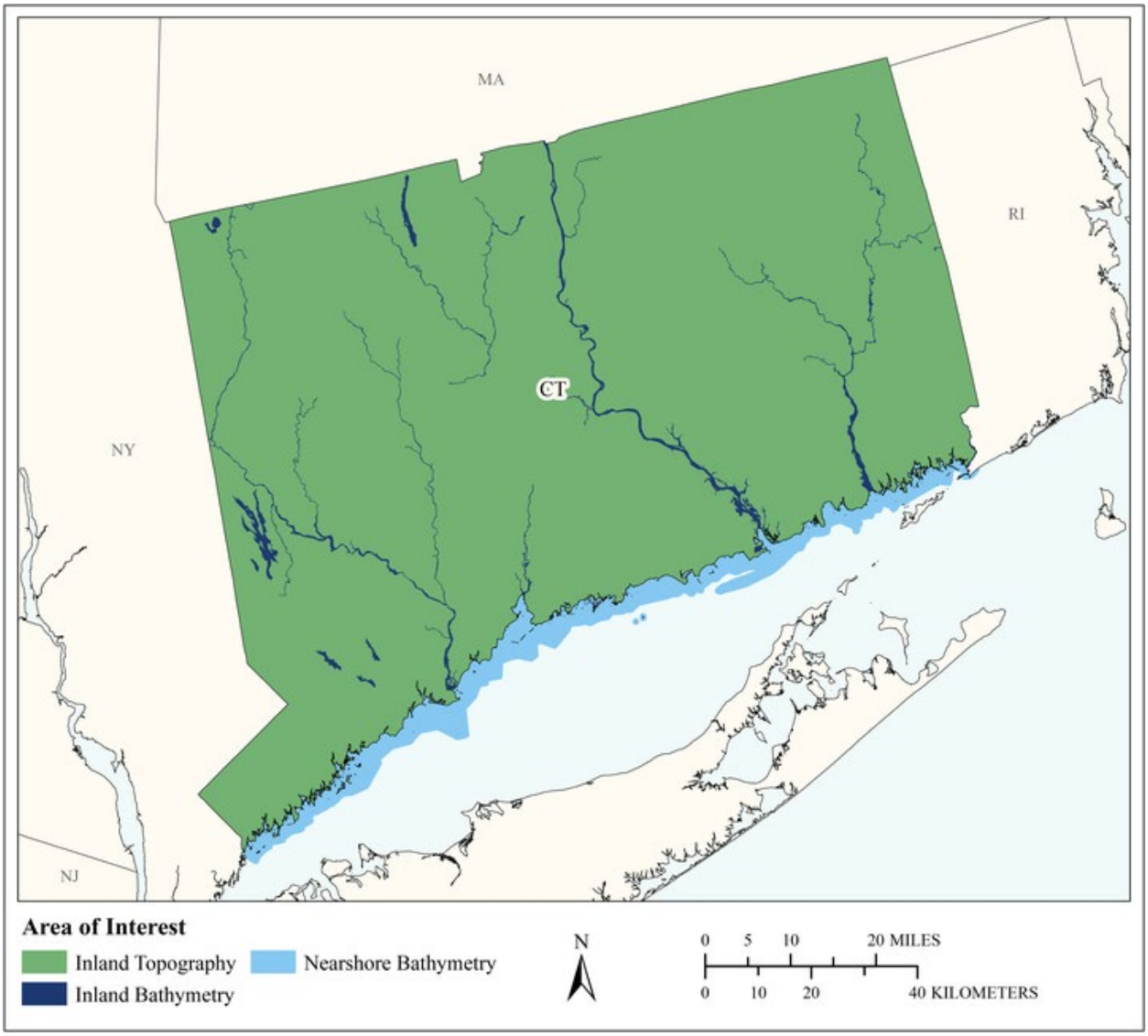
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate		Major	
Improved customer experience	Moderate		Major	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major		Major	
Environmental	Moderate		Major	
Public safety, including life and property	Major		Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide					Major	Unable to provide				
Cost avoidance	Major	Unable to provide					Moderate	Unable to provide				
Increased revenues	Moderate	Unable to provide					Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide					Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$261,757									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide					Major	Unable to provide				
Improved customer experience	Major	Unable to provide					Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate						Major					
Environmental	Moderate						Major					
Public safety, including life and property	Moderate						Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	
Contours	Yes		Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections			Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Homeland Security, Law Enforcement, Disaster Response, and Emergency Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Infrastructure and border protection. Coastal search and rescue. Population dynamics. Emergency fuel supply and movement. Line of sight analysis in urban areas. Disaster response. Flood risk analysis resulting from acts of terrorism.
MCA Title	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
MCA ID	60070
Organization Type	State or U.S. Territorial government
Organization Name	State of Connecticut
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B	QL1B	
Update Frequency	4-5 years	4-5 years	6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable		Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Required	
DTM	Required	Highly desirable	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Highly desirable	Highly desirable	
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Highly desirable	Highly desirable	
Full waveform	Nice to have	Nice to have	Highly desirable	
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Highly desirable	
Ground control/ground truthing	Required	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Required	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Highly desirable	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Nice to have	
Boundaries			Highly desirable	
Routes			Highly desirable	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	
Cost savings/cost reduction	Major	Major	Major	
Cost avoidance	Major	Moderate	Moderate	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	Moderate	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Minor	

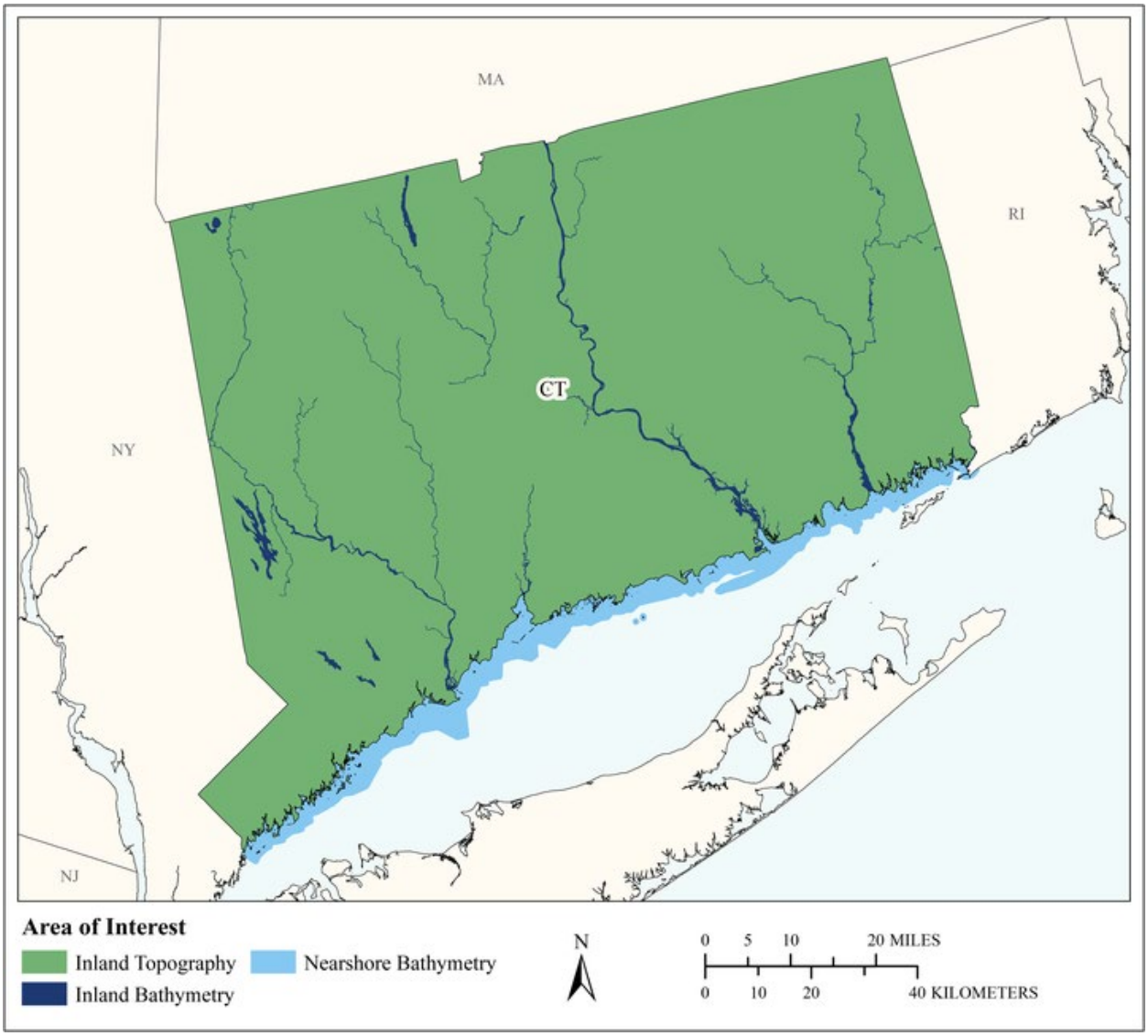
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major	Minor	
Improved customer experience	Major	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	Minor	
Environmental	Minor	Moderate	Minor	
Public safety, including life and property	Major	Major	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$146,671		Annual dollars saved/ realized	$41,306		Annual dollars saved/ realized	$2,315			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$2,592		Annual dollars saved/ realized	$2,635		Annual dollars saved/ realized	$66			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate					
Environmental	Moderate			Moderate			Moderate					
Public safety, including life and property	Major			Major			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Land Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Road and railroad route selection and maintenance. Slope analysis for autonomous cars. GPS navigation visualization.
MCA Title	Land Navigation and Safety
MCA ID	60071
Organization Type	State or U.S. Territorial government
Organization Name	State of Connecticut
Sub-Agency or Division	Department of Transportation
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 19 - Land Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL0B	QL0B	
Update Frequency	2-3 years	2-3 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable		Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Highly desirable	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	
Classified point cloud	Highly desirable	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Highly desirable	
Full waveform	Nice to have	Nice to have	Highly desirable	
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	
Ground control/ground truthing	Required	Required	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Highly desirable	Highly desirable	Highly desirable	
Water column properties - Physical			Highly desirable	
Water column properties - Chemical			Highly desirable	
Water column properties - Biological			Highly desirable	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Highly desirable	
Boundaries			Highly desirable	
Routes			Highly desirable	
Offshore cadastral			Highly desirable	
Lease areas			Highly desirable	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Nice to have	Required	Highly desirable	
Land use/land cover	Highly desirable	Required	Highly desirable	
Wetlands	Required	Required	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Highly desirable	Highly desirable	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Minor	
Cost savings/cost reduction	Major	Minor	Minor	
Cost avoidance	Moderate	Minor	Minor	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	None	

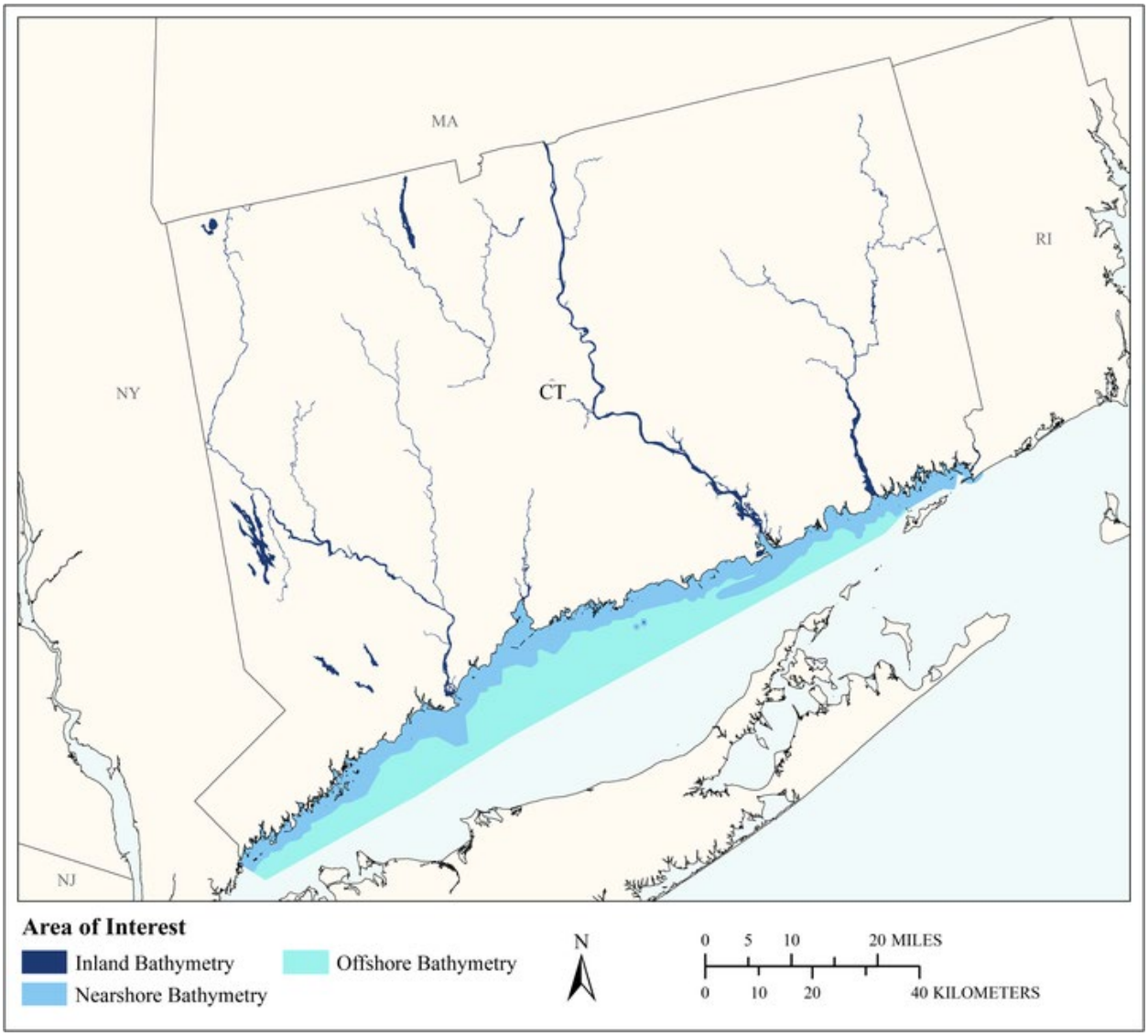
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	None	
Improved customer experience	Major	Minor	None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	None	
Environmental	Moderate	Moderate	Moderate	
Public safety, including life and property	Major	Minor	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		None					
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$64,407		Annual dollars saved/ realized	$2,747						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$5,201		Annual dollars saved/ realized	$28						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			None					
Environmental	Major			Moderate			Moderate					
Public safety, including life and property	Major			Moderate			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps	Yes		Yes	
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes		Yes	
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Marine and Riverine Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type		Required	Required	Required
Geographic Area Requirements		One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Nautical charting. Bathymetric measurements of nearshore submerged coastal topography. Identification of hazards to navigation. Sediment management at coastal navigation projects. Precision marine navigation. Movement of goods and fishing vessels.
MCA Title	Marine and Riverine Navigation and Safety
MCA ID	60072
Organization Type	State or U.S. Territorial government
Organization Name	State of Connecticut
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Nice to have
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order		QL0B	QL0B	I don't know
Update Frequency		2-3 years	2-3 years	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error		Up to 2 meters	Up to 2 meters	I don't know
Acceptable Vertical Error		Up to 30 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season		Nice to have	Nice to have	I don't know		Nice to have
Entire AOI under same environmental conditions		Nice to have	Nice to have	I don't know		Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless		Required	Required	I don't know		Highly desirable
DEM for entire AOI needs to be seamless		Required	Required	I don't know		Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness		Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM		Highly desirable	Required	I don't know
DTM		Highly desirable	Required	I don't know
DEM		Required	Required	I don't know
Raw point cloud data		Nice to have	Required	I don't know
Classified point cloud		Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Highly desirable	I don't know
Full waveform		Not required	Not required	I don't know
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	I don't know
Breaklines required for standard hydro-flattening		Not required		
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	I don't know
Tide Predictions			Required	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	I don't know
Intensity imagery/sidescan imagery		Nice to have	Highly desirable	I don't know
Ground control/ground truthing		Nice to have	Highly desirable	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	I don't know
Nautical and/or navigation charts			Highly desirable	I don't know
Acoustic imagery of the seafloor			Highly desirable	I don't know
Aerial and/or satellite imagery		Required	Highly desirable	I don't know
Underwater videography			Nice to have	I don't know
Bottom texture			Highly desirable	I don't know
Bottom type			Highly desirable	I don't know
Submerged features			Highly desirable	I don't know
Subbottom characteristics			Nice to have	I don't know
Geologic and seismic data		Not required	Nice to have	I don't know
Water column properties - Physical			Nice to have	I don't know
Water column properties - Chemical			Nice to have	I don't know
Water column properties - Biological			Nice to have	I don't know
Currents			Highly desirable	I don't know
Tide/wave heights			Highly desirable	I don't know
Sea ice conditions			Nice to have	I don't know
Habitat distribution and classification			Highly desirable	I don't know
Boundaries			Nice to have	I don't know
Routes			Required	I don't know
Offshore cadastral			Nice to have	I don't know
Lease areas			Nice to have	I don't know
Fixed obstructions			Required	I don't know
Floating observation/navigation systems			Required	I don't know
Shorelines – current, historic, change rates		Required	Required	
Land use/land cover		Nice to have	Nice to have	I don't know
Wetlands		Required	Highly desirable	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	I don't know
Inland surface water features		Required	Highly desirable	
Bridges/culverts		Highly desirable		
Landmark features		Nice to have	Nice to have	
Cultural resources		Highly desirable	Nice to have	
Coastal and riverine structures		Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts		Yes	Yes	
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings		Major	Minor	I don't know
Cost savings/cost reduction		I don't know	Minor	I don't know
Cost avoidance		Major	Minor	I don't know
Increased revenues		None	Minor	I don't know
Mission-driven performance improvements		Minor	Minor	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services		None	Minor	I don't know

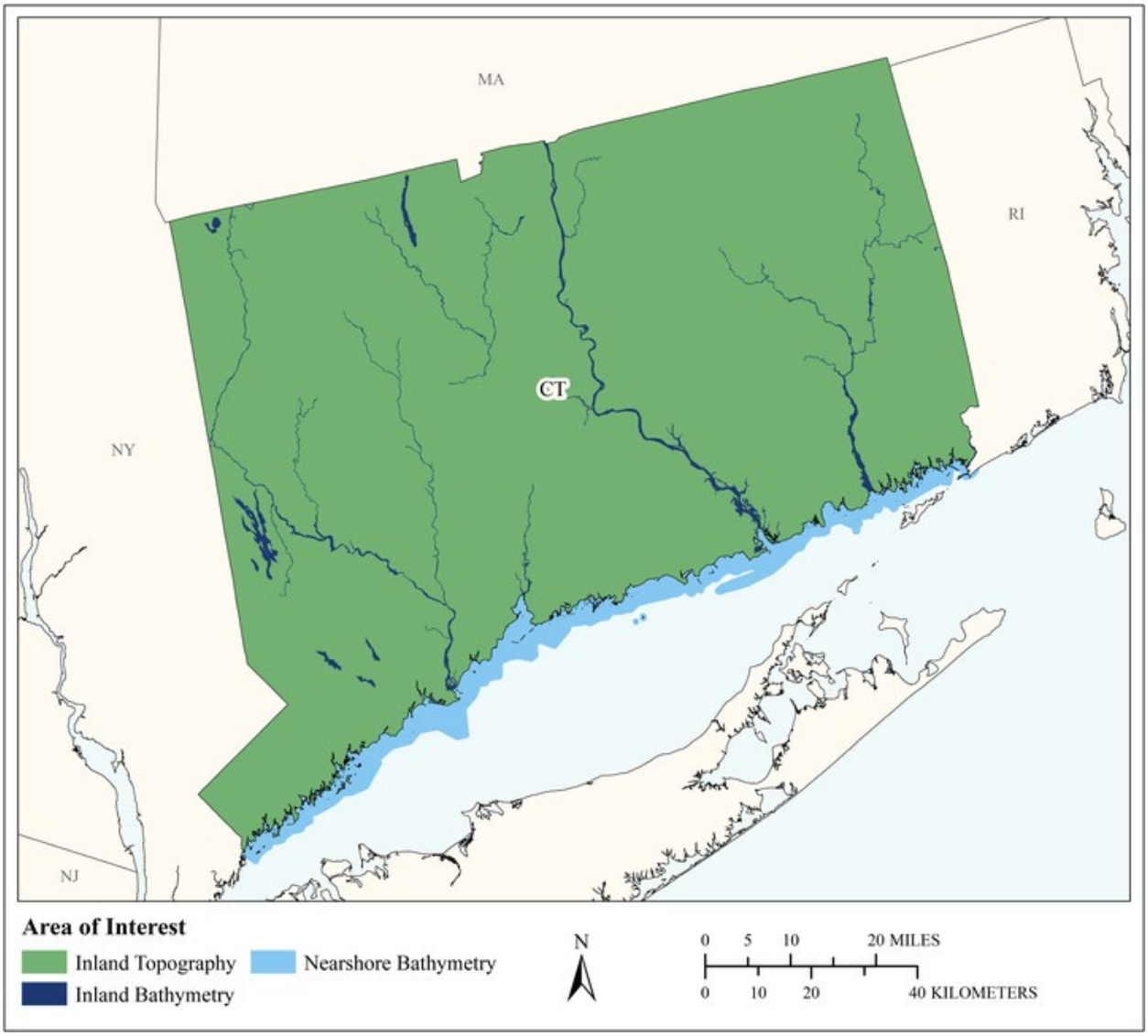
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness		None	Minor	I don't know
Improved customer experience		None	Minor	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach		None	Minor	I don't know
Environmental		None	Minor	I don't know
Public safety, including life and property		None	Major	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings				Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction				Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Cost avoidance				Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Increased revenues				Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements				Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation					Annual dollars saved/ realized	$90,691		Annual dollars saved/ realized	$192,714			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services				Minor	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness				Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Improved customer experience				Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Future annual customer service benefits added during validation					Annual dollars saved/ realized	$11,936		Annual dollars saved/ realized	$6,524			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach				Moderate			Minor			I don't know		
Environmental				Moderate			Major			I don't know		
Public safety, including life and property				Moderate			Major			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes	Yes	
Contours		Yes	Yes	Yes
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps				Yes
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)		Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints		Yes		
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				Yes

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Transportation Engineering



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Transportation engineering to include highway, railroad, and bridge planning; land acquisition; and design. Also includes H&H modeling for bridge and culvert design. (Ports and airports are no longer under CT DOT.)
MCA Title	Transportation Engineering
MCA ID	1419
Organization Type	State or U.S. Territorial government
Organization Name	CT DOT, State of CT
Sub-Agency or Division	
Organization Mission	Provide safe and efficient transportation facilities
Program Name	CT DOT
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 19 - Land Navigation and Safety
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	1 inch desirable on land, underwater obstructions especially in nearshore areas, scour at structures as well

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Not required

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Not required
Greater than 10 acres	Not required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL2B	
Update Frequency	4-5 years	4-5 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI			QL0B would be nice to have, QL2B is reasonable	
Acceptable Horizontal Error	Less than 20 cm	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 10 cm	Up to 20 cm	Up to 40 cm	
How far onshore needed			To MHW	
How far down the beach profile needed	To MLLW		To MLLW	
Tide correction requirement			MHW	
Cross sections and/or transects meet needs		Partial		
Cross section/transect requirement		Cross Sections are actually created from a 3D model. Primarily for Bridge and Bridge Scour Design Surveying (Facia, low chord, then various bridge span distances up and down stream). Cross sections needed for hydraulic model input at structures and between them.		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Required	Required		Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level		Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Nice to have	
DTM	Required	Required	Highly desirable	
DEM	Required	Highly desirable	Required	
Raw point cloud data	Required	Highly desirable	Highly desirable	
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Highly desirable	Highly desirable	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Nice to have	Nice to have	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Required	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Nice to have	Nice to have	Highly desirable	
Water column properties - Physical			Highly desirable	
Water column properties - Chemical			Highly desirable	
Water column properties - Biological			Highly desirable	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Highly desirable	
Habitat distribution and classification			Required	
Boundaries			Required	
Routes			Highly desirable	
Offshore cadastral			Nice to have	
Lease areas			Highly desirable	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Required	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Highly desirable	Highly desirable	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Statewide 2016 QL2 data	All bathymetry is a standard field survey collection for CTDOT Projects. Done by contractors using boats. No external data are currently available.	Used to design bridges and to determine construction sequencing	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast		Yes	Yes	
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes	Yes	
State repositories used	Statewide Multi-Agency Procured Data provided through the UCONN	UCONN CLEAR	UCONN CLEAR	
Other	Yes			
Other description	Custom Flights / 2 CM			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available	None	
Cost savings/cost reduction	Major	Inland bathy data not available	None	
Cost avoidance	Major	Inland bathy data not available	None	
Increased revenues	None	Inland bathy data not available	None	
Mission-driven performance improvements	Moderate	Inland bathy data not available	None	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available	None	
Improved response or timeliness	Major	Inland bathy data not available	None	
Improved customer experience	Moderate	Inland bathy data not available	None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Inland bathy data not available	None	
Environmental	Moderate	Inland bathy data not available	None	
Public safety, including life and property	Moderate	Inland bathy data not available	None	

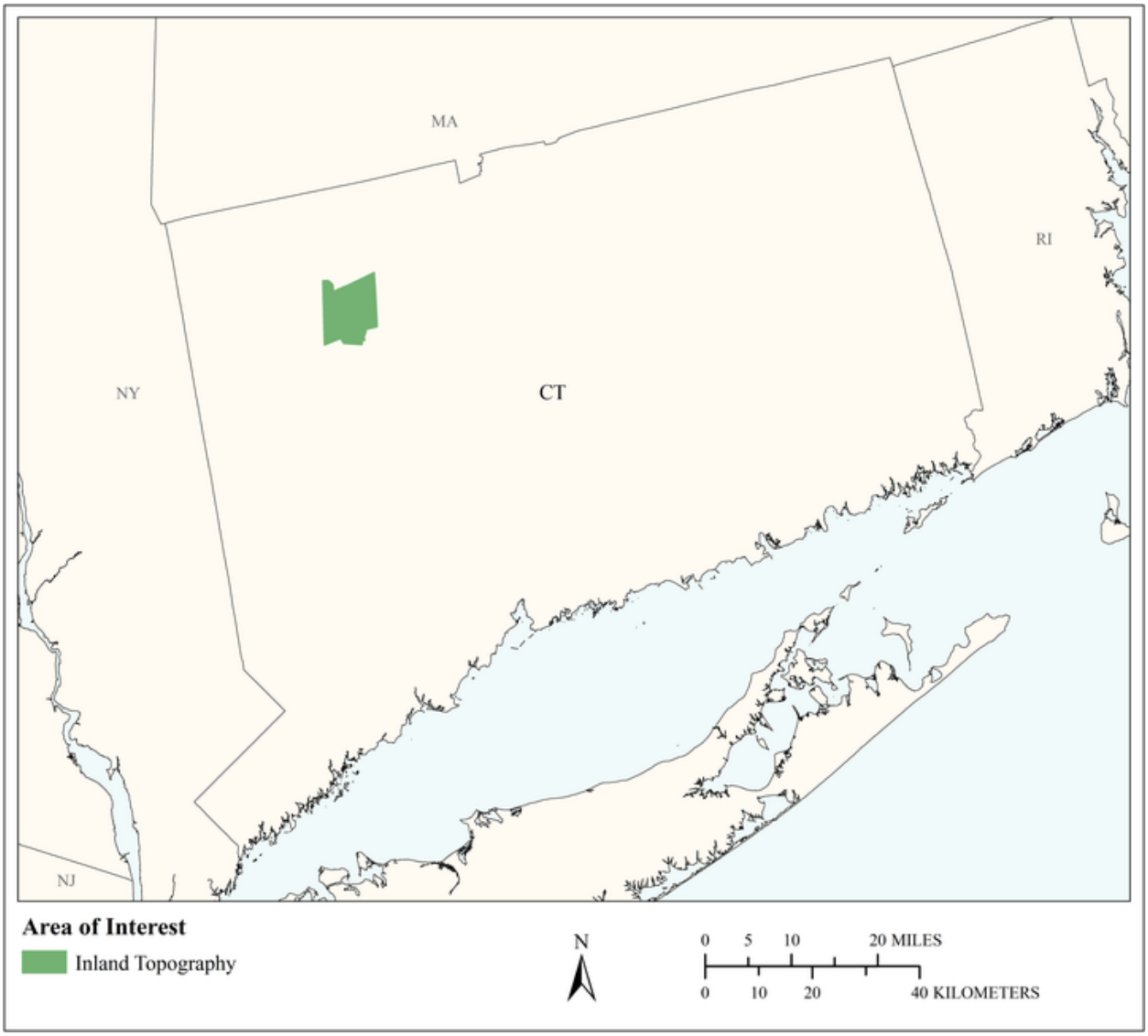
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$86,832	I don't know	Unable to provide		I don't know	Unable to provide				
Time savings description	The use of these data are not a primary management tool. Still at working levels of use. Used for all Hydraulic Analysis during Design. 1/2 crew day per project plus supervisory review time. Data is used outside of primary project limits for area extensions and study. Used for blunder detection. Savings based on reduced construction claims (likely millions of dollars). See answer above. Once these data uses are incorporated in daily work flows, I envision huge time saving throughout the CTDOT enterprise.											
Cost savings/cost reduction	Moderate	Annual dollars saved/realized	$350,000	I don't know	Unable to provide		I don't know	Unable to provide				
Cost savings/cost reduction description	Doesn't apply to Dept. of Transportation Missions. This amount is in land surveying and mapping data acquisition cost savings.			Could be significant if recent enough. Tidal rivers change frequently.								
Cost avoidance	Moderate	Annual dollars saved/realized	$1,250,000	I don't know	Unable to provide		I don't know	Unable to provide				
Cost avoidance description	See above. Again just an estimate but good DEMs will aid in volatile liquid spill mitigation and plume warnings for first responders IF available in real-time. Just an estimate of $$. Better hydrology will enable better storm analysis for bridge safety studies. At this time all of the noted work is done by consultants.											
Increased revenues	Major	Annual dollars saved/realized	$1,000,000	I don't know	Unable to provide		I don't know	Unable to provide				
Increased revenues description	As previously noted, once new workflows are available to the working level engineers, I envision very significant savings to be realized. DNA for CTDOT mission. Bridge clearances are more pertinent for truck cargo and our use of heavy rail is (unfortunately) minimal.											
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements description	See above. Not to be repetitive, but new applications and workflows will significantly improve operations, but we need the data first.											
Future annual operational benefits added during validation					Annual dollars saved/ realized	$75,279		Annual dollars saved/ realized	$5,253			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future annual customer service benefits added during validation					Annual dollars saved/ realized	$7,816		Annual dollars saved/ realized	$722			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			Minor					
Environmental	Major			Major			Major					
Public safety, including life and property	Major			Major			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Local Flood Protection and Infrastructure Mapping



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Respondent provided own shapefile, KML, or geodatabase			
Sub Area Requirements	City of Torrington, CT			

MCA Description	Response
Mission Critical Activity	Local Flood Protection and Infrastructure Mapping
MCA Title	Local Flood Protection and Infrastructure Mapping
MCA ID	22330
Organization Type	Regional, County, City, or other local government
Organization Name	City of Torrington
Sub-Agency or Division	
Organization Mission	Support of municipal public works, engineering, land use, conservation, and economic development efforts; support of public needs for geospatial data.
Program Name	Local Flood Protection and Infrastructure Mapping
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Utilities infrastructure, real-property features for survey level mapping

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm			
Acceptable Vertical Error	Less than 5 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Data available from Sate of CT for 2016 LiDAR and Ortho program, and various NRCS datasets			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes			
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know			
Cost savings/cost reduction	I don't know			
Cost avoidance	I don't know			
Increased revenues	I don't know			

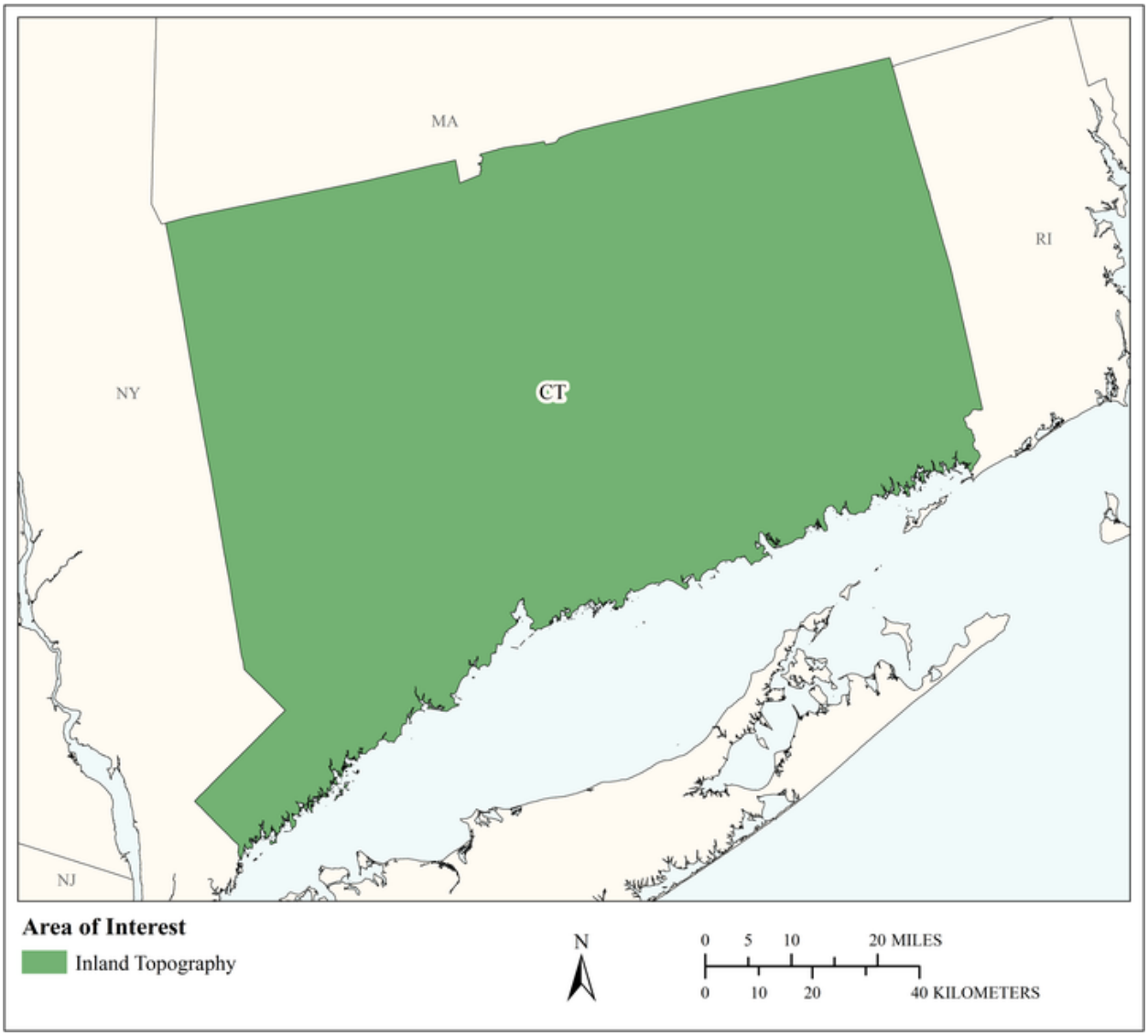
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Mission-driven performance improvements	I don't know			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know			
Improved response or timeliness	I don't know			
Improved customer experience	I don't know			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know			
Environmental	I don't know			
Public safety, including life and property	I don't know			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide										
Cost savings/cost reduction	I don't know	Unable to provide										
Cost avoidance	I don't know	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	I don't know	Unable to provide										
Other operational benefits	I don't know	Unable to provide										
Other operational benefits description	Entities such as municipal government organizations, cities/towns, NGOs, etc., typically leverage data collected through large scale statewide projects to help serve local/regional needs. By having access to elevation data accurate enough to support engineering design and environmental modeling smaller organizations will be less likely to spend out-of-pocket. It may also limit the need for field visits or focus those visits on specific tasks resulting in overall operational efficiencies.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide										
Improved response or timeliness	I don't know	Unable to provide										
Improved customer experience	I don't know	Unable to provide										
Improved customer experience description	If large scale state-wide data is made available for download through state agency or Federal sites/portals, when consultants or partners need it, those connections can be provided directly eliminating the need for staff to package it and thus reducing delays in receiving it.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Urban and Regional Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Land development and zoning. Municipal mapping of building footprints and elevations. Port resilience planning. Parks and transportation planning. Virtual city creation. Urban ecology planning.
MCA Title	Urban and Regional Planning
MCA ID	60073
Organization Type	State or U.S. Territorial government
Organization Name	State of Connecticut
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Required			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

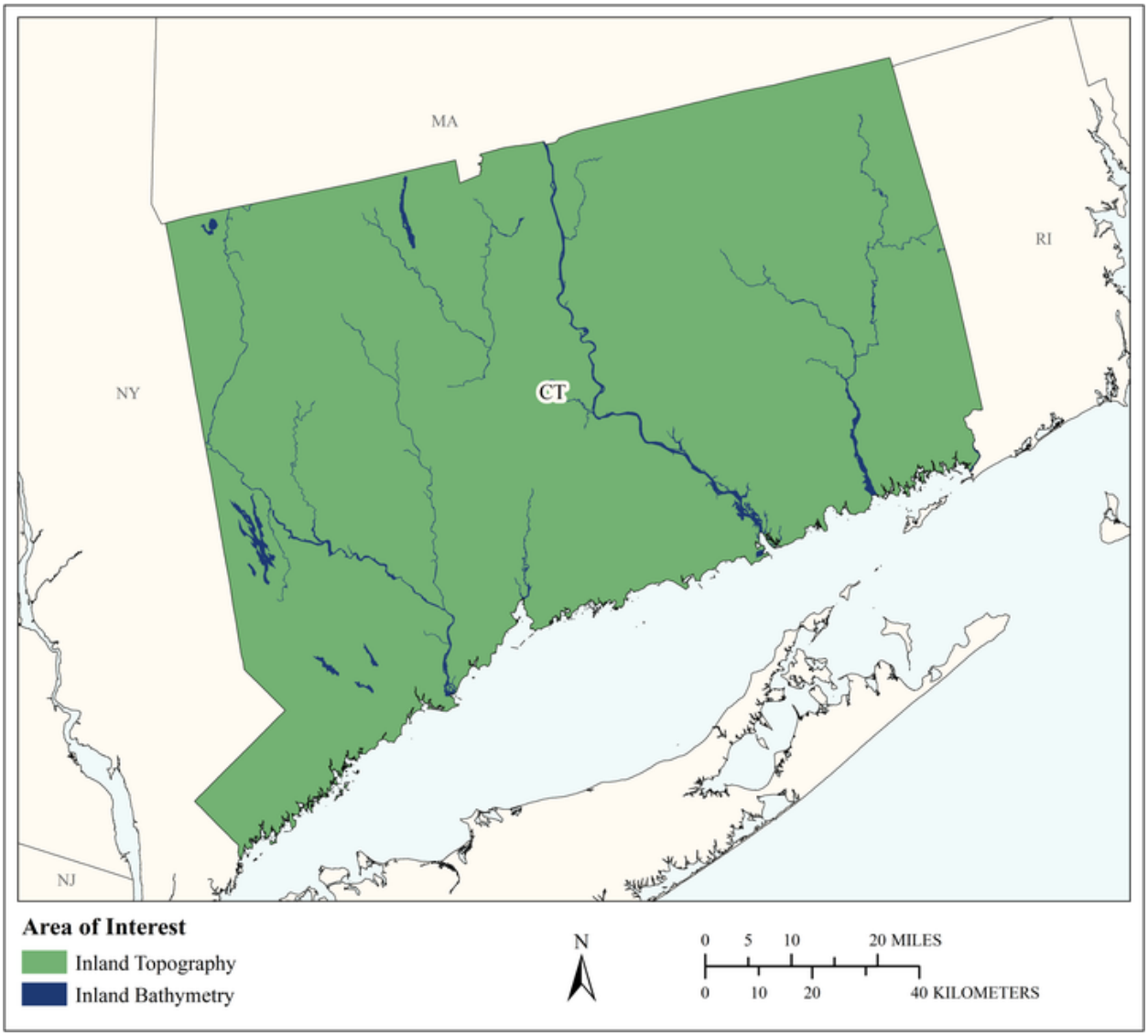
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,337,744									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$154,443									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Education and Research



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	As a University, the mission critical activity is education and research. Elevation data is used in many disciplines in research including geography, archaeology, natural resources and more. As a data provider, elevation data is accessed and downloaded across the state for more applications than I am even aware of.
MCA Title	Education and Research
MCA ID	21745
Organization Type	Academic or Not-for-Profit
Organization Name	University of Connecticut
Sub-Agency or Division	
Organization Mission	The University mission statement follows: The University of Connecticut is dedicated to excellence demonstrated through national and international recognition. Through freedom of academic inquiry and expression, we create and disseminate knowledge by means of scholarly and creative achievements, graduate and professional education, and outreach. With our focus on teaching and learning, the University helps every student grow intellectually and become a contributing member of the state, national, and world communities. Through research, teaching, service, and outreach, we embrace diversity and cultivate leadership, integrity, and engaged citizenship in our students, faculty, staff, and alumni. As our state's flagship public University, and as a land and sea grant institution, we promote the health and well-being of citizens by enhancing the social, economic, cultural, and natural environments of the state and beyond. I am with the Center for Land Use Education and Research whose mission is to provide information and assistance to land use decision makers and other audiences in support of better land use decisions, healthier natural resources, and more resilient communities.
Program Name	University of Connecticut
Total Annual Program Budget	
Primary Business Use	BU 26 - Education K12 and Beyond, Basic Research
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	For so many research objectives, the more the better. If it exists, it will be used.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL1B		
Update Frequency	As often as possible	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	I don't know	Up to 2 meters		
Acceptable Vertical Error	I don't know	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	I don't know
Hydro-enforcement	I don't know
Hydro-conditioning	I don't know
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Required			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Required			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable		
DTM	Highly desirable	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Not required	Required		
Classified point cloud	Required	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Highly desirable		
Ground control/ground truthing	Nice to have	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Required		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Nice to have	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Required		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Nice to have		
Cultural resources	Highly desirable	Nice to have		
Coastal and riverine structures	Highly desirable	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Currently using statewide, 2016 QL2 points and DEM. Ten other data sets exist across the state and are used for different applications http://cteco.uconn.edu/data/lidar/info_lidar.htm.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes			
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Connecticut Environmental Conditions Online (CT ECO) http://cteco.uconn.edu			

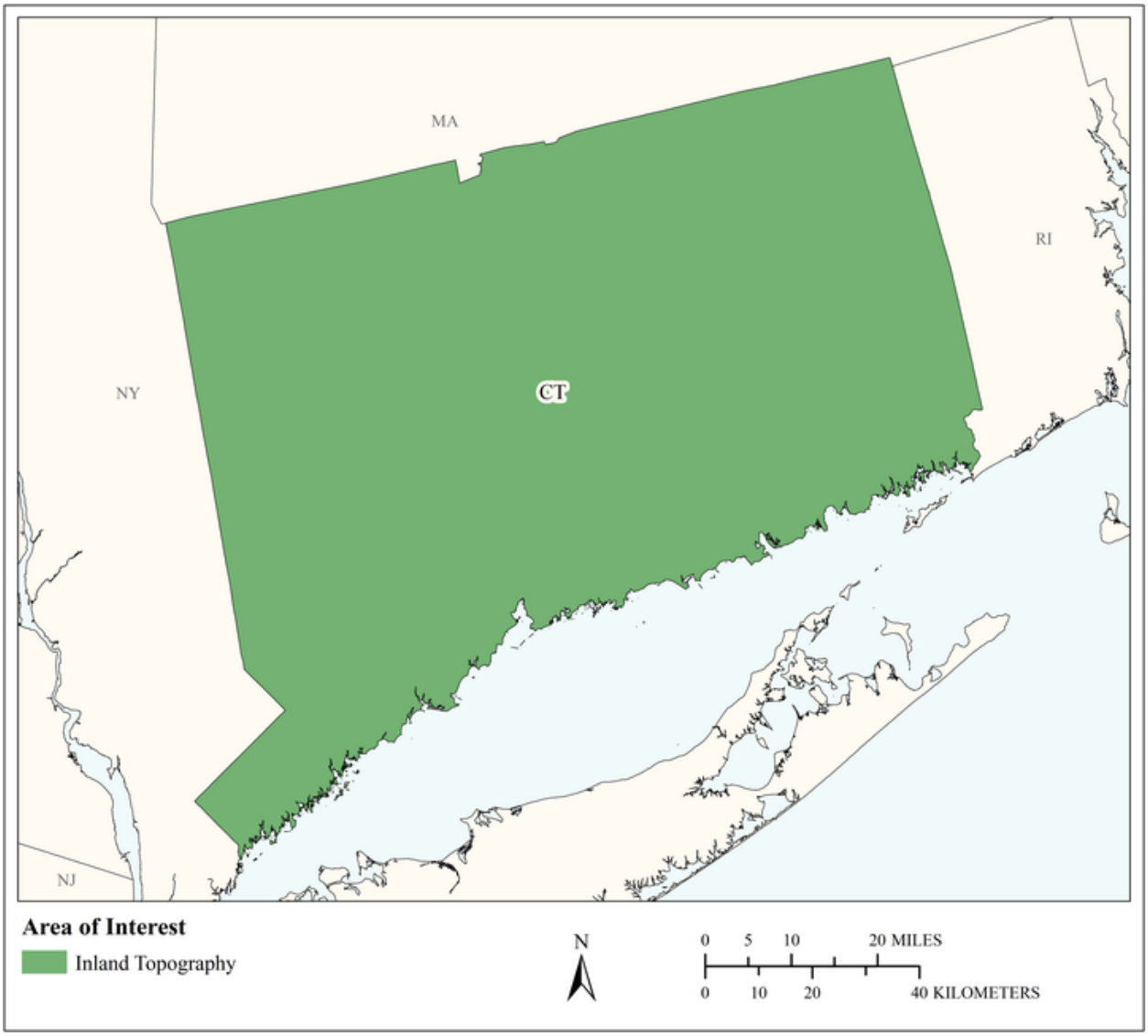
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	Major	Minor		
Increased revenues	I don't know	None		
Mission-driven performance improvements	Major	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know	Minor		
Improved response or timeliness	I don't know	Minor		
Improved customer experience	I don't know	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major		
Environmental	Major	Minor		
Public safety, including life and property	I don't know	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	I don't know	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$26,127		Annual dollars saved/ realized	$6,832						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	I don't know	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$62,453									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Major			Major								
Public safety, including life and property	I don't know			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes		
Contours		Yes		
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Telecommunications



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Telecommunication tower site selection. Design of radio and radar systems. Interference analysis. Path profiles. Undersea telecommunication route selection and deployment.
MCA Title	Telecommunications
MCA ID	60074
Organization Type	State or U.S. Territorial government
Organization Name	State of Connecticut
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 28 - Telecommunications
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Highly desirable			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

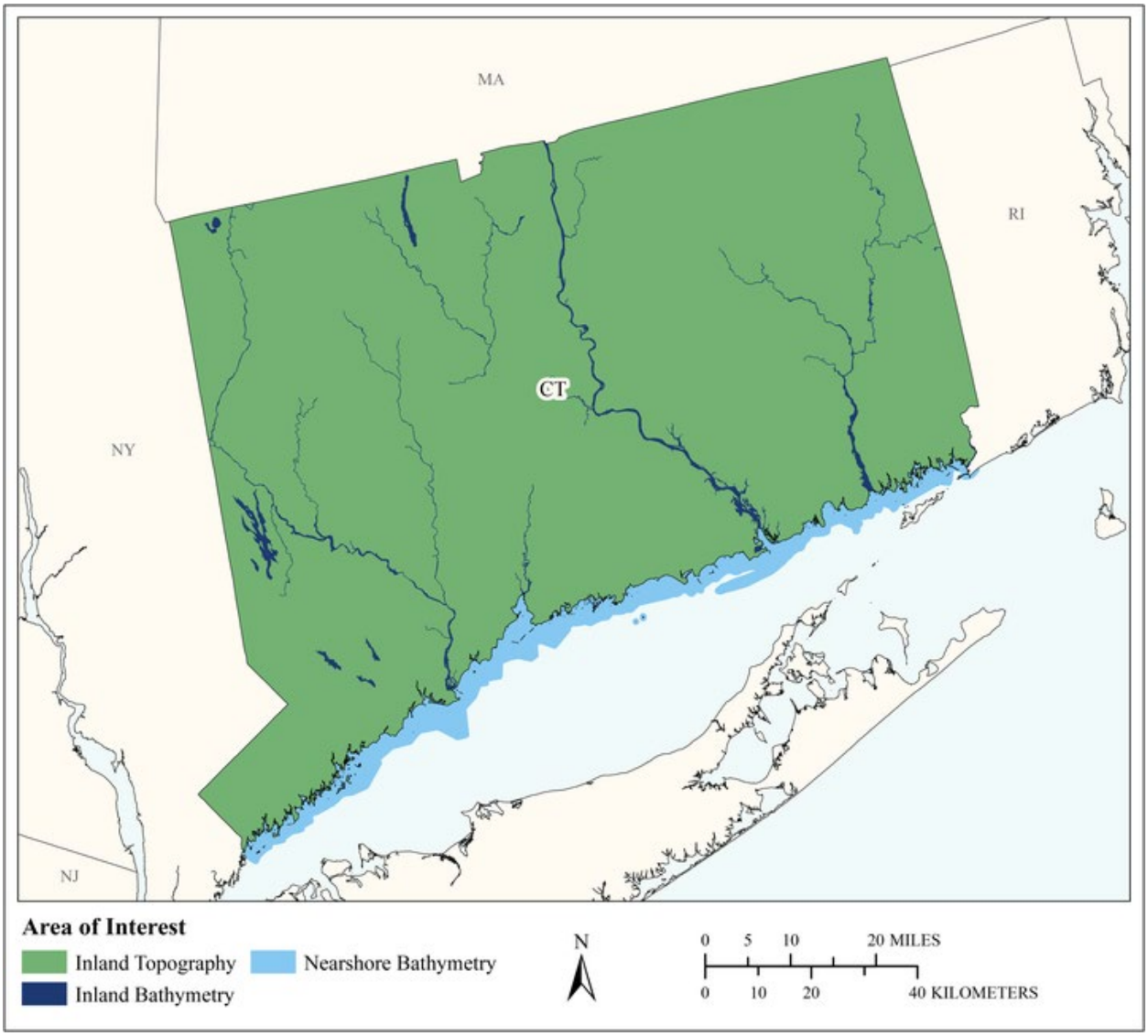
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Maritime and Land Boundary Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Delimitation of legal and other coastal boundaries, inland boundaries, and ordinary high water lines (OHWL). Delineation of Mean High Water. Mapping of stone walls and other property monument. Town boundaries defined by rivers.
MCA Title	Maritime and Land Boundary Management
MCA ID	60075
Organization Type	State or U.S. Territorial government
Organization Name	State of Connecticut
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 30 - Maritime and Land Boundary Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B	QL0B	
Update Frequency	6-10 years	6-10 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have		Highly desirable	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Nice to have		Highly desirable	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable		Required	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	
DTM	Required	Required	Required	
DEM	Highly desirable	Required	Required	
Raw point cloud data	Nice to have	Highly desirable	Required	
Classified point cloud	Highly desirable	Highly desirable	Required	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Nice to have	Not required	
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Nice to have	Required	Not required	
Ground control/ground truthing	Highly desirable	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Required	Highly desirable	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Highly desirable	
Routes			Nice to have	
Offshore cadastral			Highly desirable	
Lease areas			Highly desirable	
Fixed obstructions			Required	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Required	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Highly desirable	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Minor	None	
Cost savings/cost reduction	Moderate	None	Minor	
Cost avoidance	Moderate	None	Minor	
Increased revenues	Minor	None	None	
Mission-driven performance improvements	Major	None	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None	None	

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	None	Minor	
Improved customer experience	Major	None	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	
Environmental	Major	Minor	Minor	
Public safety, including life and property	Moderate	None	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Increased revenues	Minor	Unable to provide		None			None					
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$5,594		Annual dollars saved/ realized	$4,198		Annual dollars saved/ realized	$57,748			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$21,450									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Moderate					
Environmental	Minor			Major			Major					
Public safety, including life and property	None			Moderate			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps		Yes		
Cross sections		Yes		
Height-Above-Ground maps		Yes		
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

Delaware

The State of Delaware covers just over 1,982 square miles of land and water area. Approximately 39 percent of Delaware's land is used for agriculture. Delaware's southern two counties, Kent and Sussex, contain significant land used for cash crops and feedstock, along with considerable livestock (poultry) farming. Drainage ditches in many areas lower the water table to increase crop productivity, or site housing. Fresh and tidal wetlands also are noticeably part of the landscape--especially nearer the coast. Sussex County contains coastal resort and recreational communities, displacing some former agricultural land use. The beach communities and tourism attract a large summer population from Pittsburgh, Washington DC, Baltimore, and Philadelphia, and drive a significant portion of Delaware's economy. Northernmost New Castle County, which includes Delaware's largest city, Wilmington, lies partly within the mid-Atlantic Piedmont province, and is more populous, urban, and industrialized. Wilmington is proximate to and within commuting range of Philadelphia, which is linked by a shoreline dominated by shipping and oil refining land uses, as well as water traffic in Delaware Bay and River. The majority of the state, south of Wilmington and Newark, is underlain by low-relief coastal plain, with surface water draining to Delaware Bay and the Atlantic Ocean. The western portion of the state holds headwaters for streams flowing west and south into the Chesapeake Bay.

The Business Uses (BUs) Delaware identified can be grouped into three primary categories: 1) Natural Resource Management; 2) Infrastructure Management and Protection; and 3) Emergency Response and Planning. BU 26 Education supports all of the categories listed above. The Delaware Geological Survey and the Department of Natural Resources and Environmental Control collaborated in 2017 to develop a revised *Recommendations of Sea-Level Rise Planning Scenarios for Delaware* report that included sea-level rise projections and potential impacts on the state's natural resources, economic future, transportation network and existing infrastructure, and effects to the residential and industrial tax base. This effort reflects the state government's concern for the well-being and safety of residents, tourists, and infrastructure and is reflected in both the Natural Resource Management and Infrastructure Management and Protection aggregated business use cases. Enhanced Emergency Response Planning and the application of mitigation measures due to the rising threat to natural resources and infrastructure are actively being undertaken.

Discussions for the reacquisition of statewide Quality Level 2 topographic lidar to replace the 2014 "Superstorm Sandy" topographic lidar funded by supplemental Congressional appropriations are just beginning. At this time, Delaware has not established a dedicated funding mechanism for recurring geospatial data collection.

Figure 1. Main Street and Fire Station of Bowers Beach, Kent County Delaware during a November 2009 nor'easter. Source: DNREC

Figure 2. Flooding at Fenwick Island, Sussex County, during Hurricane Sandy, Oct 2012. Source: DNREC

Figure 3. Murderkill River tidal saltmarsh behind South Bowers Beach, Kent County. Source: Thomas McKenna, DGS

The State of Delaware has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

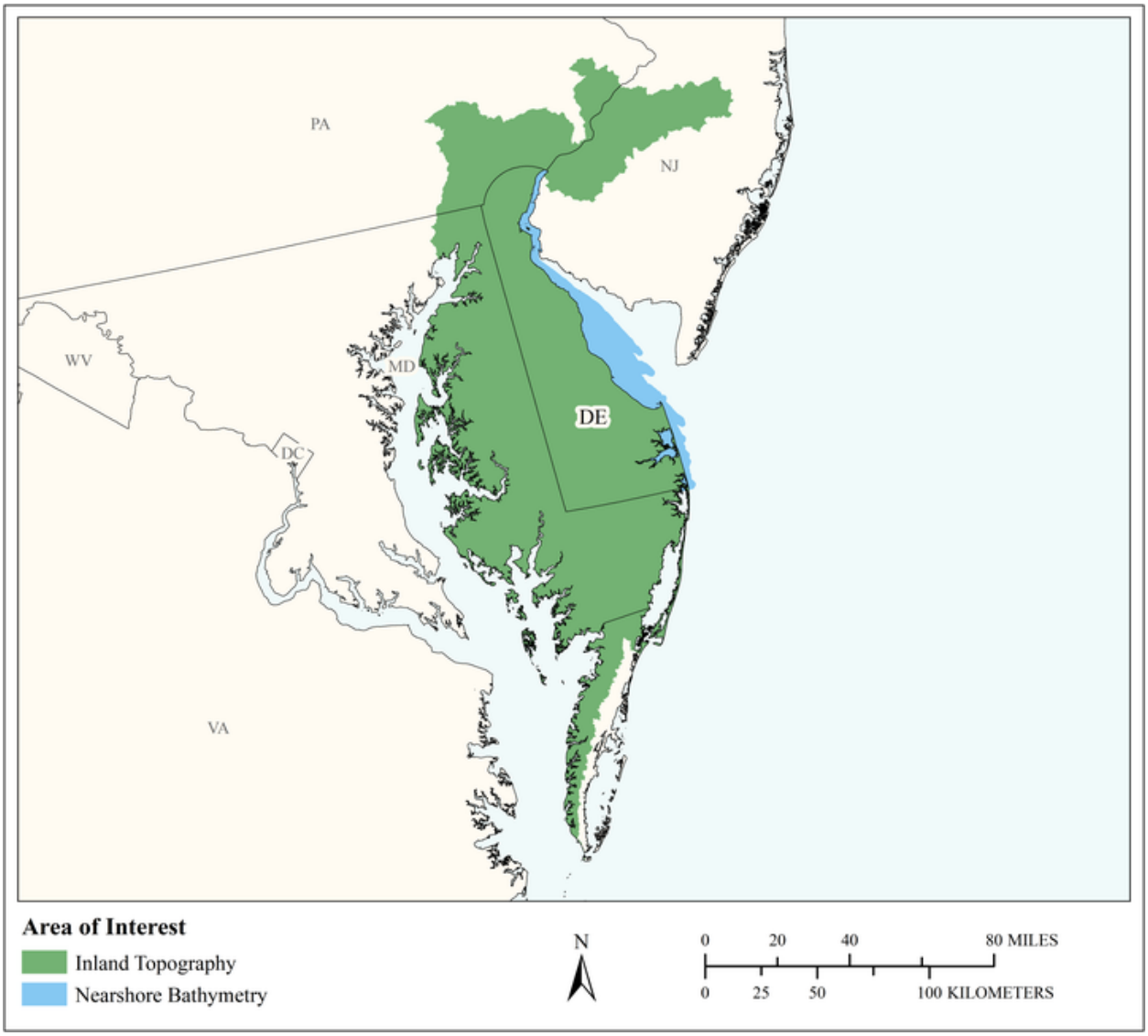
Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	University of Delaware	22185	Water Resources Management	Inland Topo	QL1	4-5 years	$33,743	$3,015	Moderate	Major	Moderate
				Nearshore Bathy	QL3B	4-5 years	$5,000	Unable to quantify	Moderate	Major	Moderate
BU 02 – Riverine Ecosystem Management	DNREC, Div. of Watershed Stewardship, Drainage Program, Delaware	21923	Management of Delaware Tax Ditches	Inland Topo	QL0 HD	2-3 years	$9,045	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	>10 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 03 – Coastal Zone Management	DNREC-Delaware Coastal Programs	1451	Coastal Resiliency	Inland Topo	QL1	6-10 years	$79,439	$8,884	Minor	Moderate	Major
				Inland Bathy	QL1B	4-5 years	$21,808	$12,785	Minor	Moderate	Major
				Nearshore Bathy	QL2B	4-5 years	$282,674	$478,178	I don't know	I don't know	I don't know
BU 03 – Coastal Zone Management	Delaware Dept of Natural Resources and Environmental Control	21776	Coastal Zone Management	Inland Topo	QL1 HD	4-5 years	$50,821	$8,884	Major	Major	Major
				Inland Bathy	QL2B	>10 years	$21,808	$12,785	Minor	Moderate	Moderate
				Nearshore Bathy	QL2B	2-3 years	$282,675	$478,179	Minor	Moderate	Moderate
				Offshore Bathy	Order 1b	6-10 years	$9,899	$1,976	Minor	Moderate	Moderate
BU 06 – Natural Resource Management	Delaware Department of Natural Resources and Environmental Control, Watershed Assessment	21747	Watershed Assessment and Management	Inland Topo	QL0	2-3 years	$9,899	$1,976	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	6-10 years	$10,480	$471	Major	Major	Major
				Nearshore Bathy	QL1B	Annually	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 09 – Fisheries Management and Aquaculture	State of Delaware	60076	Fisheries Management and Aquaculture	Inland Topo	QL2	2-3 years	$2,015	$4,377	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	6-10 years	$3,944	$1,795	Major	Major	Moderate
				Nearshore Bathy	QL0B	6-10 years	$396,537	$29,122	Moderate	Major	Minor
BU 10 – Geologic Assessment	Delaware Geological Survey	21879	Geologic Mapping	Inland Topo	QL2	4-5 years	$5,020,000	$3,015	Minor	Moderate	Moderate
				Inland Bathy	QL2B	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	Minor
				Nearshore Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	Minor	Minor	Minor
				Offshore Bathy	Order 1	2-3 years	Unable to quantify	Unable to quantify	Minor	Minor	Minor

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 12 – Renewable Energy Resources	State of Delaware	60077	Renewable Energy Resources	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	None
				Inland Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 15 – Flood Risk Management	Delaware Geological Survey	22145	Real-time Response to Emergency Management Due to Flooding	Inland Topo	QL2	6-10 years	$5,020,000	Unable to quantify	None	Moderate	Moderate
				Nearshore Bathy	QL2B	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	Major
BU 16 – Sea Level Rise and Subsidence	Delaware Geological Survey	1381	Identifying, Modeling, and Mapping the Effects of Future Scenarios of Sea Level Rise and Local Land Subsidence	Inland Topo	(a) QL1 (b) QL2	2-3 years	$5,020,000	Unable to quantify	Minor	Moderate	Moderate
				Nearshore Bathy	QL2B	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	Minor
				Offshore Bathy	Order 2	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	None
BU 18 – Homeland Security	State of Delaware	60078	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management	Inland Topo	QL2	4-5 years	$58,158	$1,027	Major	Moderate	Major
				Inland Bathy	QL0B	4-5 years	$16,379	$1,045	Major	Moderate	Major
				Nearshore Bathy	QL1B	6-10 years	$23,253	$667	Moderate	Moderate	Major
BU 20 – Marine and Riverine Navigation	State of Delaware	60000	Marine and Riverine Navigation and Safety	Inland Topo	QL0 HD	2-3 years	$75,523	Unable to quantify	None	None	Minor
				Inland Bathy	QL0B	2-3 years	$35,961	$4,732	Moderate	Moderate	Moderate
				Nearshore Bathy	QL0B	2-3 years	$177,496	$6,009	Minor	Major	Major
BU 22 – Infrastructure Management	Delaware DOT	1239	Managing Bridges in the Transportation Network	Inland Topo	QL1	Event driven	$44,290	$130,338	Major	I don't know	Moderate
				Inland Bathy	QL1B	Event driven	$14,921	$1,549	I don't know	I don't know	I don't know
BU 22 – Infrastructure Management	Delaware Department of Transportation	22234	Transportation Infrastructure Management	Inland Topo	QL0 HD	Annually	$44,306	$130,385	Moderate	Major	Moderate
				Inland Bathy	QL0B	2-3 years	$14,927	$1,549	Moderate	Major	Minor
				Nearshore Bathy	Cross sections and/or transects meet needs	2-3 years	$52,747	$7,252	Moderate	Major	Moderate
				Offshore Bathy	Cross sections and/or transects meet needs	2-3 years	Unable to quantify	Unable to quantify	Minor	Major	Moderate

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 23 – Urban and Regional Planning	Delaware Office of State Planning Coordination	22063	Statewide and Local Planning	Inland Topo	QL1	4-5 years	$530,447	$61,240	I don't know	I don't know	I don't know
				Inland Bathy	QL1B	6-10 years	$21,604	$27,331	Moderate	Moderate	Major
				Nearshore Bathy	QL2B	4-5 years	$461,980	$487,371	I don't know	I don't know	I don't know
BU 26 – Education and Basic Research	University of Delaware	22497	Geospatial Support to Education and Research	Inland Topo	QL1 HD	6-10 years	$10,359	$24,763	Major	Major	None
				Inland Bathy	QL1B	6-10 years	$2,708	Unable to quantify	Major	I don't know	I don't know
				Nearshore Bathy	QL2B	4-5 years	$16,554	$653	Major	Major	Minor
				Offshore Bathy	Order 1a	6-10 years	$245	Unable to quantify	Major	Minor	Minor
BU 30 – Maritime and Land Boundary Management	State of Delaware	60079	Maritime and Land Boundary Management	Inland Topo	QL1	6-10 years	$2,218	$8,505	Moderate	Minor	None
				Inland Bathy	QL2B	6-10 years	$1,664	Unable to quantify	Major	Major	Moderate
				Nearshore Bathy	QL0B	2-3 years	$579,812	Unable to quantify	Moderate	Major	Moderate
				Offshore Bathy	I don't know	2-3 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate

MCA Title: Water Resources Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	One or more Hydrologic Units (HUC8s)		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Watershed and water quality protection, storm and flooding study, science and policy translation
MCA Title	Water Resources Management
MCA ID	22185
Organization Type	Academic or Not-for-Profit
Organization Name	University of Delaware
Sub-Agency or Division	
Organization Mission	The University of Delaware Water Resources Center (DWRC), established in 1965, is one of the 54 National Institutes for Water Resources (NIWRs) at land-grant universities in the 50 states, District of Columbia and island territories of Guam, Puerto Rico, and U.S. Virgin Islands. The DWRC receives funding through Section 104 of the Water Resources Research Act of 1984, which was originally signed into law by Lyndon Baines Johnson in 1964. The U.S. Geological Survey administers the provisions of the Act and provides oversight of the nation's Water Resources Centers through the National Institute of Water Resources (NIWR).
Program Name	National Institutes of Water Resources, Delaware Water Supply Coordinating Council, Delaware Source Water Protection Program
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Bridges, culverts, coastal structures

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1		QL3B	
Update Frequency	4-5 years		4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Horizontal Error	Up to 50 cm		Up to 1 meter	
Acceptable Vertical Error	Up to 20 cm		Up to 40 cm	
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed	To MHHW		To MHHW	
Tide correction requirement			MLLW	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable		Highly desirable			Highly desirable
Entire AOI under same environmental conditions	Highly desirable		Required			Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable		Nice to have			Nice to have
DEM for entire AOI needs to be seamless	Highly desirable		Required			Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required		Nice to have	
DTM	Nice to have		Highly desirable	
DEM	Required		Required	
Raw point cloud data	Not required		Nice to have	
Classified point cloud	Highly desirable		Highly desirable	
Edited/cube XYZ			Not required	
Full waveform	Nice to have		Not required	
Bathymetric Attributed Grid (BAG)			Not required	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have		Nice to have	
Ground control/ground truthing	Nice to have		Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required		Highly desirable	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have		Not required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Highly desirable	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable		Highly desirable	
Land use/land cover	Required		Highly desirable	
Wetlands	Required		Required	
Estuaries			Required	
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required		Required	
Cultural resources	Nice to have		Nice to have	
Coastal and riverine structures	Highly desirable		Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Sandy and other LIDAR, Point Cloud data, 10 and 30 m USGS DEMs & DTMs		DNREC Coastal Programs survey data and NOAA bathymetry	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes		Yes	
NCEI	Yes			
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes		Yes	
State repositories used	Delaware Firstmap, PASDA (Penn State)		Firstmap (DE), PASDA (PA)	
Data that meet my needs are not available				

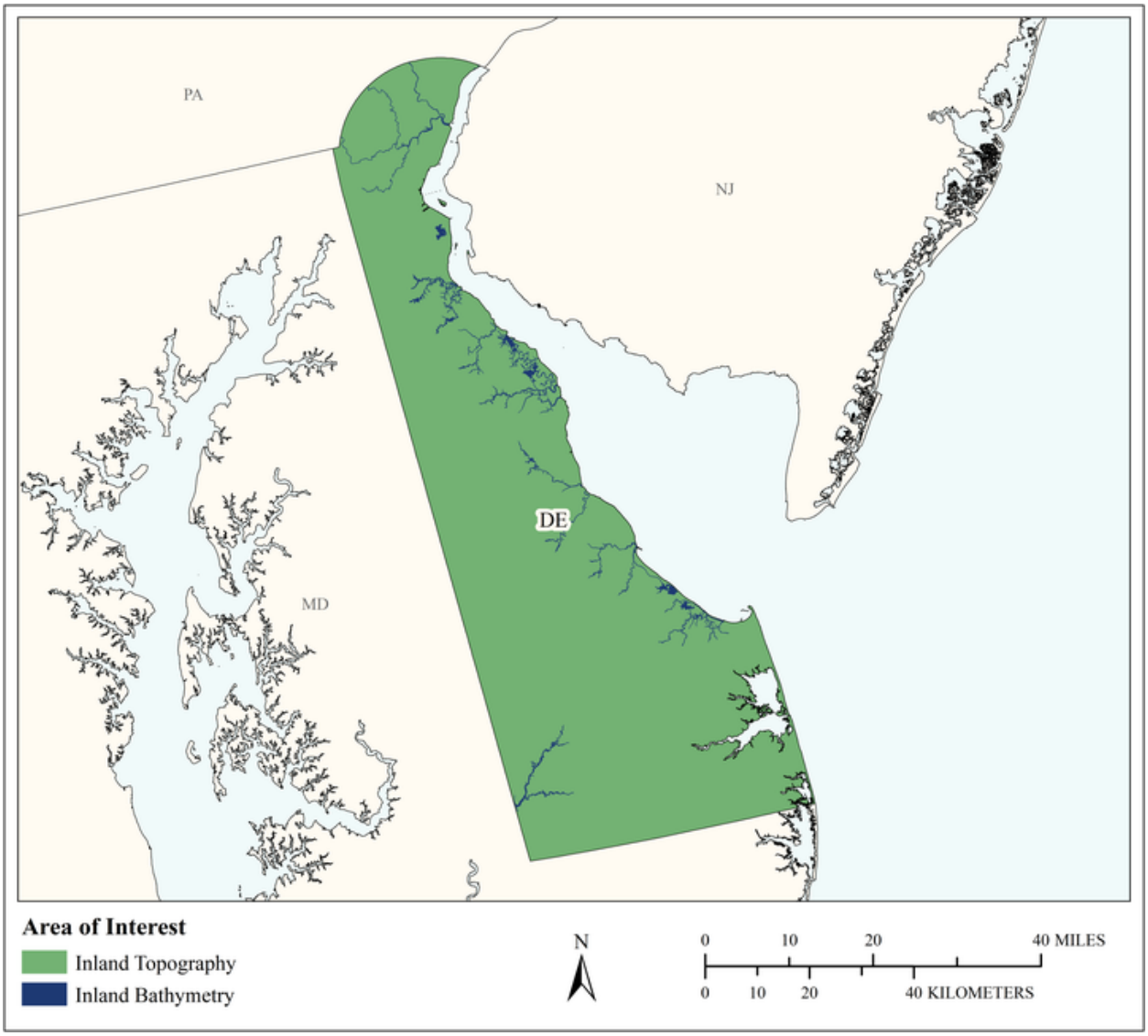
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Moderate	
Cost savings/cost reduction	Major		Moderate	
Cost avoidance	Major		I don't know	
Increased revenues	Moderate		Minor	
Mission-driven performance improvements	Major		Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		Minor	
Improved response or timeliness	Major		Moderate	
Improved customer experience	Major		Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate		Moderate	
Environmental	Major		Moderate	
Public safety, including life and property	Major		Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$2,714				Major	Unable to provide				
Cost savings/cost reduction	Moderate	Unable to provide					Moderate	Unable to provide				
Cost avoidance	Major	Annual dollars saved/realized	$20,000				Moderate	Annual dollars saved/realized	$5,000			
Increased revenues	Moderate	Annual dollars saved/realized	$5,000				Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide					Major	Annual percent improvement	50%			
Other operational benefits	Major	Annual dollars saved/realized	$6,030									
Other operational benefits description	Data are critical to applications such as stormwater modeling.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Minor	Unable to provide				
Improved response or timeliness	Major	Annual dollars saved/realized	$3,015				Moderate	Unable to provide				
Improved customer experience	Moderate	Unable to provide					Moderate	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate						Moderate					
Environmental	Major						Major					
Public safety, including life and property	Moderate						Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Management of Delaware Tax Ditches



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Management of Delaware Tax Ditches. Agricultural ditches that were constructed in the 1800s to create agricultural lands are managed like a utility, by watershed. Owners pay a tax for maintenance of the ditches in perpetuity. Maintenance includes mowing, weed scour, cleaning out obstructions, and periodic application of herbicide for woody debris. Topographic elevation data are needed to improve the accuracy of the tax ditch maps, to help identify ditches that need reconstruction, for cost estimating for ditch improvements, and to improve communication with owners. Currently field crews survey ditch bottoms as needed to get bottom elevations and pipe inverts. Inland Bathymetry could reduce the need for field surveys and help with management of sedimentation. Some ditches are always filled with water, others are filled only perennially. DNREC has considered use of drones to help identify the condition of ditches. Additional Business Uses are BU 06 - Natural Resources Conservation BU 15 - Flood Risk Management BU 22 - Infrastructure and Construction Management
MCA Title	Management of Delaware Tax Ditches
MCA ID	21923
Organization Type	State or U.S. Territorial government
Organization Name	DNREC, Div. of Watershed Stewardship, Drainage Program, Delaware
Sub-Agency or Division	
Organization Mission	Provide technical assistance to Tax Ditch Organizations and landowners and regional planning organizations.
Program Name	Delaware Tax Ditch Program
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	BU 08 - Agriculture and Precision Farming
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Culverts and pipes

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B		
Update Frequency	2-3 years	>10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Less than 50 cm		
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial	Partial		
Cross section/transect requirement	500 ft cross sections every 100 feet. Survey grade precise	In designing drainage systems with storage ponds then the volume and invert and outlet elevations are required.		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Nice to have	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable		
DTM	Highly desirable	Highly desirable		
DEM	Required	Highly desirable		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Required	Highly desirable		
Edited/cube XYZ		Not required		
Full waveform	Highly desirable	Not required		
Bathymetric Attributed Grid (BAG)		Not required		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Nice to have	Nice to have		
Wetlands	Highly desirable	Highly desirable		
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Highly desirable	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	2014 LIDAR DEM for Delaware hosted from Delaware First Map. I also download for small area of interests the entire point cloud to determine risks for flying and recording video with drones over drainage systems in forested areas. Engineering designs are accomplished with additional total station survey.	Surveyors in a jon boat getting the bottom elevations using total station survey		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes			
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				

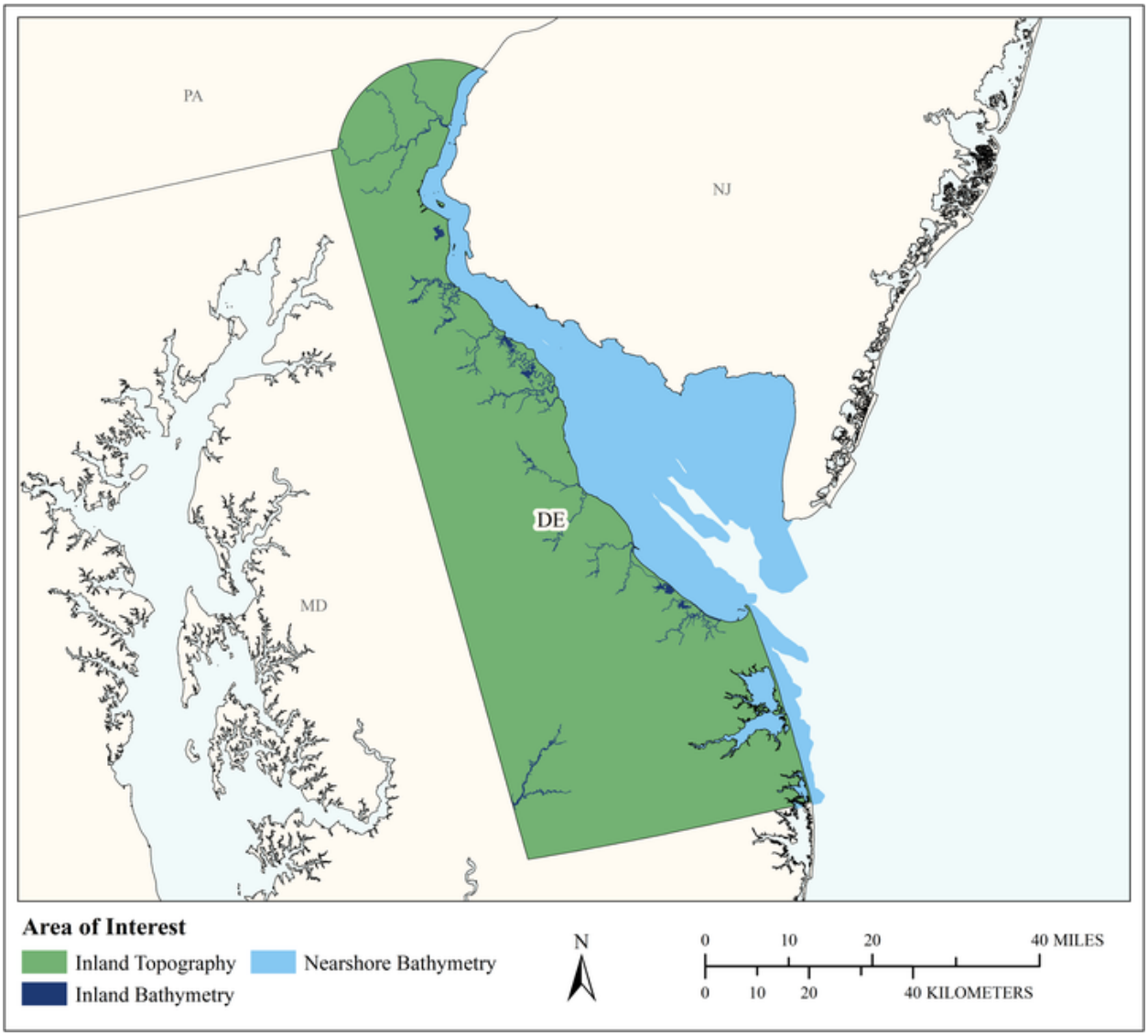
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Delaware FirstMap			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	I don't know		
Cost savings/cost reduction	Major	I don't know		
Cost avoidance	Major	I don't know		
Increased revenues	I don't know	I don't know		
Mission-driven performance improvements	Major	I don't know		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	I don't know		
Improved response or timeliness	Major	I don't know		
Improved customer experience	Major	I don't know		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	I don't know		
Environmental	Major	I don't know		
Public safety, including life and property	Major	I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$9,045	I don't know	Unable to provide							
Time savings description	Responding to drainage concerns. We produce DEM maps before we visit the field. Responding to drainage concerns. We use DEM maps to correlate with other concerns.			Having ditch bottoms and pipe inverts would save time.								
Cost savings/cost reduction	Moderate	Unable to provide		I don't know	Unable to provide							
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide							
Increased revenues	Moderate	Unable to provide		I don't know	Unable to provide							
Increased revenues description	Enhanced web map Arcgis Online products.											
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	Moderate	Unable to provide		I don't know	Unable to provide							
Improved customer experience	Moderate	Unable to provide		I don't know	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			I don't know								
Education or outreach description	Better online products											
Environmental	Moderate			I don't know								
Environmental description	Better water quality											
Public safety, including life and property	Moderate			I don't know								
Public safety, including life and property description	Better protection of infrastructure and private property for drainage related issues											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes	Yes		
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Coastal Resiliency



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Custom description	
Sub Area Requirements			Delaware shoreline and the New Jersey shoreline of the Delaware Bay	

MCA Description	Response
Mission Critical Activity	Coastal resiliency
MCA Title	Coastal Resiliency
MCA ID	1451
Organization Type	State or U.S. Territorial government
Organization Name	DNREC-Delaware Coastal Programs
Sub-Agency or Division	
Organization Mission	Delaware Coastal Programs manages, protects and monitors the state's coastal resources through the administration of the Delaware Coastal Management Program, Delaware National Estuarine Research Reserve (DNERR) and the Coastal and Estuarine Land Conservation Program. This includes managing coastal resources through innovative research projects, education and outreach efforts, grant programs and policy development; administering the Coastal Zone Federal Consistency Certification program; providing special area management planning and assistance to state and local governments for local land use planning; conducting special on-the-ground projects related to Delaware's coastal resources to promote informed decision-making; managing over 6,000 acres in designated size, one of 28 National Estuarine Research Reserves across the country.
Program Name	Resilient Community Partnership and the Coastal Management Program overall
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Coastal structures, buildings, etc.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL2B	
Update Frequency	6-10 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 30 cm	The best horizontal accuracy achievable for the vertical accuracy I need	Up to 1 meter	
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 40 cm	
How far onshore needed			To cover the beach slope	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MHW	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Required	Highly desirable		Required	Highly desirable
Entire AOI under same environmental conditions	Required	Required	Required		Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Nice to have	Nice to have	
DTM	Highly desirable	Highly desirable	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Not required	Highly desirable	Highly desirable	
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Not required	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Highly desirable	
Ground control/ground truthing	Highly desirable	Nice to have	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Nice to have	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Not required	Not required	Nice to have	
Water column properties - Physical			Highly desirable	
Water column properties - Chemical			Highly desirable	
Water column properties - Biological			Highly desirable	
Currents			Highly desirable	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Required	
Routes			Highly desirable	
Offshore cadastral			Required	
Lease areas			Required	
Fixed obstructions			Required	
Floating observation/navigation systems			Required	
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Highly desirable	Required	Highly desirable	
Wetlands	Required	Required	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Aerial imagery from 2017, 2012, 2007,2002 State Land Use Land Cover for same years Wetlands 2012, 2007, Sandy and other LIDAR, Point Cloud data, 10 and 30 m USGS DEMs & DTMs	Little to none	DNREC Coastal Programs survey data and NOAA bathymetry	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes	Yes	Yes	
NCEI			Yes	
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes		Yes	
State repositories used	FirstMAP (Delaware)		Delaware FirstMAP	
Data that meet my needs are not available				

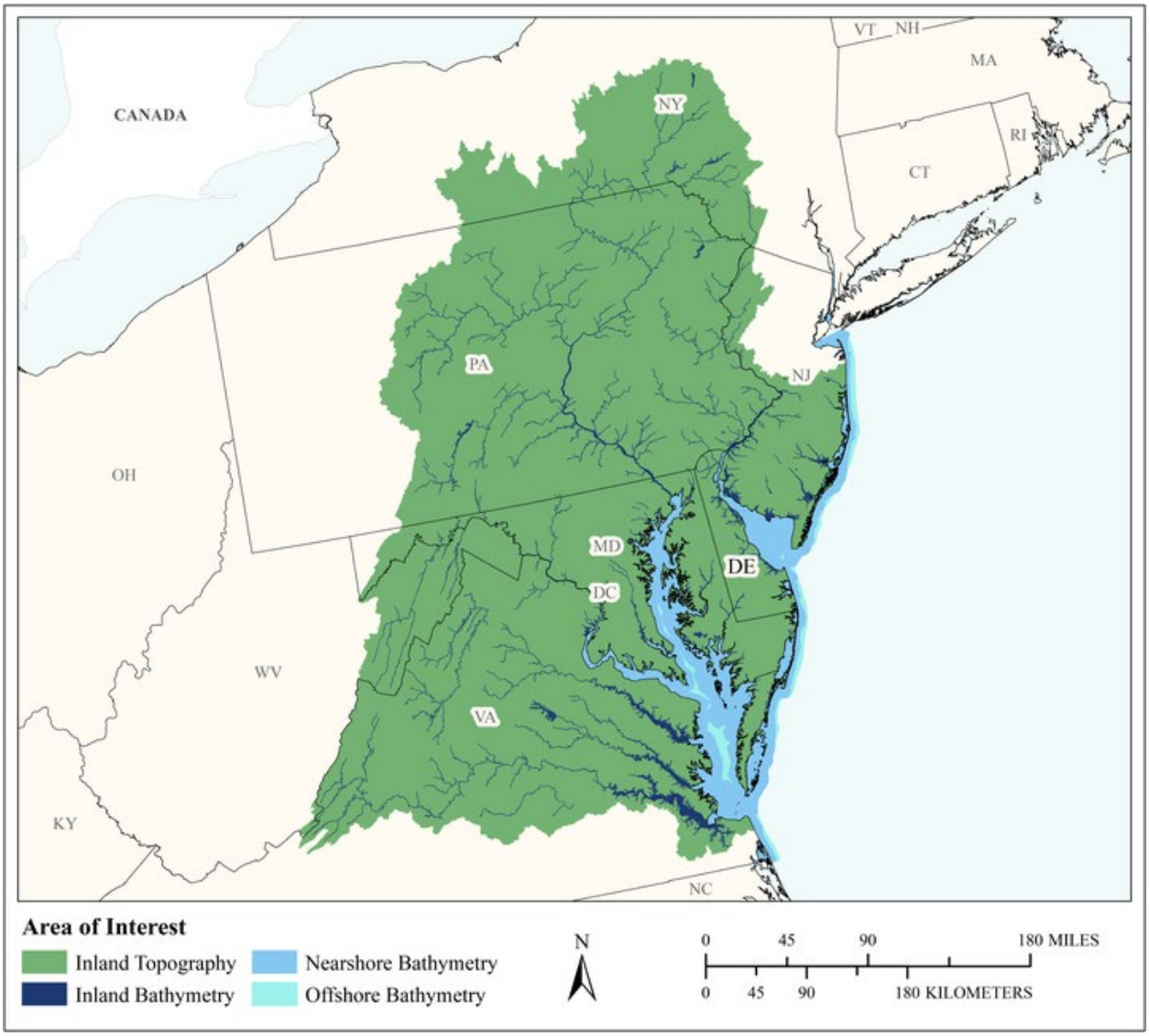
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Inland bathy data not available	I don't know	
Cost savings/cost reduction	Moderate	Inland bathy data not available	I don't know	
Cost avoidance	Major	Inland bathy data not available	I don't know	
Increased revenues	None	Inland bathy data not available	I don't know	
Mission-driven performance improvements	Minor	Inland bathy data not available	I don't know	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	Inland bathy data not available	I don't know	
Improved response or timeliness	Minor	Inland bathy data not available	I don't know	
Improved customer experience	Moderate	Inland bathy data not available	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Inland bathy data not available	Minor	
Environmental	Moderate	Inland bathy data not available	Minor	
Public safety, including life and property	Major	Inland bathy data not available	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$3,618	Moderate	Unable to provide		I don't know	Unable to provide				
Cost savings/cost reduction	Moderate	Annual dollars saved/realized	$25,000	Major	Unable to provide		I don't know	Unable to provide				
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide				
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$50,821		Annual dollars saved/ realized	$21,808		Annual dollars saved/ realized	$282,674			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$8,884		Annual dollars saved/ realized	$12,785		Annual dollars saved/ realized	$478,178			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			I don't know					
Environmental	Moderate			Moderate			I don't know					
Public safety, including life and property	Major			Major			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	
Hillshades				
Slope maps	Yes		Yes	
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Coastal Zone Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)	One or more Hydrologic Units (HUC4s)	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Coastal Zone Management, Coastal resource and coastal economy protection, Research in coastal resource management and protection, Coastal Resiliency activities including supporting local communities, Federal Consistency
MCA Title	Coastal Zone Management
MCA ID	21776
Organization Type	State or U.S. Territorial government
Organization Name	Delaware Dept of Natural Resources and Environmental Control
Sub-Agency or Division	
Organization Mission	The mission of the Department of Natural Resources and Environmental Control (DNREC) is to: Engage all stakeholders to ensure the wise management, conservation and enhancement of the State's natural resources; Protect public health and the environment; Provide quality outdoor recreation; Improve the quality of life; Lead energy policy and climate preparedness; And educate the public on historic, cultural and natural resource use, requirements and issues.
Program Name	Delaware Coastal Management Program, Delaware National Estuarine Research Reserve
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Coastal structures, buildings, etc.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required

Inland Bathy Feature Size Requirements	Response
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL2B	QL2B	Order 1b
Update Frequency	4-5 years	>10 years	2-3 years and certain events.	6-10 years
Event type(s)			Event driven	
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	Up to 5 meters
Acceptable Vertical Error	Up to 10 cm	Up to 40 cm	Up to 40 cm	Less than 1 meter
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MLLW	MLLW
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Highly desirable

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable	Highly desirable	Nice to have	Highly desirable	Nice to have
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable	Nice to have	Highly desirable	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Nice to have	Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Required	Required	Required	Highly desirable	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Required	Required	Highly desirable
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Required	Highly desirable
Tide Predictions			Highly desirable	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Nice to have
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Required	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Nice to have
Aerial and/or satellite imagery	Required	Required	Highly desirable	Highly desirable
Underwater videography			Nice to have	Nice to have
Bottom texture			Nice to have	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Highly desirable	Nice to have
Water column properties - Chemical			Highly desirable	Nice to have
Water column properties - Biological			Highly desirable	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Nice to have
Sea ice conditions			Nice to have	Nice to have
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Highly desirable	Highly desirable
Routes			Required	Highly desirable
Offshore cadastral			Highly desirable	Highly desirable
Lease areas			Required	Highly desirable
Fixed obstructions			Required	
Floating observation/navigation systems			Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Required	Highly desirable	
Land use/land cover	Highly desirable	Required	Required	Not required
Wetlands	Highly desirable	Required	Required	Not required
Estuaries			Required	Not required
Inland surface water features	Highly desirable	Required	Required	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Sandy and other LIDAR, Point Cloud data, 10 and 30 m USGS DEMs & DTMs	Surveyors in a jon boat getting the bottom elevations using total station survey	DNREC Coastal Programs survey data and NOAA bathymetry	DNREC Coastal Programs survey data and NOAA bathymetry
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast		Yes	Yes	Yes
NCEI				
Open Topography				
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Delaware First Map, Department Servers			
Data that meet my needs are not available				

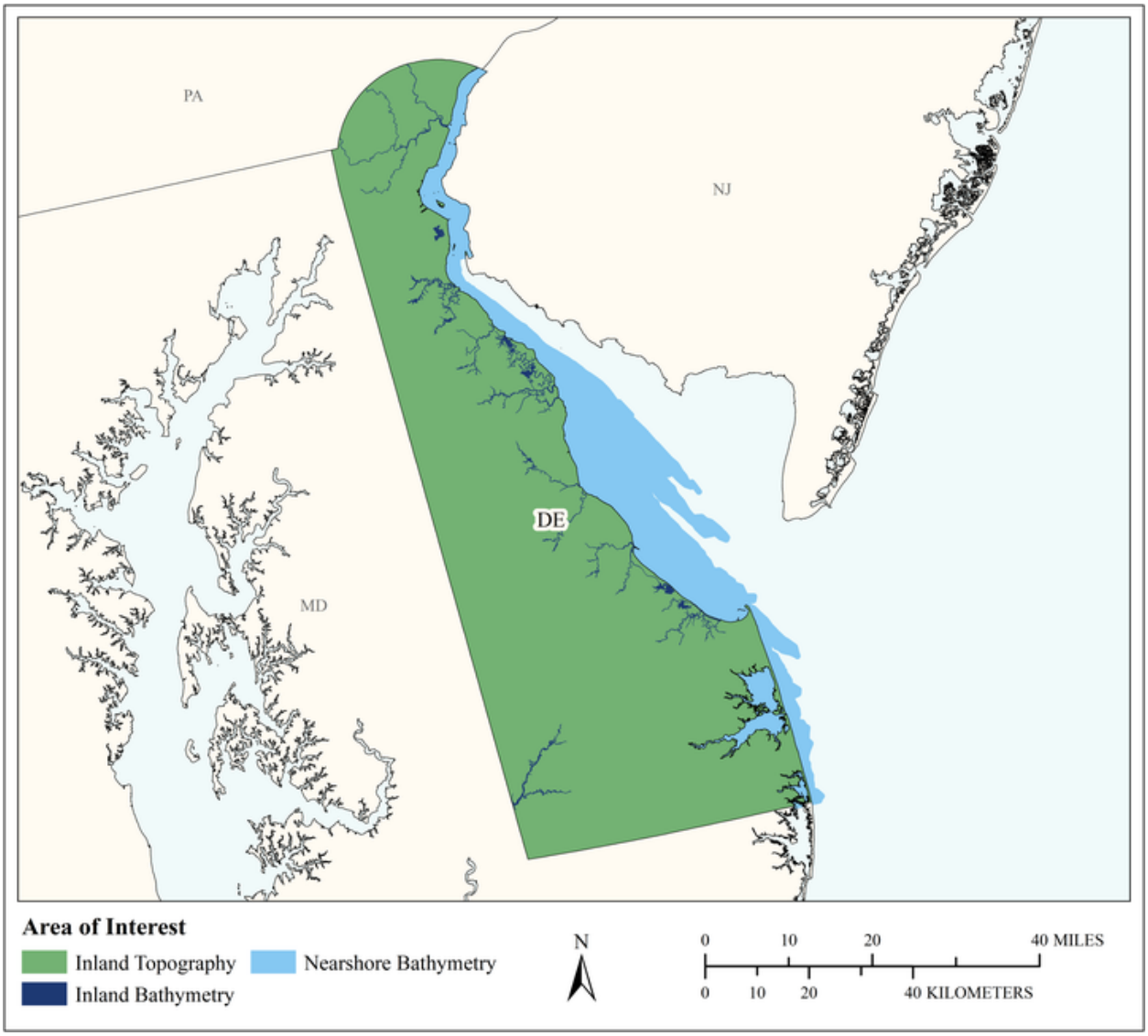
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Moderate	Moderate
Cost savings/cost reduction	Moderate	Moderate	Moderate	Minor
Cost avoidance	Moderate	Minor	Moderate	Minor
Increased revenues	None	None	None	None
Mission-driven performance improvements	Major	Moderate	Moderate	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Minor	Minor
Improved response or timeliness	Major	Moderate	Moderate	Moderate
Improved customer experience	Moderate	Moderate	Moderate	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Minor	Minor
Environmental	Major	Moderate	Moderate	Moderate
Public safety, including life and property	Major	Moderate	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	None			None			Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$50,821		Annual dollars saved/ realized	$21,808		Annual dollars saved/ realized	$282,675		Annual dollars saved/ realized	$9,899
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Other customer service benefits				Moderate	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$8,884		Annual dollars saved/ realized	$12,785		Annual dollars saved/ realized	$478,179		Annual dollars saved/ realized	$1,976
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Minor			Minor			Minor		
Environmental	Major			Moderate			Moderate			Moderate		
Public safety, including life and property	Major			Moderate			Moderate			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	Yes
Hillshades				
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Watershed Assessment and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Protect and improve water quality from contaminants, excess nutrients and sediment. Protect shellfish harvesting and beach health. Protect and conserve wetlands and riparian habitat so that natural functions provided by these habitats remain beneficial (e.g. flood attenuation, water quality, etc.).
MCA Title	Watershed Assessment and Management
MCA ID	21747
Organization Type	State or U.S. Territorial government
Organization Name	Delaware Department of Natural Resources and Environmental Control, Watershed Assessment
Sub-Agency or Division	
Organization Mission	The conservation, restoration and protection of natural resources.
Program Name	Watershed Assessment and Management
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	BU 02 - Riverine Ecosystem Management
Tertiary Business Use	BU 01 - Water Supply and Quality

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Vegetation - shrub all drainage stream/ditch/rill features

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL0B	QL1B	
Update Frequency	2-3 years	6-10 years	Annually	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	Up to 2 meters	The best horizontal accuracy achievable for the vertical accuracy I need	
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 20 cm	
How far onshore needed			To cover the beach slope	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MHW	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Highly desirable	Required		Required	Required
Entire AOI under same environmental conditions	Required	Required	Required		Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required		Required	Required
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	
DTM	Required	Required	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Required	Required	Highly desirable	
Classified point cloud	Required	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Required	Nice to have	Highly desirable	
Bathymetric Attributed Grid (BAG)		Highly desirable	Required	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	
Ground control/ground truthing	Highly desirable	Required	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Highly desirable	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Highly desirable	Nice to have	Nice to have	
Water column properties - Physical			Highly desirable	
Water column properties - Chemical			Highly desirable	
Water column properties - Biological			Highly desirable	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Required	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral				
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Required	Required	Highly desirable	
Wetlands	Required	Required	Required	
Estuaries			Required	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Highly desirable	Required		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Not required	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	2014 USGS LiDAR/DEM		Unknown	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes		Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Delaware FirstMap https://firstmap.delaware.gov/			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Major	I don't know	
Cost savings/cost reduction	Moderate	Major	I don't know	

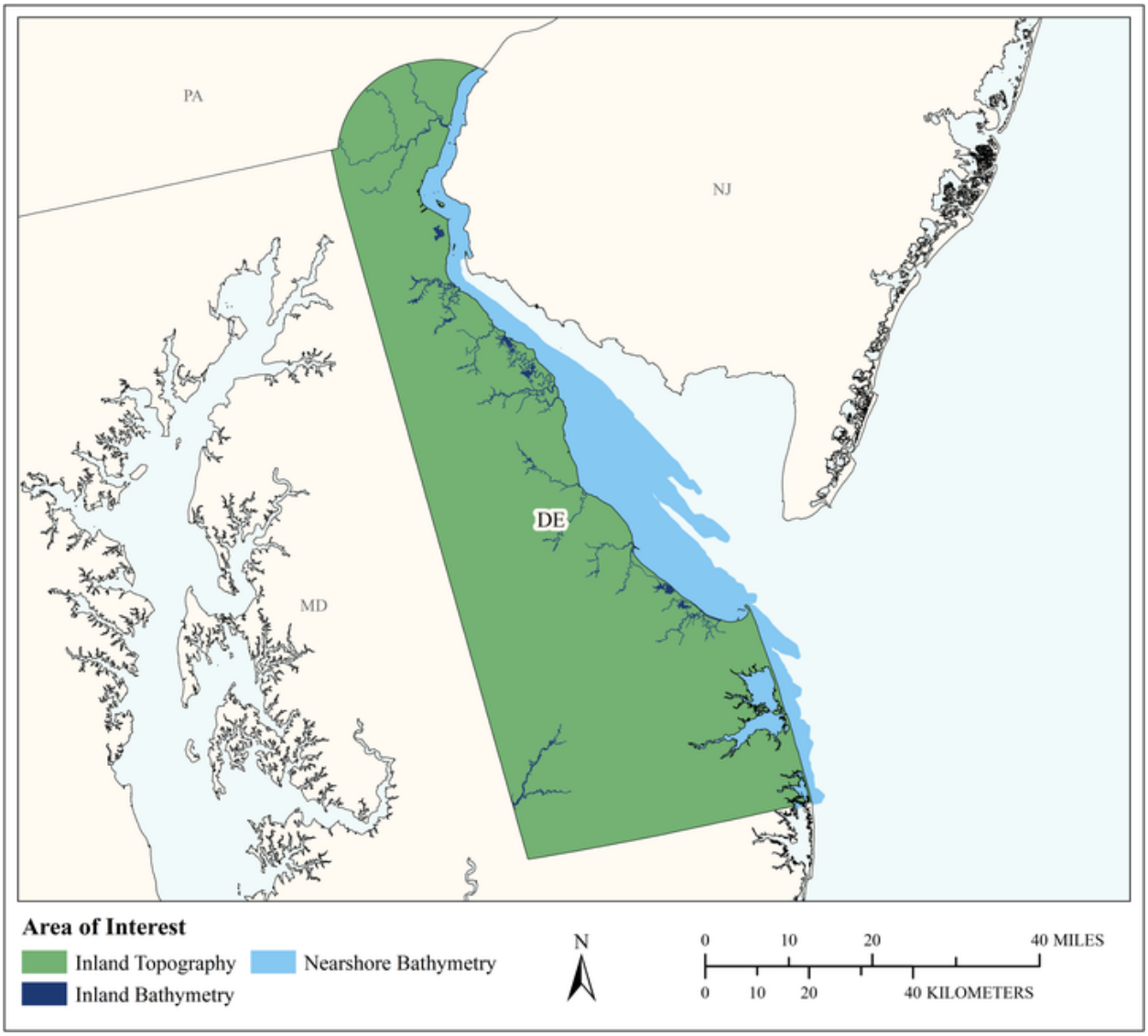
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost avoidance	I don't know	Moderate	I don't know	
Increased revenues	Minor	Minor	I don't know	
Mission-driven performance improvements	Major	Major	I don't know	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	I don't know	
Improved response or timeliness	Major	Major	I don't know	
Improved customer experience	Moderate	Moderate	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	I don't know	
Environmental	Major	Major	I don't know	
Public safety, including life and property	Major	Moderate	I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Increased revenues	None			Minor	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$9,899		Annual dollars saved/ realized	$10,480						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,976		Annual dollars saved/ realized	$471						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			I don't know					
Environmental	Moderate			Major			I don't know					
Public safety, including life and property	Moderate			Major			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes		Yes	
Aspect maps	Yes		Yes	
Curvature maps	Yes			
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Fisheries Management and Aquaculture



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Management of fisheries. Sustainable aquaculture.
MCA Title	Fisheries Management and Aquaculture
MCA ID	60076
Organization Type	State or U.S. Territorial government
Organization Name	State of Delaware
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B	QL0B	
Update Frequency	2-3 years	6-10 years	6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Nice to have		Required	Nice to have
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Required	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	
DTM	Required	Highly desirable	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Nice to have	Highly desirable	
Classified point cloud	Highly desirable	Nice to have	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Highly desirable	
Ground control/ground truthing	Required	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Highly desirable	Nice to have	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Required	Highly desirable	Highly desirable	
Land use/land cover	Required	Highly desirable	Nice to have	
Wetlands	Required	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Nice to have	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Not required	
Coastal and riverine structures	Required	Highly desirable	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	
Cost savings/cost reduction	Major	Moderate	Major	
Cost avoidance	Moderate	Moderate	Minor	
Increased revenues	Moderate	Moderate	Minor	
Mission-driven performance improvements	Major	Major	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Minor	

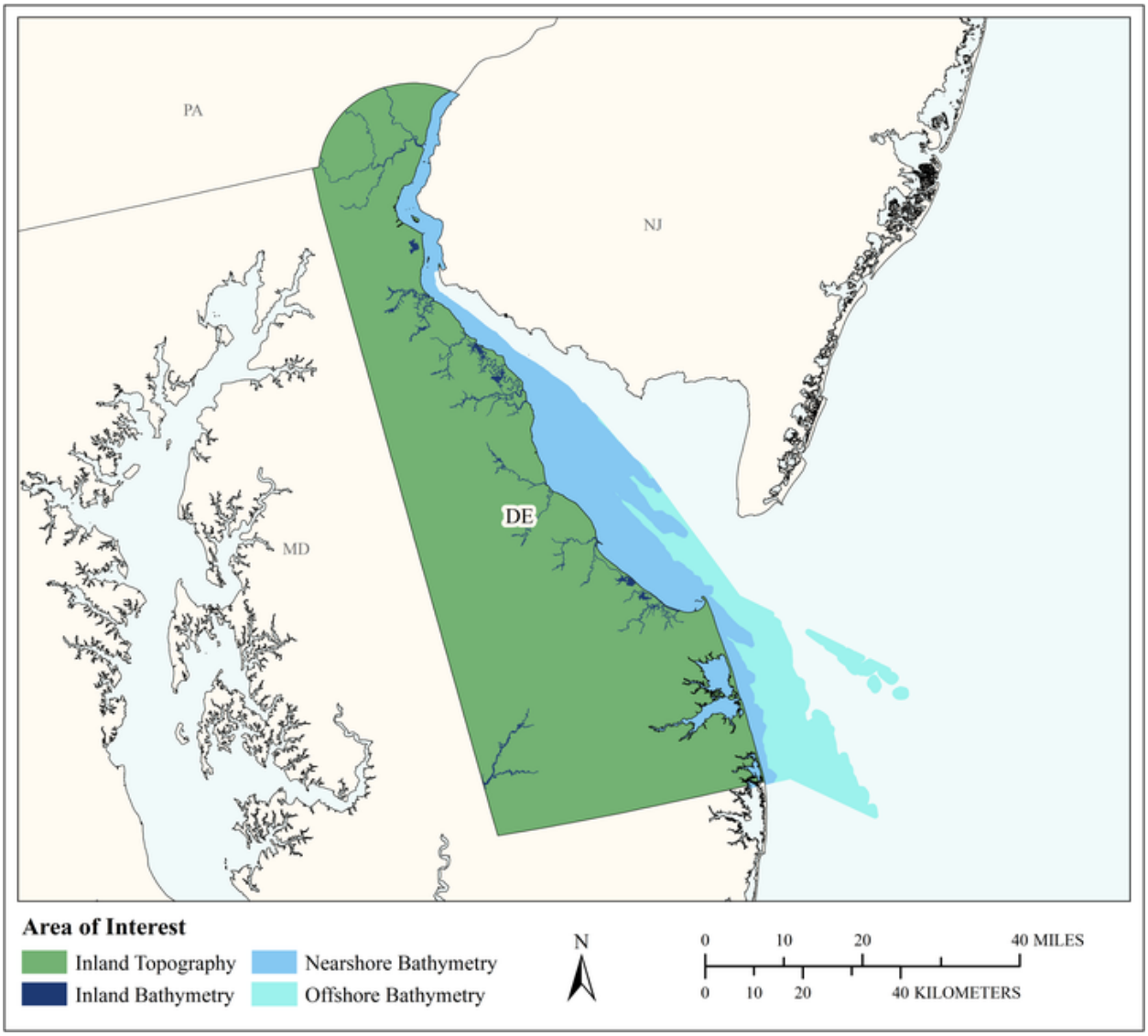
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major	Moderate	
Improved customer experience	Moderate	Major	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Moderate	
Environmental	Major	Moderate	Moderate	
Public safety, including life and property	Moderate	Minor	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Increased revenues	Minor	Unable to provide		None			Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,015		Annual dollars saved/ realized	$3,944		Annual dollars saved/ realized	$396,537			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$4,377		Annual dollars saved/ realized	$1,795		Annual dollars saved/ realized	$29,122			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Moderate					
Environmental	Moderate			Major			Major					
Public safety, including life and property	Moderate			Moderate			Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic Mapping



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Custom description
Sub Area Requirements				30 meter depth off Delaware

MCA Description	Response
Mission Critical Activity	The DGS's mission critical activities are to characterize water resources, geology, environmental protection, and energy and mineral resources (to include sand resources) to economic development, land-use planning, emergency management, public health, and recreation.
MCA Title	Geologic Mapping
MCA ID	21879
Organization Type	State or U.S. Territorial government
Organization Name	Delaware Geological Survey
Sub-Agency or Division	
Organization Mission	The Delaware Geological Survey (DGS) is a science-based, public-service-driven Delaware state agency at the University of Delaware (UD) that conducts geologic and hydrologic research, service, and exploration for the benefit of the citizens of the First State. The mission of the DGS is to provide objective earth science information, advice, and service to its stakeholders–the citizens, policy makers, industries, and educational institutions of Delaware. DGS research and service activities are focused on five areas: (1) geology, (2) hydrology, (3) natural hazards, (4) the state geospatial framework, and (5) information dissemination.
Program Name	Scientific support for the state Emergency Management Agency
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 01 - Water Supply and Quality
Tertiary Business Use	BU 15 - Flood Risk Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Permanent small structures for georeferencing, bottom surface

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Highly desirable
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B	QL2B	Order 1
Update Frequency	4-5 years	6-10 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 30 cm	Up to 1 meter	Up to 1 meter	
Acceptable Vertical Error	Up to 10 cm	Up to 40 cm	Up to 40 cm	Less than 1 meter
How far onshore needed			To Mean Higher High Water (MHHW)	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs	Partial			
Cross section/transect requirement	10 cm, 3x per meter			

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Required	Required	Required	Required	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable	Highly desirable	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Nice to have	Nice to have
DTM	Required	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Highly desirable	Required	Required
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Classified point cloud	Required	Nice to have	Highly desirable	
Edited/cube XYZ		Nice to have	Highly desirable	Highly desirable
Full waveform	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	Highly desirable

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Required	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Not required	Not required
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required	Nice to have	Nice to have	Nice to have
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Highly desirable	Not required	Highly desirable	Highly desirable
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Required	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Nice to have	Highly desirable	Highly desirable
Wetlands	Highly desirable	Required	Highly desirable	Highly desirable
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Highly desirable	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Q2 lidar flown post Sandy	We have very little except for NOAA data around coastal areas	We have access to near shore Bathymetry for areas of our state collected post-Sandy.	NOAA and core data
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI		Yes	Yes	Yes
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				Yes
State Repositories	Yes	Yes		
State repositories used	Delaware FirstMap DGS data repository	Delaware FirstData		
Other	Yes			
Other description	In house data			

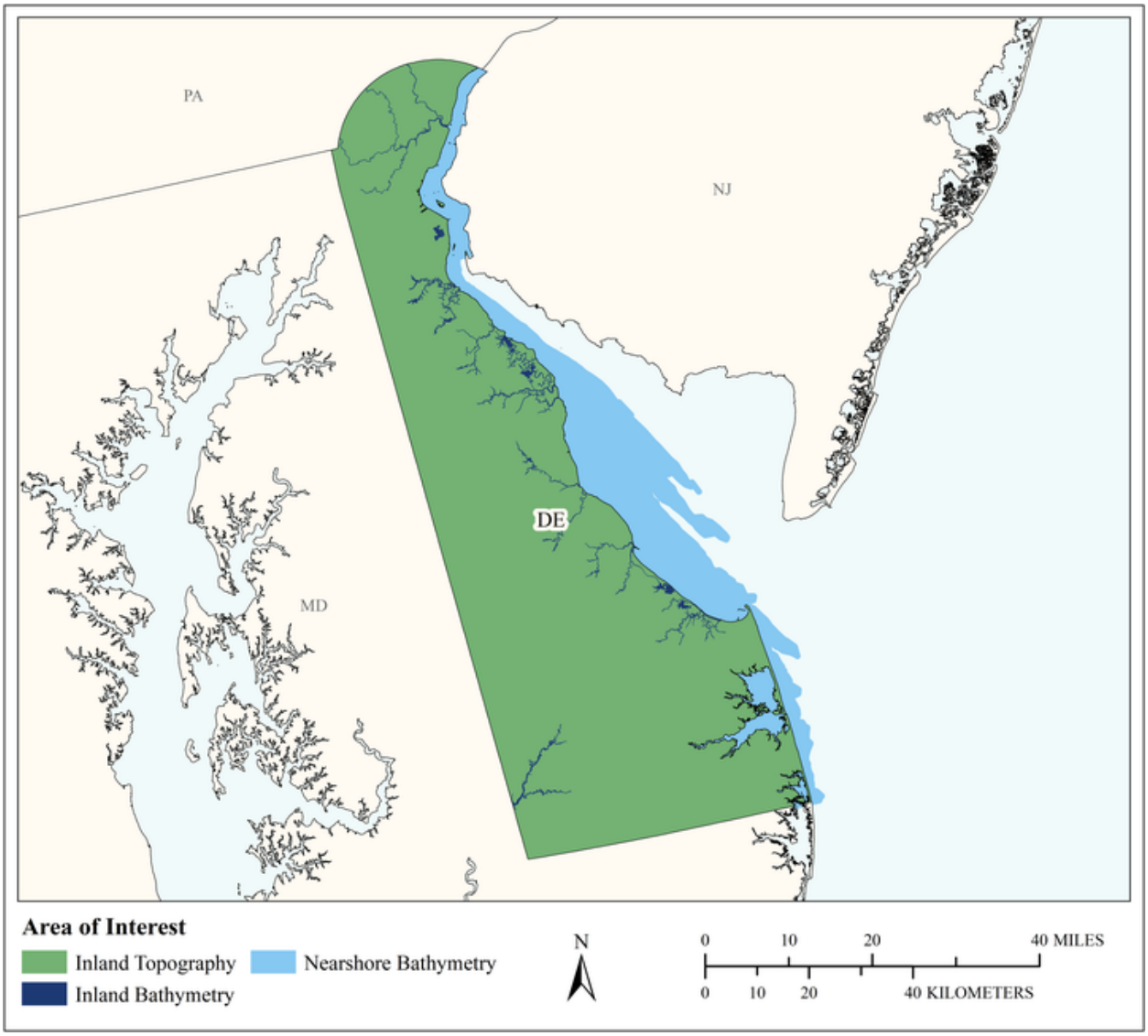
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Minor	Minor
Cost savings/cost reduction	Moderate	Moderate	None	None
Cost avoidance	Major	Minor	None	None
Increased revenues	None	None	None	None
Mission-driven performance improvements	Moderate	Moderate	None	None
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Minor	Minor
Improved response or timeliness	Major	None	None	None
Improved customer experience	Major	None	None	None
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	Minor
Environmental	Major	Minor	Minor	Minor
Public safety, including life and property	Major	Minor	Minor	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	I don't know	Annual dollars saved/realized	$20,000	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction description	Cost share of costs to acquire most recent lidar coverage (for Sandy) over assumed future update frequency of 5 years.											
Cost avoidance	Major	Annual dollars saved/realized	$5,000,000	Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Cost avoidance description	Flooded roadway avoidance. Coastal flood mapping, warnings to communities, state agencies.											
Increased revenues	Moderate	Unable to provide		Moderate	Unable to provide		None			None		
Mission-driven performance improvements	Major	Annual percent improvement	15%	Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Other operational benefits							Minor	Unable to provide		Minor	Unable to provide	
Other operational benefits description												
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		None			I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Major	Annual dollars saved/realized	$3,015	None			Minor	Unable to provide		Minor	Unable to provide	
Other customer service benefits	Moderate	Unable to provide										
Other customer service benefits description												
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			Minor			Minor		
Education or outreach description	Provide more accurate maps, apps											
Environmental	Moderate			Minor			Minor			Minor		
Environmental description	Better land use information, delineation of vegetation areas, etc.											
Public safety, including life and property	Moderate			Minor			Minor			Minor		
Public safety, including life and property description	Better flood plain maps, coastal flooding, low lying areas											
Other												
Other benefits	Moderate			Moderate								
Other description				Better navigation								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	Yes
Hillshades				
Slope maps	Yes		Yes	Yes
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes		Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Renewable Energy Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Alternate energy development – solar, tidal, wind, wave, and ocean current. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Low head power potential for hydropower.
MCA Title	Renewable Energy Resources
MCA ID	60077
Organization Type	State or U.S. Territorial government
Organization Name	State of Delaware
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	I don't know
Rivers and Streams	
Less than 10 ft	I don't know
10 - 50 ft	I don't know
51 - 100 ft	I don't know
101 - 500 ft	I don't know
501 - 2,500 ft	I don't know
Greater than 2,500 ft	I don't know
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	I don't know
½ - 1 acre	I don't know
1.1 – 2 acres	I don't know
2.1 – 5 acres	I don't know

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	I don't know
Greater than 10 acres	I don't know

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	I don't know	I don't know	
Update Frequency	6-10 years	I don't know	I don't know	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	I don't know	I don't know	
Acceptable Vertical Error	Up to 20 cm	I don't know	I don't know	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					I don't know	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	I don't know	I don't know		I don't know	I don't know
Entire AOI under same environmental conditions	Highly desirable	I don't know	I don't know		I don't know	I don't know
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	I don't know	I don't know		I don't know	I don't know
DEM for entire AOI needs to be seamless	Highly desirable	I don't know	I don't know		I don't know	I don't know
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	I don't know	I don't know	
DTM	Required	I don't know	I don't know	
DEM	Required	I don't know	I don't know	
Raw point cloud data	Highly desirable	I don't know	I don't know	
Classified point cloud	Highly desirable	I don't know	I don't know	
Edited/cube XYZ		I don't know	I don't know	
Full waveform	Nice to have	I don't know	I don't know	
Bathymetric Attributed Grid (BAG)		I don't know	I don't know	
Breaklines required for standard hydro-flattening	Nice to have	I don't know		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			I don't know	
Tide Predictions			I don't know	
Tidal Constituent And Residual Interpolation (TCARI)			I don't know	
Intensity imagery/sidescan imagery	Not required	I don't know	I don't know	
Ground control/ground truthing	Highly desirable	I don't know	I don't know	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			I don't know	
Nautical and/or navigation charts			I don't know	
Acoustic imagery of the seafloor			I don't know	
Aerial and/or satellite imagery	Highly desirable	I don't know	I don't know	
Underwater videography			I don't know	
Bottom texture			I don't know	
Bottom type			I don't know	
Submerged features			I don't know	
Subbottom characteristics			I don't know	
Geologic and seismic data	Not required	I don't know	I don't know	
Water column properties - Physical			I don't know	
Water column properties - Chemical			I don't know	
Water column properties - Biological			I don't know	
Currents			I don't know	
Tide/wave heights			I don't know	
Sea ice conditions			I don't know	
Habitat distribution and classification			I don't know	
Boundaries			I don't know	
Routes			I don't know	
Offshore cadastral			I don't know	
Lease areas			I don't know	
Fixed obstructions			I don't know	
Floating observation/navigation systems			I don't know	
Shorelines – current, historic, change rates	Nice to have	I don't know	I don't know	
Land use/land cover	Highly desirable	I don't know	I don't know	
Wetlands	Nice to have	I don't know	I don't know	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			I don't know	
Inland surface water features	Nice to have	I don't know	I don't know	
Bridges/culverts	Nice to have	I don't know		
Landmark features	Nice to have	I don't know	I don't know	
Cultural resources	Not required	I don't know	I don't know	
Coastal and riverine structures	Nice to have	I don't know	I don't know	
Overhead structures			I don't know	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	I don't know	I don't know	
Cost savings/cost reduction	Moderate	I don't know	I don't know	
Cost avoidance	Moderate	I don't know	I don't know	
Increased revenues	None	I don't know	I don't know	
Mission-driven performance improvements	Minor	I don't know	I don't know	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	I don't know	I don't know	

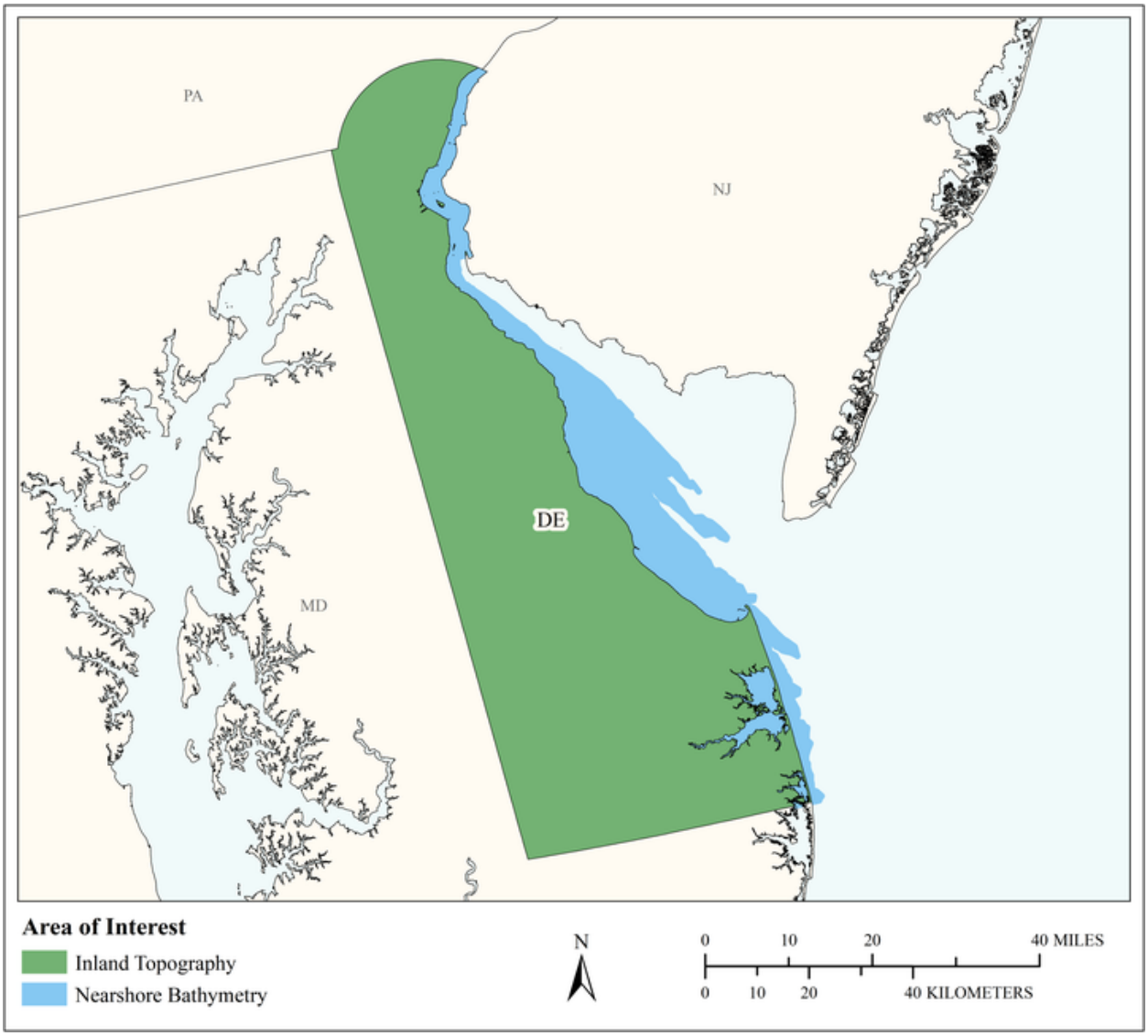
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor	I don't know	I don't know	
Improved customer experience	Minor	I don't know	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	I don't know	I don't know	
Environmental	Minor	I don't know	I don't know	
Public safety, including life and property	Minor	I don't know	I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost savings/cost reduction	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Increased revenues	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved customer experience	Minor	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			I don't know			I don't know					
Environmental	Minor			I don't know			I don't know					
Public safety, including life and property	None			I don't know			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Real-time Response to Emergency Management Due to Flooding



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Real-time response to emergency management due to flooding from storms (including both riverine/stream and coastal flooding), through interpretation of precipitation and flood forecasts, analysis of tidal and stream gage data, and topographic/environmental conditions. Elevation data are needed for vulnerability analyses; flood risk analyses; and identification of effects on infrastructure, critical facilities, transportation routes, etc.
MCA Title	Real-time Response to Emergency Management Due to Flooding
MCA ID	22145
Organization Type	State or U.S. Territorial government
Organization Name	Delaware Geological Survey
Sub-Agency or Division	
Organization Mission	The Delaware Geological Survey's mission is, by statute, geologic and hydrologic research and exploration of Delaware, and dissemination of information through publication and public service.
Program Name	DGS Natural Hazards
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 03 - Coastal Zone Management
Tertiary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Large features, bare earth

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2		QL2B	
Update Frequency	6-10 years		6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Horizontal Error	Up to 1 meter		Up to 1 meter	
Acceptable Vertical Error	Up to 20 cm		Up to 20 cm	
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed	To MLLW		To MLLW	
Tide correction requirement			MLLW	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable		Required			Highly desirable
Entire AOI under same environmental conditions	Highly desirable		Highly desirable			Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Highly desirable			Highly desirable
DEM for entire AOI needs to be seamless	Required		Required			Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable		Highly desirable	
DTM	Highly desirable		Highly desirable	
DEM	Required		Required	
Raw point cloud data	Highly desirable		Highly desirable	
Classified point cloud	Highly desirable		Highly desirable	
Edited/cube XYZ			Nice to have	
Full waveform	Nice to have		Nice to have	
Bathymetric Attributed Grid (BAG)			Not required	
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Highly desirable		Highly desirable	
Ground control/ground truthing	Required		Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required		Required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Not required	
Submerged features			Not required	
Subbottom characteristics			Not required	
Geologic and seismic data	Nice to have		Not required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Highly desirable	
Tide/wave heights			Required	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Required		Required	
Land use/land cover	Highly desirable		Required	
Wetlands	Required		Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required		Required	
Bridges/culverts	Required			
Landmark features	Nice to have		Highly desirable	
Cultural resources	Nice to have		Nice to have	
Coastal and riverine structures	Highly desirable		Nice to have	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Statewide topobathy, hydro-flattened DEM and spot elevation from GPS/surveys. QL2 2013-2014		Topobathy, NOAA 2014, 2 southern counties; JALBTCX Atlantic coastline	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes		Yes	
NCEI			Yes	
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes		Yes	
State repositories used	Delaware FirstMap DGS data repository		Delaware state agencies	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Moderate	
Cost savings/cost reduction	Major		Moderate	
Cost avoidance	Moderate		Minor	

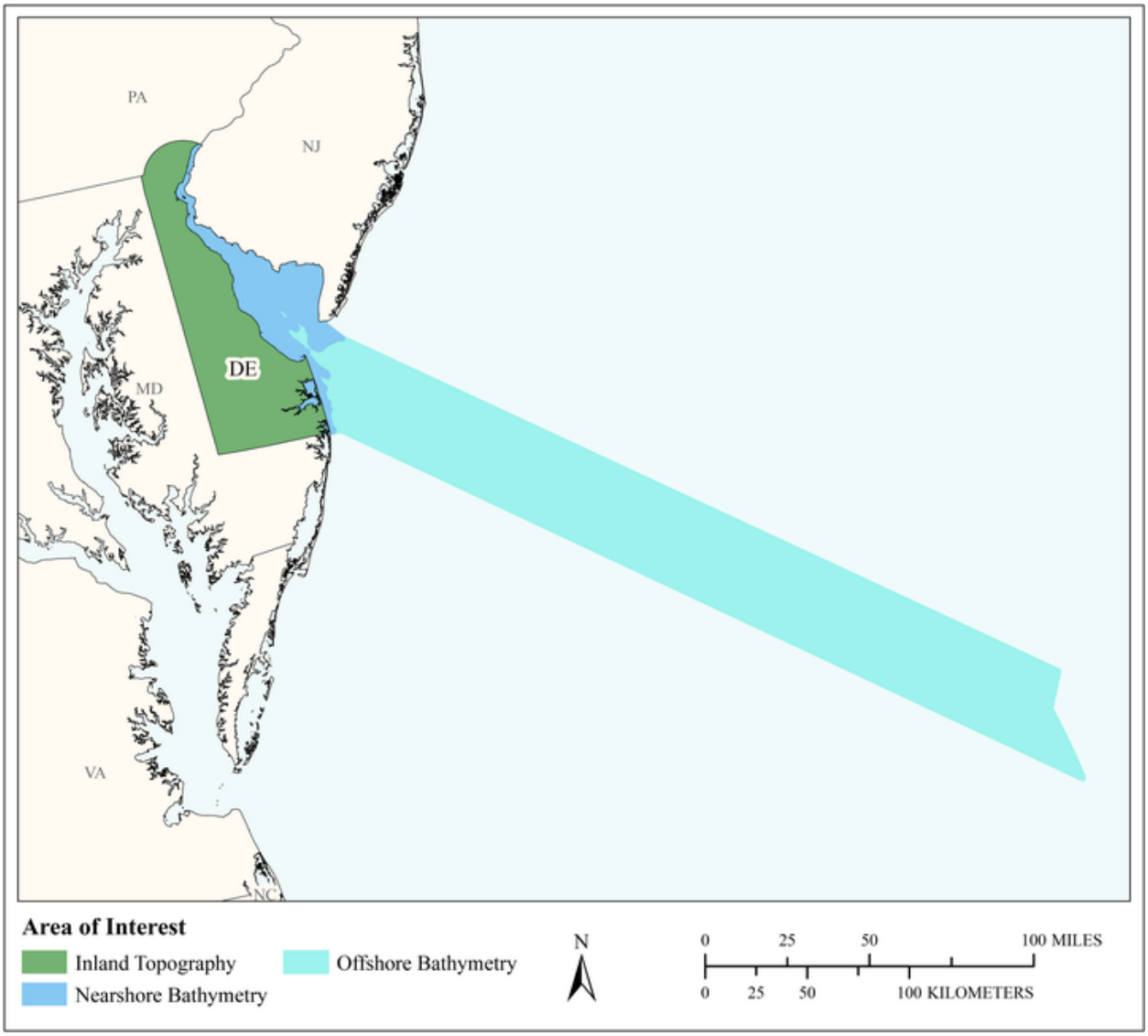
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	None		None	
Mission-driven performance improvements	Moderate		Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate		Minor	
Improved response or timeliness	Minor		Minor	
Improved customer experience	Minor		Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate		Minor	
Environmental	Minor		Moderate	
Public safety, including life and property	Major		Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide					Moderate	Unable to provide				
Cost savings/cost reduction	Moderate	Annual dollars saved/realized	$20,000				Minor	Unable to provide				
Cost savings/cost reduction description	Cost share of costs to acquire most recent lidar coverage (from Sandy) over assumed 5 year update frequency.											
Cost avoidance	Major	Annual dollars saved/realized	$5,000,000				Major	Unable to provide				
Cost avoidance description	Help planning for areas subject to inland/stream and coastal surge flooding.											
Increased revenues	None						None					
Mission-driven performance improvements	Major	Unable to provide					Moderate	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide					Moderate	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide					Moderate	Unable to provide				
Improved customer experience	Minor	Unable to provide					Minor	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None						Minor					
Environmental	Moderate						Minor					
Public safety, including life and property	Moderate						Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	
Contours	Yes		Yes	
Hillshades				
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Identifying, Modeling, and Mapping the Effects of Future Scenarios of Sea Level Rise and Local Land Subsidence



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	Required
Geographic Area Requirements	Area split by varying quality level or update frequency		Custom description	Custom description
Sub Area Requirements	Delaware		Delaware shoreline and the New Jersey shoreline of the Delaware Bay	Delaware Bay and out to the outer continental shelf

MCA Description	Response
Mission Critical Activity	Identifying, modeling, and mapping the effects of future scenarios of sea level rise and local land subsidence. This includes determination of future sea level rise scenarios for Delaware, impacts on groundwater, extent of potential flooding into communities, and effects of tidal saltmarshes, among others. Salt marsh resiliency, impacts to communities from SLR, Impacts to communities from subsidence.
MCA Title	Identifying, Modeling, and Mapping the Effects of Future Scenarios of Sea Level Rise and Local Land Subsidence
MCA ID	1381
Organization Type	State or U.S. Territorial government
Organization Name	Delaware Geological Survey
Sub-Agency or Division	
Organization Mission	The Delaware Geological Survey's mission is, by statute, geologic and hydrologic research and exploration, and dissemination of information through publication and public service.
Program Name	DGS Natural Hazards
Total Annual Program Budget	
Primary Business Use	BU 16 - Sea Level Rise and Subsidence
Secondary Business Use	BU 03 - Coastal Zone Management
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Bare earth, bottom surface

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	(a) QL1 (b) QL2		QL2B	Order 2
Update Frequency	2-3 years		6-10 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI	If possible, to have higher resolution (QL1) in coastal marsh areas (HUC 0204)			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Horizontal Error	Up to 1 meter		Up to 1 meter	Up to 10 meters
Acceptable Vertical Error	Up to 20 cm		Up to 40 cm	1-3 meters
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed	To MLLW		To MLLW	
Tide correction requirement			MLLW	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required		Required	Not required		Required
Entire AOI under same environmental conditions	Required		Required	Not required		Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have		Required	Required		Required
DEM for entire AOI needs to be seamless	Required		Required	Required		Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable		Highly desirable	Highly desirable
DTM	Highly desirable		Highly desirable	Highly desirable
DEM	Required		Required	Required
Raw point cloud data	Highly desirable		Highly desirable	Nice to have
Classified point cloud	Highly desirable		Highly desirable	
Edited/cube XYZ			Nice to have	Nice to have
Full waveform	Nice to have		Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)			Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	Required
Tide Predictions			Required	Required
Tidal Constituent And Residual Interpolation (TCARI)			Required	Required
Intensity imagery/sidescan imagery	Highly desirable		Nice to have	Nice to have
Ground control/ground truthing	Required		Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Not required	Not required
Aerial and/or satellite imagery	Highly desirable		Required	Nice to have
Underwater videography			Not required	Not required
Bottom texture			Not required	Not required
Bottom type			Nice to have	Nice to have
Submerged features			Not required	Not required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Highly desirable		Nice to have	Nice to have
Water column properties - Physical			Highly desirable	Highly desirable
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Nice to have	Nice to have
Tide/wave heights			Required	Required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Highly desirable	Highly desirable
Routes			Highly desirable	Highly desirable
Offshore cadastral			Not required	Not required
Lease areas			Not required	Not required
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Highly desirable		Highly desirable	
Land use/land cover	Required		Highly desirable	Highly desirable
Wetlands	Required		Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required		Nice to have	
Bridges/culverts	Required			
Landmark features	Nice to have		Not required	
Cultural resources	Nice to have		Not required	
Coastal and riverine structures	Required		Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Statewide topobathy, hydro-flattened DEM and spot elevation from GPS/surveys. QL2 2013-2014		Topobathy, NOAA 2014, 2 southern counties; JALBTCX Atlantic coastline	NOAA
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	Yes
NCEI			Yes	Yes
Open Topography				
NOAA nautical charts				Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes		Yes	
State repositories used	Delaware FirstMap DGS data repository		Delaware state agencies	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Major	Major
Cost savings/cost reduction	Major		Major	Major
Cost avoidance	Major		Major	Major

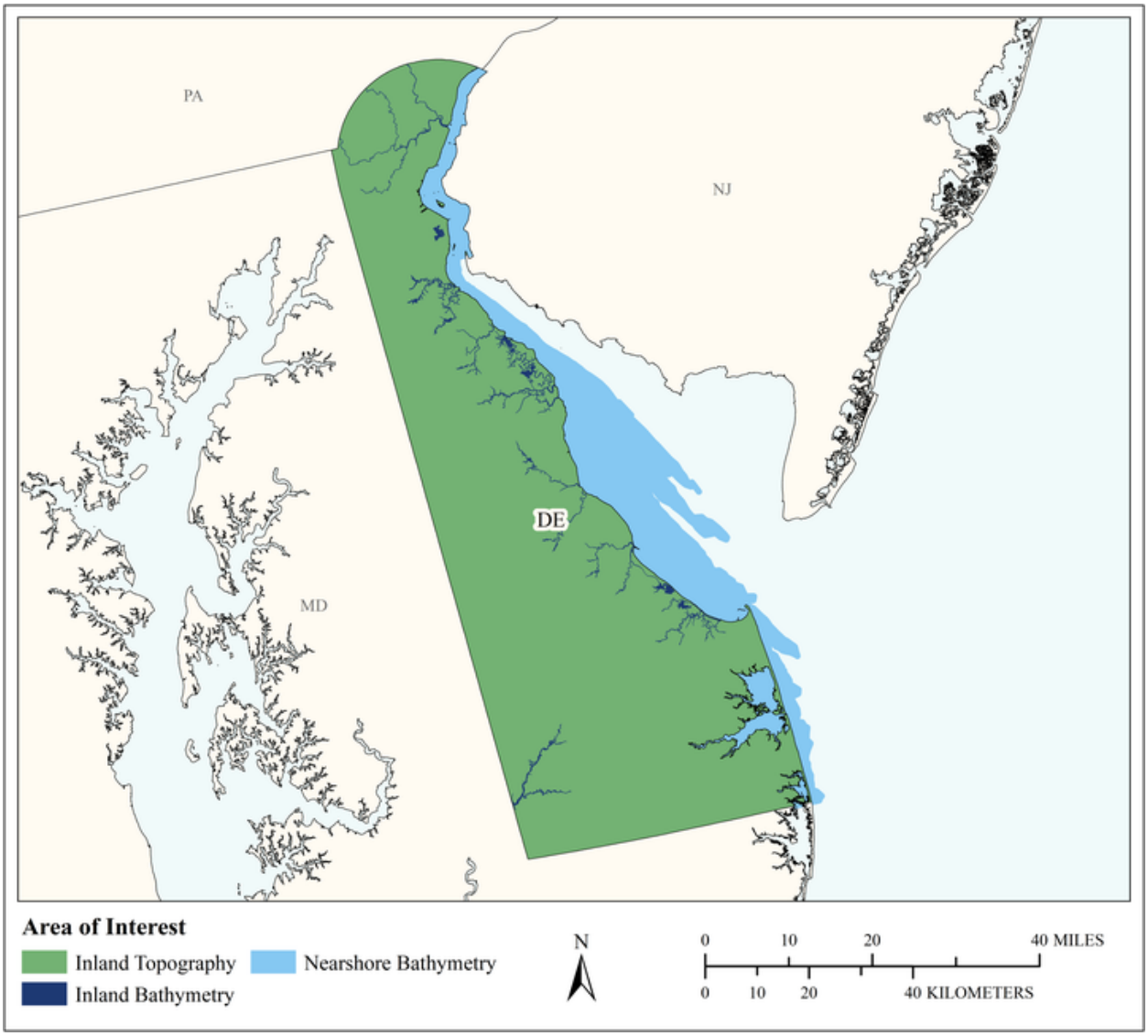
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Increased revenues	None		None	None
Mission-driven performance improvements	Major		Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		Major	Major
Improved response or timeliness	Major		Moderate	Moderate
Improved customer experience	Major		Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major		Major	Major
Environmental	Major		Major	Major
Public safety, including life and property	Major		Major	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Moderate	Annual dollars saved/realized	$20,000				Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction description	Cost share of costs to acquire most recent lidar coverage (from Sandy) over assumed update frequency of 5 years.											
Cost avoidance	Major	Annual dollars saved/realized	$5,000,000				Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance description	Coastal flood mapping, warnings to communities, state agencies.											
Increased revenues	Moderate	Unable to provide					None			None		
Mission-driven performance improvements	Major	Unable to provide					Major	Unable to provide		Moderate	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide					Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide					Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Major	Unable to provide					Minor	Unable to provide		Minor	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor						Minor			Minor		
Education or outreach description	Provide more accurate maps, apps											
Environmental	Moderate						Minor			Minor		
Environmental description	Better land use information, delineation of vegetation areas, etc.											
Public safety, including life and property	Moderate						Minor			None		
Public safety, including life and property description	Better flood plain maps, coastal flooding, low lying areas											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Homeland Security, Law Enforcement, Disaster Response, and Emergency Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Infrastructure and border protection. Coastal search and rescue. Population dynamics. Emergency fuel supply and movement. Line of sight analysis in urban areas. Disaster response. Flood risk analysis resulting from acts of terrorism.
MCA Title	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
MCA ID	60078
Organization Type	State or U.S. Territorial government
Organization Name	State of Delaware
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B	QL1B	
Update Frequency	4-5 years	4-5 years	6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable		Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Required	
DTM	Required	Highly desirable	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Highly desirable	Highly desirable	
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Highly desirable	Highly desirable	
Full waveform	Nice to have	Nice to have	Highly desirable	
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Highly desirable	
Ground control/ground truthing	Required	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Required	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Highly desirable	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Nice to have	
Boundaries			Highly desirable	
Routes			Highly desirable	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	
Cost savings/cost reduction	Major	Major	Major	
Cost avoidance	Major	Moderate	Moderate	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	Moderate	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Minor	

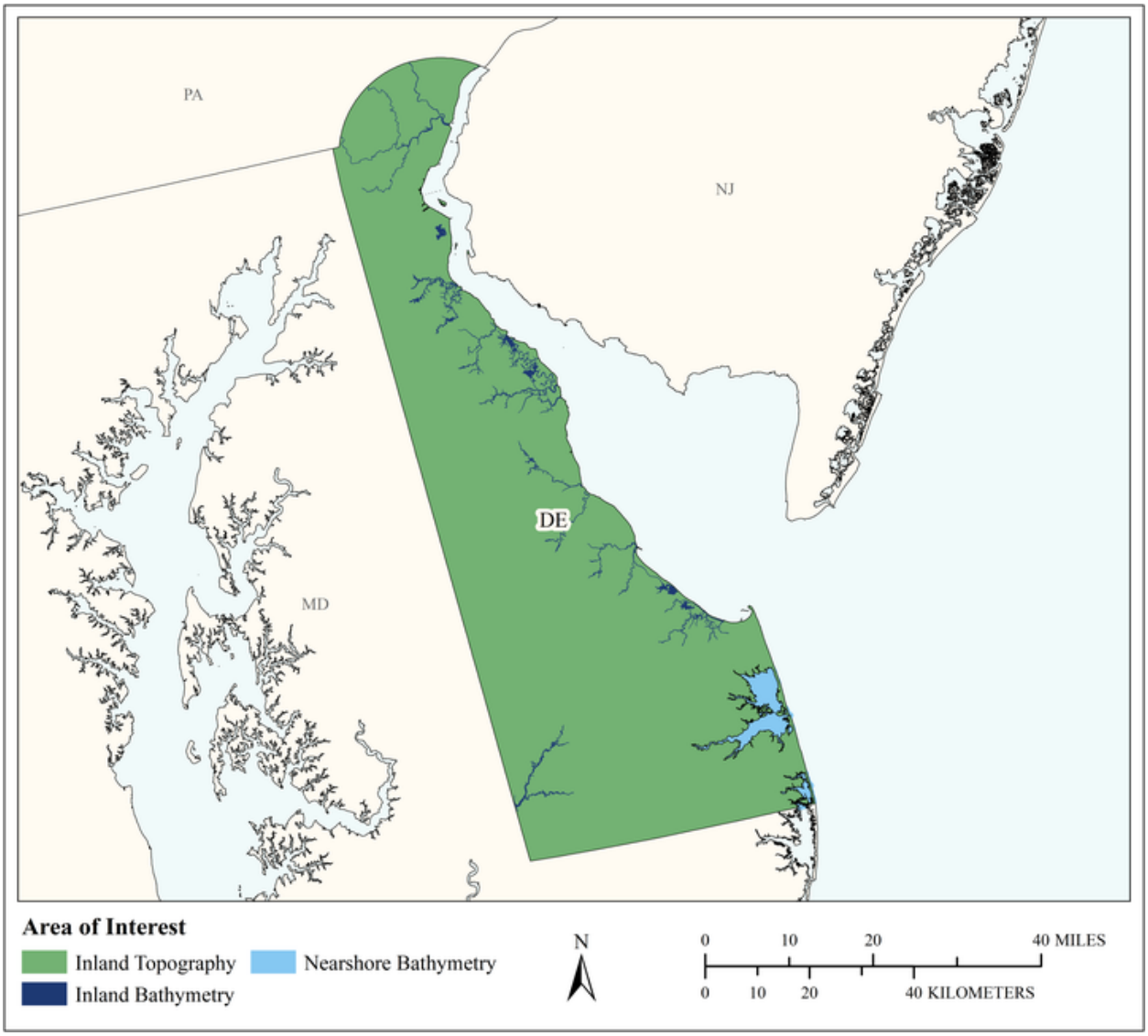
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major	Minor	
Improved customer experience	Major	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	Minor	
Environmental	Minor	Moderate	Minor	
Public safety, including life and property	Major	Major	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$58,158		Annual dollars saved/ realized	$16,379		Annual dollars saved/ realized	$23,253			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,027		Annual dollars saved/ realized	$1,045		Annual dollars saved/ realized	$667			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate					
Environmental	Moderate			Moderate			Moderate					
Public safety, including life and property	Major			Major			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Marine and Riverine Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Custom description	
Sub Area Requirements			Inland bays of Delaware	

MCA Description	Response
Mission Critical Activity	Nautical charting. Bathymetric measurements of nearshore submerged coastal topography. Identification of hazards to navigation. Sediment management at coastal navigation projects. Precision marine navigation. Movement of goods and fishing vessels.
MCA Title	Marine and Riverine Navigation and Safety
MCA ID	60000
Organization Type	State or U.S. Territorial government
Organization Name	State of Delaware
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Nice to have
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B	QL0B	
Update Frequency	2-3 years	2-3 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Nice to have	Nice to have		Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required		Required	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Required	
DTM	Required	Highly desirable	Required	
DEM	Required	Required	Required	
Raw point cloud data	Required	Nice to have	Required	
Classified point cloud	Required	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Highly desirable	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	
Breaklines required for standard hydro-flattening	Highly desirable	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Highly desirable	
Ground control/ground truthing	Required	Nice to have	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Required	Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Not required	Not required	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Highly desirable	
Boundaries			Nice to have	
Routes			Required	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Required	
Floating observation/navigation systems			Required	
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Nice to have	Nice to have	Nice to have	
Wetlands	Highly desirable	Required	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Highly desirable	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Required	Nice to have	Nice to have	
Cultural resources	Highly desirable	Highly desirable	Nice to have	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts		Yes	Yes	
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	
Cost savings/cost reduction	Major	I don't know	Minor	
Cost avoidance	Moderate	Major	Minor	
Increased revenues	Moderate	None	Minor	
Mission-driven performance improvements	Moderate	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	None	Minor	

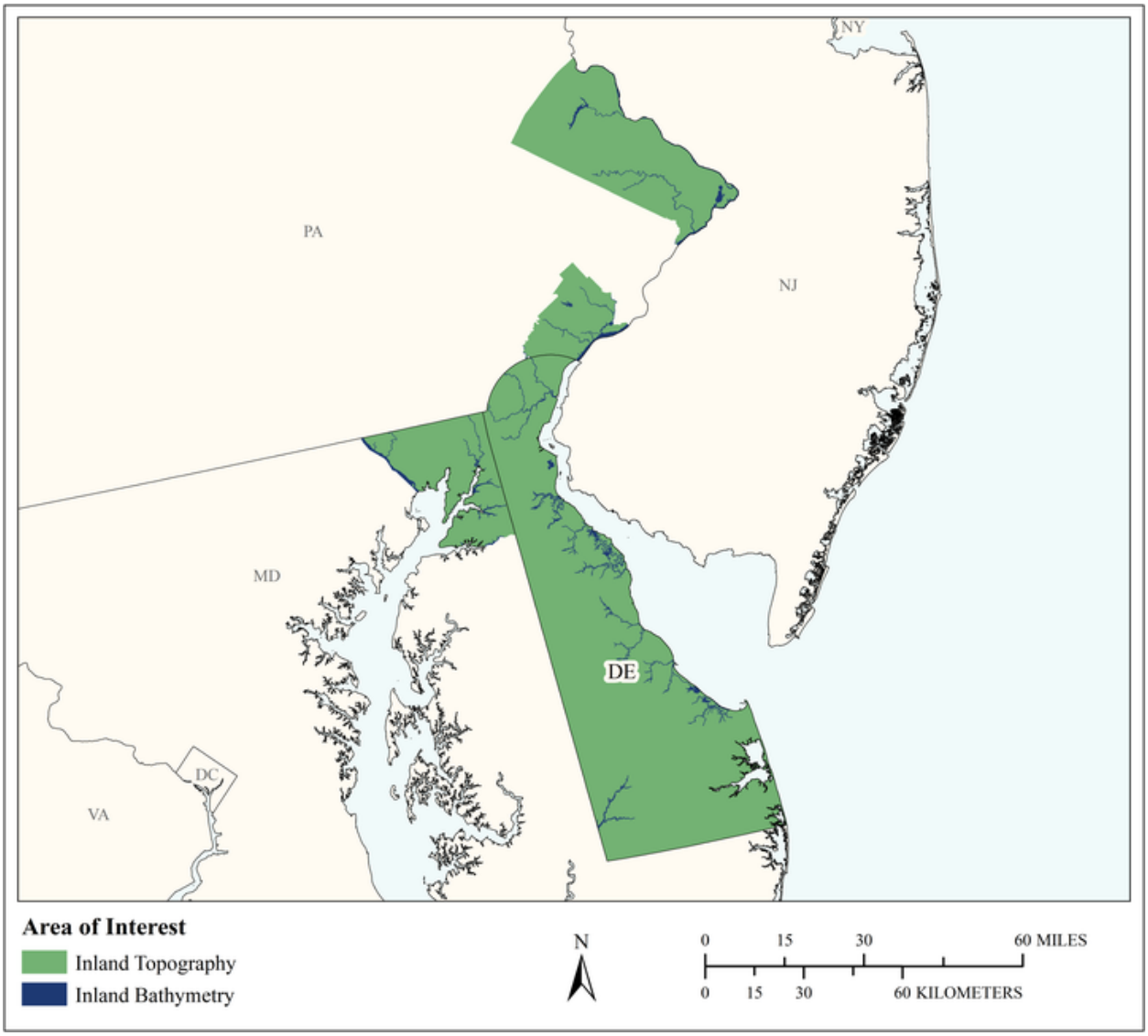
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Minor	None	Minor	
Improved customer experience	Moderate	None	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	None	Minor	
Environmental	Moderate	None	Minor	
Public safety, including life and property	Major	None	Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Increased revenues	None			Moderate	Unable to provide		Major	Unable to provide				
Mission-driven performance improvements	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$75,523		Annual dollars saved/ realized	$35,961		Annual dollars saved/ realized	$177,496			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Future annual customer service benefits added during validation					Annual dollars saved/ realized	$4,732		Annual dollars saved/ realized	$6,009			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			Moderate			Minor					
Environmental	None			Moderate			Major					
Public safety, including life and property	Minor			Moderate			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps				
Aspect maps				
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Managing Bridges in the Transportation Network



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Custom description	Custom description		
Sub Area Requirements	Delaware, Cecil County, MD, and Delaware & Bucks Counties, PA	Delaware, Cecil County, MD, and Delaware & Bucks Counties, PA		

MCA Description	Response
Mission Critical Activity	Managing bridges in the transportation network. Elevation data are needed to supplement field survey data for H&H analysis, to identify scour, etc. for bridges and culverts. The data can be used for planning and preliminary design. Field survey data are still needed for final design and construction. Inland bathymetry would be used to derive the stream profile for hydraulic modeling.
MCA Title	Managing Bridges in the Transportation Network
MCA ID	1239
Organization Type	State or U.S. Territorial government
Organization Name	Delaware DOT
Sub-Agency or Division	
Organization Mission	Excellence in Transportation - Every Trip. Every Mode. Every Dollar. Everyone.
Program Name	Capital Transportation Program
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Not required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Culverts, surface roughness, etc.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B		
Update Frequency	Event driven only – Data need to coincide with a specific event.	Event driven only – Data need to coincide with a specific event.		
Event type(s)	A new project.	A new project.		
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 30 cm	Up to 1 meter		
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed	Below MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Nice to have			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Nice to have			Nice to have	
DEM for entire AOI needs to be seamless	Highly desirable	Nice to have			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Highly desirable		
Raw point cloud data	Required	Highly desirable		
Classified point cloud	Nice to have	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Nice to have	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required	Required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required	Required		
Land use/land cover	Required	Required		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Required	Required		
Cultural resources	Required	Required		
Coastal and riverine structures	Required	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Aerial LiDar, topographic field survey	None available		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	DelDOT			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know	Inland bathy data not available		
Cost savings/cost reduction	I don't know	Inland bathy data not available		
Cost avoidance	I don't know	Inland bathy data not available		

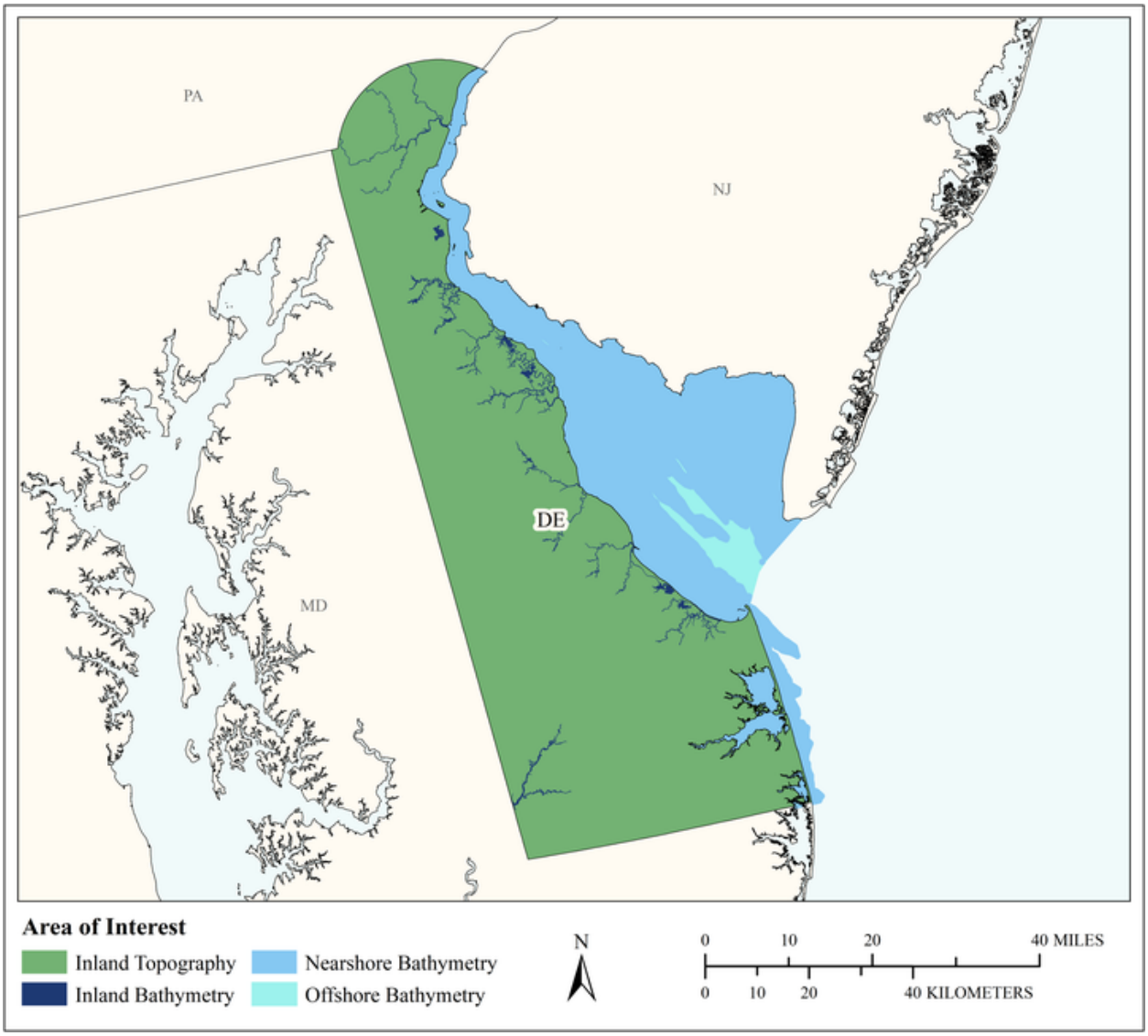
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	I don't know	Inland bathy data not available		
Mission-driven performance improvements	I don't know	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	Inland bathy data not available		
Improved response or timeliness	None	Inland bathy data not available		
Improved customer experience	None	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	Inland bathy data not available		
Environmental	I don't know	Inland bathy data not available		
Public safety, including life and property	I don't know	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction	Minor	Unable to provide		I don't know	Unable to provide							
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide							
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Moderate	Unable to provide		I don't know	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$44,290		Annual dollars saved/ realized	$14,921						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	Moderate	Unable to provide		I don't know	Unable to provide							
Improved customer experience	Moderate	Unable to provide		I don't know	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$130,338		Annual dollars saved/ realized	$1,549						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			I don't know								
Environmental	I don't know			I don't know								
Public safety, including life and property	Moderate			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps	Yes	Yes		
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Transportation Infrastructure Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Custom description	Custom description
Sub Area Requirements			Delaware shoreline and the New Jersey shoreline of the Delaware Bay	Delaware Bay

MCA Description	Response
Mission Critical Activity	Sea Level Rise and Subsidence, Aviation Navigation and Safety, Infrastructure and Construction Management. BU 23 - Urban and Regional Planning is an additional Business Use.
MCA Title	Transportation Infrastructure Management
MCA ID	22234
Organization Type	State or U.S. Territorial government
Organization Name	Delaware Department of Transportation
Sub-Agency or Division	
Organization Mission	Every Trip - We strive to make every trip taken in Delaware safe, reliable and convenient for people and commerce. Every Mode - We provide safe choices for travelers in Delaware to access roads, rails, buses, airways, waterways, bike trails, and walking paths. Every Dollar - We seek the best value for every dollar spent for the benefit of all. Everyone - We engage our customers and employees with respect and courtesy as we deliver our services.
Program Name	Bridge Design and Management.
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 16 - Sea Level Rise and Subsidence
Tertiary Business Use	BU 21 - Aviation Navigation and Safety

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Culverts, surface roughness, etc.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have

Inland Bathy Feature Size Requirements	Response
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B	Cross sections and/or transects meet needs	Cross sections and/or transects meet needs
Update Frequency	Annually	2-3 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	I don't know	I don't know	I don't know
Acceptable Vertical Error	I don't know	I don't know	I don't know	I don't know
How far onshore needed			To cover the beach slope	
How far down the beach profile needed	Not applicable		I don't know	
Tide correction requirement			No requirement for tide correction	I don't know
Cross sections and/or transects meet needs		Partial	Yes	Yes
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Highly desirable

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have	Nice to have	Highly desirable	Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Nice to have	Nice to have	Highly desirable	Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DTM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Nice to have	Nice to have
Full waveform	Highly desirable	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Nice to have	Nice to have
Ground control/ground truthing	Highly desirable	Nice to have	Nice to have	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Not required	Nice to have
Acoustic imagery of the seafloor			Required	Nice to have
Aerial and/or satellite imagery	Required	Required	Nice to have	Nice to have
Underwater videography			Nice to have	Nice to have
Bottom texture			Nice to have	Nice to have
Bottom type			Nice to have	Nice to have
Submerged features			Nice to have	Nice to have
Subbottom characteristics			Highly desirable	Nice to have
Geologic and seismic data	Required	Required	Nice to have	Highly desirable
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Not required	Nice to have
Tide/wave heights			Not required	Nice to have
Sea ice conditions			Nice to have	Nice to have
Habitat distribution and classification			Not required	Nice to have
Boundaries			Not required	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Not required	Nice to have
Lease areas			Not required	Nice to have
Fixed obstructions			Not required	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Required	Highly desirable
Wetlands	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Nice to have	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Aerial Lidar, topographic field survey	We have very little except for NOAA data around coastal areas	We have access to near shore Bathymetry for areas of our state collected post-Sandy.	NOAA
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				Yes
NCEI		Yes		Yes
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Delaware First Map			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Moderate	Moderate
Cost savings/cost reduction	Major	Moderate	Moderate	Moderate
Cost avoidance	Moderate	Moderate	Moderate	Moderate
Increased revenues	Minor	None	Moderate	Moderate

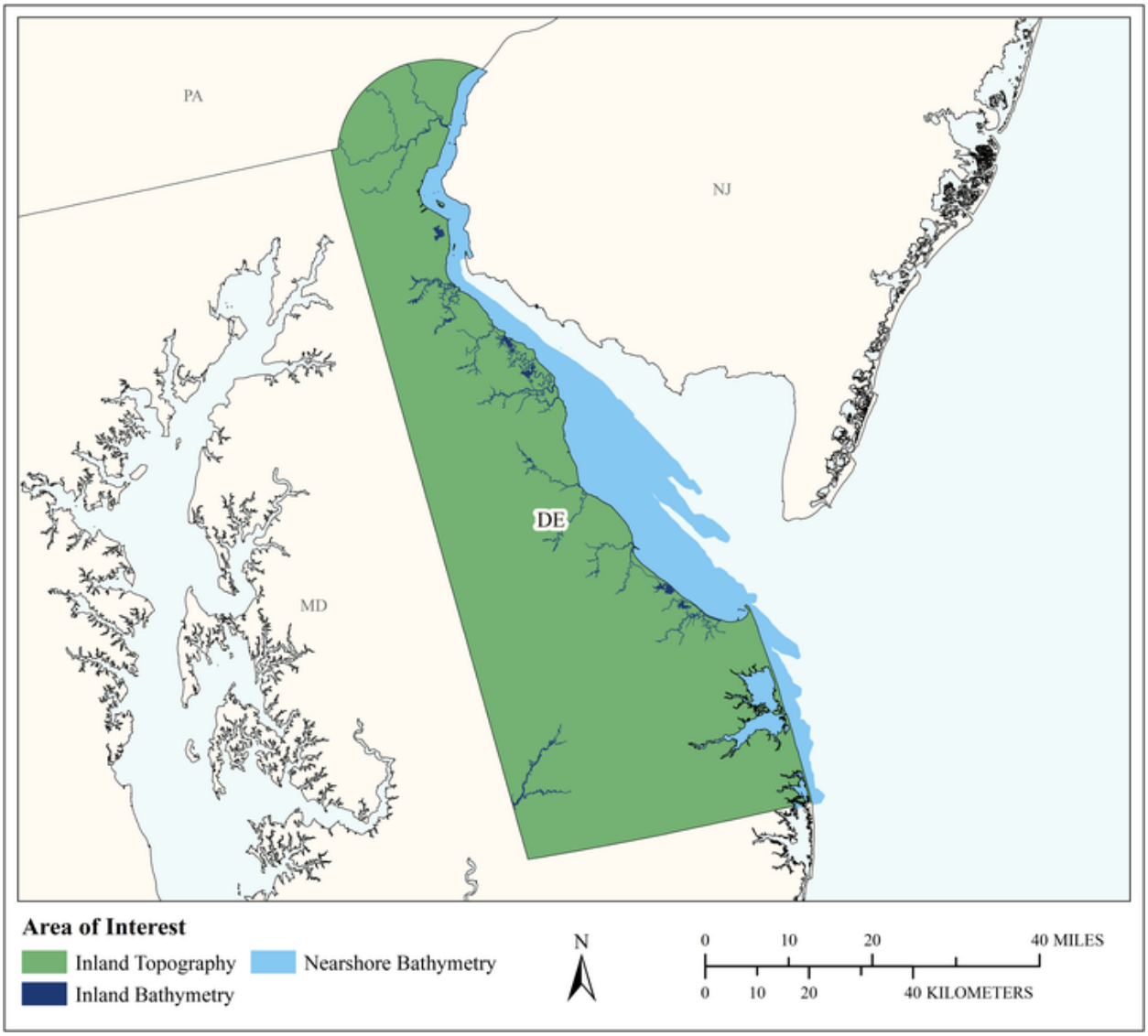
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Mission-driven performance improvements	Moderate	Moderate	Moderate	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Moderate	Moderate
Improved response or timeliness	Moderate	Moderate	Moderate	Moderate
Improved customer experience	Moderate	Moderate	Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Moderate	Moderate
Environmental	Major	Major	Moderate	Moderate
Public safety, including life and property	Major	Moderate	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	None			Minor	Unable to provide		Minor	Unable to provide		None		
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$44,306		Annual dollars saved/ realized	$14,927		Annual dollars saved/ realized	$52,747			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Other customer service benefits										Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$130,385		Annual dollars saved/ realized	$1,549		Annual dollars saved/ realized	$7,252			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate			Minor		
Environmental	Major			Major			Major			Major		
Public safety, including life and property	Moderate			Minor			Moderate			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Statewide and Local Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Statewide and local planning missions to provide appropriate development based on a lot of environmental and land use variables (sea level rise, wetlands, zoning, coastal issues etc.)
MCA Title	Statewide and Local Planning
MCA ID	22063
Organization Type	State or U.S. Territorial government
Organization Name	Delaware Office of State Planning Coordination
Sub-Agency or Division	
Organization Mission	Coordination of State Planning initiatives, including Geospatial technology, comprehensive local planning, etc.
Program Name	Preliminary Land Use reviews
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Building level detail

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL2B	
Update Frequency	4-5 years	6-10 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	I don't know	Up to 2 meters	Less than 50 cm	
Acceptable Vertical Error	I don't know	Up to 30 cm	Up to 40 cm	
How far onshore needed			To Mean Higher High Water (MHHW)	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MHW	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Highly desirable	Required		Highly desirable	Required
Entire AOI under same environmental conditions	Required	Highly desirable	Required		Highly desirable	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Required		Highly desirable	Required
DEM for entire AOI needs to be seamless	Required	Highly desirable	Required		Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Required	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Required	Nice to have	Required	
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Highly desirable	
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Highly desirable	
Sea ice conditions			Not required	
Habitat distribution and classification			Not required	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Required	Highly desirable	Highly desirable	
Wetlands	Required	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Nice to have	
Cultural resources	Highly desirable	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Nice to have	Nice to have	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Delaware was fortunate to acquire LiDAR through USGS and the hurricane Sandy relief fund, so we are fairly current, but will require an update soon		Coastal Programs and the DNREC sections know more about this than I do.	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes		Yes	
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes		Yes	
State repositories used	Delaware maintains an Enterprise GIS System (FirstMap) our DEM is shared through this system, but we have the .las information in our system for retrieval as well.		Delaware maintains an Enterprise GIS System - FirstMap. Data is stored here.	

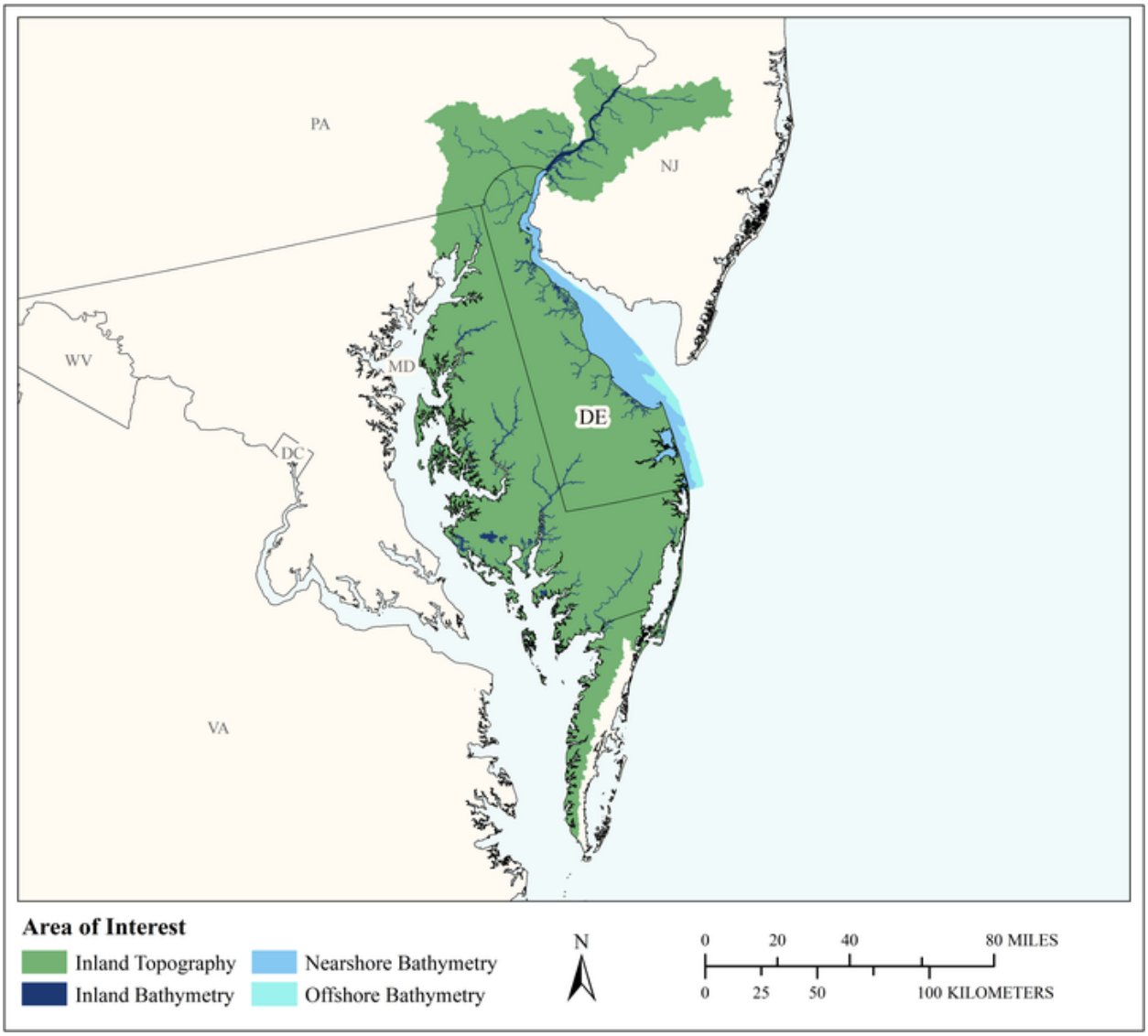
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Major	
Cost savings/cost reduction	Moderate	Minor	Major	
Cost avoidance	Moderate	Minor	Moderate	
Increased revenues	I don't know	Minor	Moderate	
Mission-driven performance improvements	Major	Minor	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Major	
Improved response or timeliness	Moderate	Minor	I don't know	
Improved customer experience	Moderate	Moderate	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	I don't know	
Environmental	Major	Minor	I don't know	
Public safety, including life and property	Major	Minor	I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide				
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Increased revenues	I don't know	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$530,447		Annual dollars saved/ realized	$21,604		Annual dollars saved/ realized	$461,980			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$61,240		Annual dollars saved/ realized	$27,331		Annual dollars saved/ realized	$487,371			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			Moderate			I don't know					
Environmental	I don't know			Moderate			I don't know					
Public safety, including life and property	I don't know			Major			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes		Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geospatial Support to Education and Research



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more Hydrologic Units (HUC8s)	One or more Hydrologic Units (HUC8s)	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Education. Help students understand elevation data - how to import, visualize and use in analysis.
MCA Title	Geospatial Support to Education and Research
MCA ID	22497
Organization Type	Academic or Not-for-Profit
Organization Name	University of Delaware
Sub-Agency or Division	
Organization Mission	Education and research
Program Name	Department of Geography
Total Annual Program Budget	
Primary Business Use	BU 26 - Education K12 and Beyond, Basic Research
Secondary Business Use	BU 08 - Agriculture and Precision Farming
Tertiary Business Use	BU 16 - Sea Level Rise and Subsidence

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Forest patch, individual field

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Not required
51 - 100 ft	Not required
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL1B	QL2B	Order 1a
Update Frequency	6-10 years	6-10 years	4-5 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	I don't know	Up to 5 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	I don't know	Up to 40 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Not required	Not required	Nice to have
Entire AOI under same environmental conditions	Nice to have	Required	Nice to have	Not required	Nice to have	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Not required	Highly desirable	Highly desirable	Not required	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required	Highly desirable	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Not required	Required	Required
DTM	Required	Not required	Required	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Not required	Not required	Required	Required
Classified point cloud	Not required	Not required	Highly desirable	
Edited/cube XYZ		Not required	Nice to have	Nice to have
Full waveform	Not required	Not required	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Not required	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Required	Not required		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Not required	Not required	Nice to have	Nice to have
Ground control/ground truthing	Not required	Not required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Highly desirable
Underwater videography			Nice to have	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Nice to have
Geologic and seismic data	Not required	Not required	Nice to have	Highly desirable
Water column properties - Physical			Highly desirable	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Highly desirable
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Required	Required	Highly desirable	Nice to have
Wetlands	Highly desirable	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Not required	Not required		
Landmark features	Not required	Not required	Highly desirable	
Cultural resources	Not required	Not required	Highly desirable	
Coastal and riverine structures	Not required	Not required	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	GTOPO30 Delaware lidar data	NOAA data around coastal areas		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	First Map Delaware			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	I don't know	Major	Minor
Cost savings/cost reduction	None	I don't know	Moderate	Minor
Cost avoidance	Major	I don't know	Major	Moderate
Increased revenues	None	I don't know	Minor	None
Mission-driven performance improvements	Major	I don't know	Major	Moderate

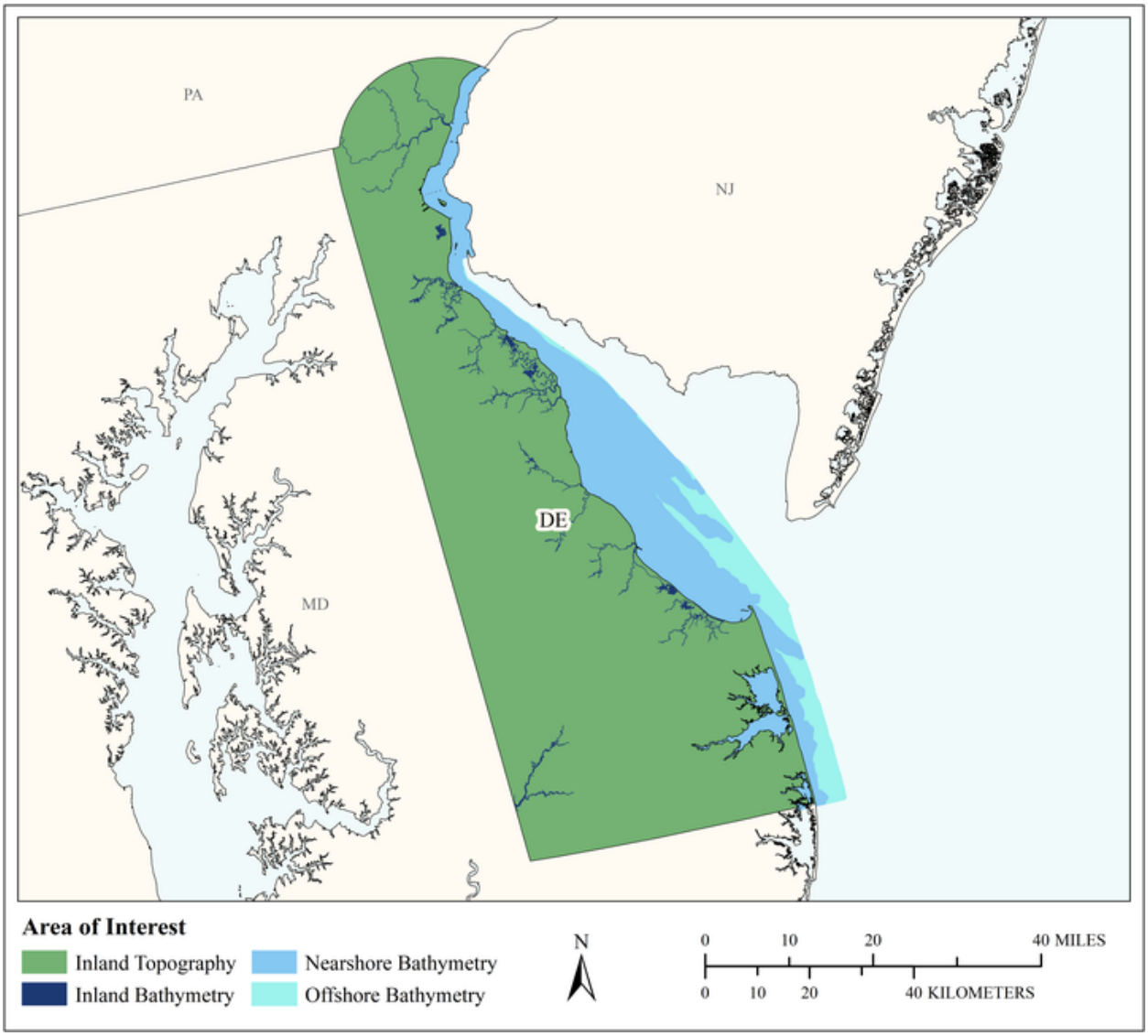
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None	I don't know	Major	Moderate
Improved response or timeliness	Major	I don't know	Minor	Minor
Improved customer experience	Major	I don't know	Moderate	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major	Major	Major
Environmental	Major	I don't know	Minor	Minor
Public safety, including life and property	I don't know	I don't know	Minor	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		I don't know	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide	
Cost avoidance	None			I don't know	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	Moderate	Unable to provide		I don't know	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Moderate	Unable to provide		I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$10,359		Annual dollars saved/ realized	$2,708		Annual dollars saved/ realized	$16,554		Annual dollars saved/ realized	$245
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	None			I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	None			I don't know	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Moderate	Unable to provide		I don't know	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$24,763					Annual dollars saved/ realized	$653			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major			Major		
Environmental	Major			I don't know			Major			Minor		
Public safety, including life and property	None			I don't know			Minor			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes			Yes
Aspect maps	Yes			Yes
Curvature maps				
Cross sections			Yes	Yes
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Maritime and Land Boundary Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Delimitation of legal and other coastal boundaries, inland boundaries, and ordinary high water lines (OHWL).
MCA Title	Maritime and Land Boundary Management
MCA ID	60079
Organization Type	State or U.S. Territorial government
Organization Name	State of Delaware
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 30 - Maritime and Land Boundary Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B	QL0B	I don't know
Update Frequency	6-10 years	6-10 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Highly desirable	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Nice to have	Nice to have	Highly desirable	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable	Highly desirable	Required	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable	Highly desirable	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	Required
DTM	Required	Required	Required	Required
DEM	Highly desirable	Required	Required	Required
Raw point cloud data	Nice to have	Highly desirable	Required	Required
Classified point cloud	Highly desirable	Highly desirable	Required	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Not required	Nice to have
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Not required
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Nice to have	Required	Not required	Not required
Ground control/ground truthing	Highly desirable	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Required	Highly desirable	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Nice to have
Water column properties - Biological			Not required	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Highly desirable	Nice to have
Routes			Nice to have	Highly desirable
Offshore cadastral			Highly desirable	Nice to have
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Required	Required
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Nice to have
Wetlands	Required	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Highly desirable	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Minor	None	I don't know
Cost savings/cost reduction	Moderate	None	Minor	Moderate
Cost avoidance	Moderate	None	Minor	Moderate
Increased revenues	Minor	None	None	I don't know
Mission-driven performance improvements	Major	None	Moderate	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None	None	I don't know

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	None	Minor	Moderate
Improved customer experience	Major	None	Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	Moderate
Environmental	Major	Minor	Minor	Moderate
Public safety, including life and property	Moderate	None	Minor	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	Minor	Unable to provide		None			None			I don't know	Unable to provide	
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,218		Annual dollars saved/ realized	$1,664		Annual dollars saved/ realized	$579,812			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$8,505									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Moderate			Moderate		
Environmental	Minor			Major			Major			Major		
Public safety, including life and property	None			Moderate			Moderate			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps		Yes		
Cross sections		Yes		
Height-Above-Ground maps		Yes		
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

District of Columbia

The District of Columbia (DC) has an area of just over 68 square miles bracketed by over seven square miles of the Potomac River, Anacostia River, and other surface water. DC contains numerous large federal buildings, parkland, monuments, and military infrastructure. DC also has the highest population density of any state at 11,506 people per square mile. In such an urban environment it is to be expected that storm-water flood management, coastal and riverine flood management, infrastructure protection, environmental protection and remediation, and water quality and supply constitute the focii for the District 3D Nation responses. Besides flood and inundation risk from coastal storms and riverine sources, climate change-driven sea level rise increases the threat from these flood risks and threatens important military and civilian infrastructure such as Joint Base Anacostia Bolling, Washington Navy Yard, and the Blue Plains Wastewater Treatment Plant. Blue Plains treats over 370 million gallons of wasterwater per day under normal flow conditions and is situated at the confluence of the Potomac and Anacostia Rivers. Waterfront parks, monuments of The Mall, residences and small businesses in Georgetown, Buzzard Point, and Southeast DC are also impacted by proximity to varying water levels.

Dependable elevation data are vital for managing and planning mitigation strategy for flooding, anticipating future storm-water flow and protecting transportation infrastructure such as National Airport located on the Potomac River, protecting Metro the DC subway system, and maintaining the numerous highways and bridges in and around DC that are important for commerce, the flow of goods and services, and access to places of employment. Bathymetric data is also important for DC and can be used to inform understanding of boating activity limitations, commercial endeavors on the water, suitable sub aquatic habitat, storm surge / flooding models, and functional river segments in support of water quality "Assessment" pursuant to Section 303(d) of the Clean Water Act.

The DC Office of the Chief Technology Officer (DC-OCTO) is charged with maintaining geospatial data acquisition and management, however it is the DC Department of Energy & Environment (DOEE) that applies science and management policy for flooding, environmental concerns, and water supply monitoring and protection. DC-OCTO has obtained lidar data since the early 2000s both from internal contracting and partnership as well as being a beneficiary of federal disaster response to Hurricane Sandy. The small areal size and relatively strong funding sources have provided DC no need yet to participate in the 3DEP Elevation Program, however coordination with that program is maintained to avoid any duplication of data acquisition. Current DC 2018 Quality Level 2 (QL2) lidar data are compliant with 3DEP Lidar Base Specifications and accessible for use by government agencies including the Federal Emergency Management Agency, the National Park Service, the National Capital Planning Commission, the U.S. Geological Survey, and use by the U.S. Armed Forces.

DC-OCTO is planning lidar acquisition in two to three-year cycles as the rapid pace of anthropogenic change to the topographic surface is on-going, and that lidar supports the urban planning mission of the National Capital Planning Commission and other District and federal agencies. Complementing DC's lidar and 9" pixel orthoimagery is a newly created hydrography network derived from lidar for surface waters and was integrated with DC Water storm-water pipe data and together were conflated to the National Hydrographic Dataset. Part of the hydrographic network project was HUC-14 and HUC-16 watershed boundaries derived from lidar DEM data and in impervious areas derived in part from topography and also integrating stormwater systems. These data reside in the USGS Watershed Boundary Dataset. DC's agencies, regional planning commissions, academic institutions, federal agencies, non-profit institutions, and private sector organizations will benefit from reliable, high-resolution, accessible, standardized elevation data with a compendium of use cases listed as part of this 3D Nation report.

In general DC requires QL2 inland topography updated every 2-3 years, QL1B inland bathymetry updated annually, and QL2B nearshore bathymetry updated annually, though cross sections and transects

meet some nearshore requirements. Benefits that come from improved elevation data include significant time and cost savings, mission-driven performance improvements, as well as major educational, environmental, and public safety benefits.

Figure 1. Stormwater flooding in the Bloomingdale Neighborhood in central DC summer 2012. Source: Bloomingdale neighborhood blog.

Figure 2. Photo of the District of Columbia Flood Wall and levee without street closure post and panels on the Mall near the Washington Monument.

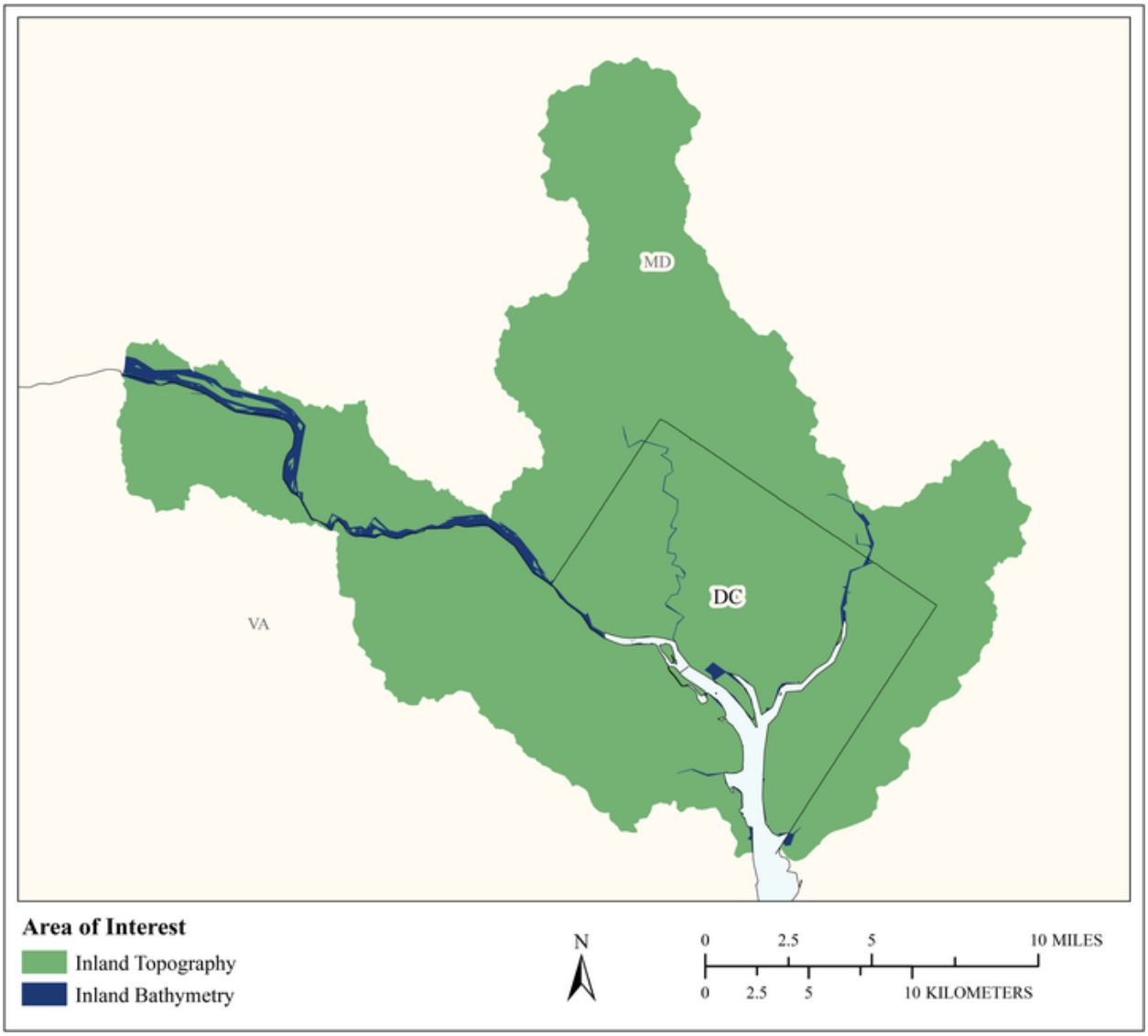
Figure 3. Looking upstream to the Georgetown waterfront from the top of the Kennedy Center with Theodore Roosevelt Island across the water. This portion of the river is tidal and is subject to rising sea level.

The District of Columbia has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	District of Columbia, Department of Energy and Environment, Natural Resource Administration	1413	Water Quantity and Water Quality for the District	Inland Topo	QL2	2-3 years	$12,060	Unable to quantify	Major	Major	Major
				Inland Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 15 – Flood Risk Management	USACE	1152	Flood Risk and Sediment Management	Inland Topo	QL2	Event driven	Unable to quantify	Unable to quantify	Moderate	Minor	Major
				Inland Bathy	Cross sections and/or transects meet needs	Event driven	Unable to quantify	Unable to quantify	Major	Minor	Major
				Nearshore Bathy	Cross sections and/or transects meet needs	Event driven	Unable to quantify	Unable to quantify	Moderate	None	Moderate
BU 15 – Flood Risk Management	DC Department of Energy and Environment	21598	Flood Risk Assessment for the District	Inland Topo	(a) QL1 (b) QL2	Annually	Unable to quantify	Unable to quantify	Major	Major	I don't know
				Inland Bathy	QL2B	Annually	Unable to quantify	Unable to quantify	Major	Major	I don't know
				Nearshore Bathy	QL2B	Annually	Unable to quantify	Unable to quantify	Major	Major	I don't know
BU 23 – Urban and Regional Planning	OCTO/DC GIS, District of Columbia	21906	District-wide Geospatial Data Provisioning	Inland Topo	QL2	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	Cross sections and/or transects meet needs	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 23 – Urban and Regional Planning	National Capital Planning Commission	22181	Urban and Regional Planning	Inland Topo	QL1	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 23 – Urban and Regional Planning	DC Office of Planning	22505	Urban Planning	Inland Topo	QL1	Annually	Unable to quantify	Unable to quantify	Minor	Minor	Minor

MCA Title: Water Quantity and Water Quality for the District



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Custom description	Custom description		
Sub Area Requirements	HUC12s that cover DC	HUC12s that cover DC		

MCA Description	Response
Mission Critical Activity	Stream Assessment, Habitat restoration along riparian zones, watershed modeling, working with USGS on the National Hydrographic Dataset and Watershed Boundary Dataset of DC, water quality modeling, inundation mapping, and mitigating environmental risks. Elevation data is critical to all DOEE programs including water quality, watershed protection, solar panel placement, floodplain studies, BMPs, stream restoration, and sea level rise analyses. Elevation data plus pipe inverts can be used to visualize pipe locations and reduce field inspections. It is also crucial to understanding how water flows and accumulates. BU 06 – Natural Resources Conservation is an additional Business Use.
MCA Title	Water Quantity and Water Quality for the District
MCA ID	1413
Organization Type	State or U.S. Territorial government
Organization Name	District of Columbia, Department of Energy and Environment, Natural Resource Administration
Sub-Agency or Division	
Organization Mission	DOEE's mission is to improve the quality of life for the residents and natural inhabitants of the nation's capital by protecting and restoring the environment, conserving our natural resources, mitigating pollution, increasing access to clean and renewable energy, and educating the public on ways to secure a sustainable future. The agency's core responsibilities include, but are not limited to, enforcing environmental regulations; monitoring and assessing environmental risks; developing energy and environmental policies; issuing permits; and providing residents and local businesses with funding, technical assistance, and information on initiatives designed to ensure a more resilient and sustainable city. We perform all agency mission activities with the highest integrity to uphold the public trust.
Program Name	MS4 permit, pollution mitigation, TMDL, stream channel erosion, stream restoration, wetland mapping, erosion control, programs, LID implementation programs such as the Riversmart Homes and Schools, and water quality planning.
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 02 - Riverine Ecosystem Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)

General Geographic Area and Size	
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Buildings, Curbs, walls, drop offs, submerged structures, sedimentation areas, dredging needs

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B		
Update Frequency	2-3 years	2-3 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	Less than 50 cm		
Acceptable Vertical Error	Up to 20 cm	Up to 50 cm		
How far onshore needed				
How far down the beach profile needed	I don't know			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Highly desirable		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Required	Required		
Edited/cube XYZ		Not required		
Full waveform	Highly desirable	Highly desirable		
Bathymetric Attributed Grid (BAG)		Required		
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required	Required		
Ground control/ground truthing	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required	Highly desirable		
Land use/land cover	Required	Required		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL2 lidar and contours collected by USGS after Hurricane Sandy (2015), DC (OCTO) has also collected QL1 lidar (2015), and DC is getting new QL2 lidar (2018)	Best available		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI	Yes			
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	OCTO GIS Enterprise GIS database.	OCTO GIS Enterprise database		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	I don't know		

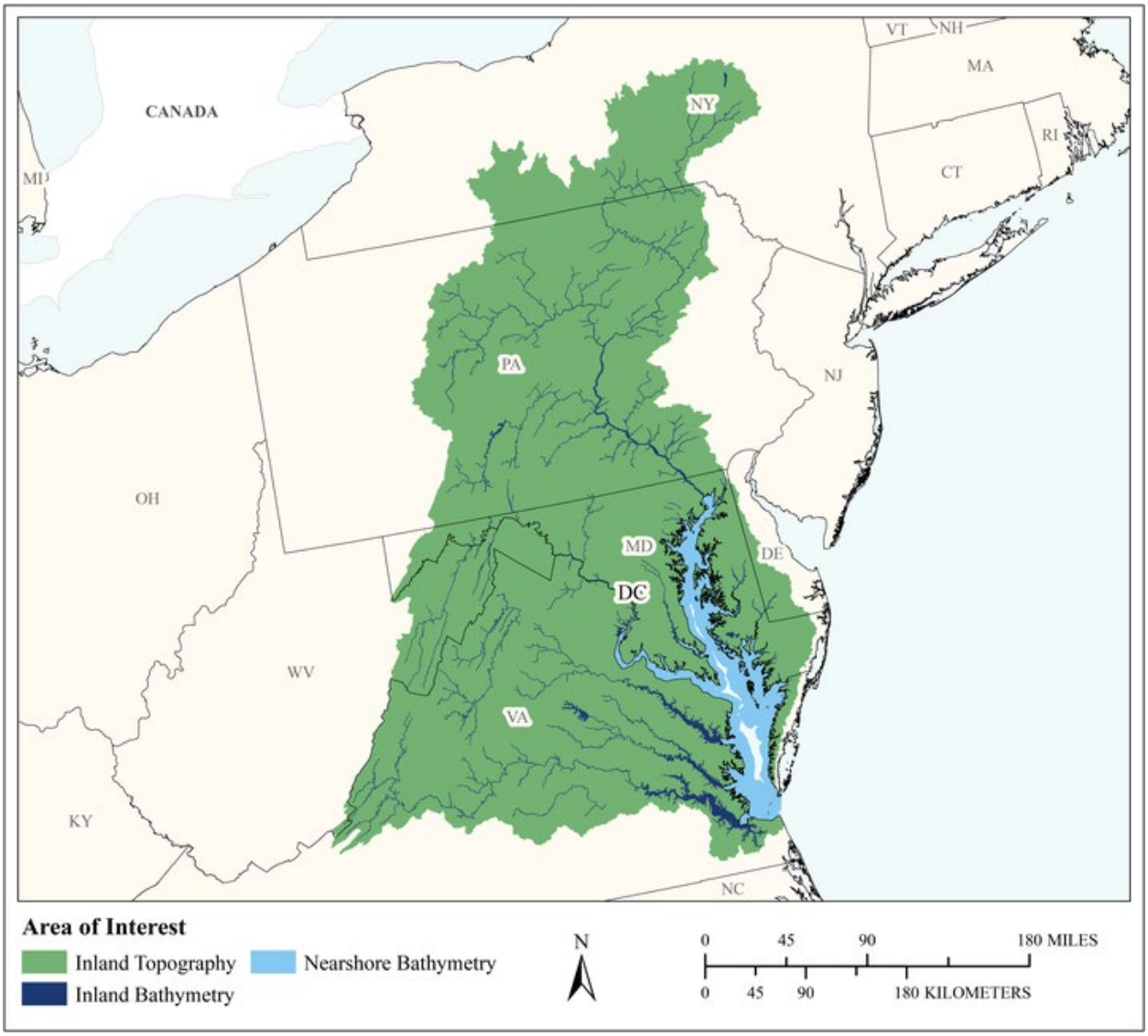
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Cost savings/cost reduction	Major	I don't know		
Cost avoidance	Major	I don't know		
Increased revenues	Major	I don't know		
Mission-driven performance improvements	Major	I don't know		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	I don't know		
Improved response or timeliness	Major	I don't know		
Improved customer experience	Major	I don't know		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	I don't know		
Environmental	Major	Major		
Public safety, including life and property	Major	Major		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$12,060	I don't know	Unable to provide							
Time savings description	Will certainly save more than 2 hours/field visit - and we have more than 200 field visits a year. This could be huge, depending on what and how long it would take to detect and correct errors. Permitting process sometimes takes years. Not quite sure on this. It depends. This could be huge, depending on what and how long it would take to detect and correct errors. This could be substantial, depending on the nature of engagement ranging from working with consultants to handling internal stakeholders and general public outreach.											
Cost savings/cost reduction	Major	Unable to provide		I don't know	Unable to provide							
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide							
Increased revenues	None			I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	Major	Unable to provide		I don't know	Unable to provide							
Improved customer experience	Major	Unable to provide		I don't know	Unable to provide							
Improved customer experience description	Public Engagement.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			I don't know								
Education or outreach description	Ease of access of important pieces of environmental information (water quality) is empowering.											
Environmental	Major			I don't know								
Environmental description	Improved water quality modeling leads to improved living resources outcomes (more fish in numbers and variety).											
Public safety, including life and property	Major			I don't know								
Public safety, including life and property description	Readily viewable flood forecasting saves lives.											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades				
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Flood Risk and Sediment Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)	One or more Hydrologic Units (HUC4s)	Nearshore areas along the coast (including the Great Lakes) off one or more Hydrologic Units (HUC4s)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Flood risk modeling and mapping of riverine and coastal areas. Dam/dike/levee safety analysis. Emergency management. Flood forecasts. A 2013 bathymetric survey of the Anacostia River was done for the Anacostia River Sa sediment remediation project. Bathymetry is needed for managing contaminated sediment and maintaining the federal navigation channel. USACE also conducts bathymetric surveys of the Anacostia River – lower Anacostia (2018), Upper Anacostia (2010)
MCA Title	Flood Risk and Sediment Management
MCA ID	1152
Organization Type	Federal Agencies and Commissions
Organization Name	USACE
Sub-Agency or Division	Baltimore District
Organization Mission	The U.S. Army Corps of Engineer's mission is to provide vital public engineering services in peace and war to strengthen our Nation's security, energize the economy, and reduce risks from disasters.
Program Name	Floodplain Management Services Program; Silver Jackets; FEMA National Flood Insurance Program.
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	200,000 sq mi - 2 million sq mi (e.g. large state, large multi-state region such as the Great Basin, standard Federal region, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Stormwater infrastructure

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Required

Inland Bathy Feature Size Requirements	Response
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	Cross sections and/or transects meet needs	Cross sections and/or transects meet needs	
Update Frequency	Event driven only – Data need to coincide with a specific event.	Event driven only – Data need to coincide with a specific event.	Event driven only – Data need to coincide with a specific event.	
Event type(s)	Flood or other disaster.	Flood or other disaster.	Flood or other disaster.	
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter	Up to 1 meter	
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm	Less than 10 cm	
How far onshore needed			To cover the beach slope	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			No requirement for tide correction	
Cross sections and/or transects meet needs		Yes	Yes	
Cross section/transect requirement		Typically cross section may be 1000 feet apart in open reaches, with additional cross section immediately upstream and downstream of hydraulic structures (culverts, bridges, weirs, etc.)		

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required	Not required		Not required	Not required
Entire AOI under same environmental conditions	Not required	Not required	Not required		Not required	Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Nice to have	Not required		Nice to have	Not required
DEM for entire AOI needs to be seamless	Highly desirable	Nice to have	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Not required	Not required	
DTM	Highly desirable	Nice to have	Not required	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Nice to have	Not required	
Classified point cloud	Nice to have	Nice to have	Not required	
Edited/cube XYZ		Not required	Not required	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Not required	Not required	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Not required	Not required		
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)			Not required	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Not required	Not required	Not required	
Ground control/ground truthing	Not required	Not required	Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Highly desirable	
Submerged features			Not required	
Subbottom characteristics			Not required	
Geologic and seismic data	Nice to have	Nice to have	Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Not required	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have	Nice to have	Not required	
Land use/land cover	Required	Required	Required	
Wetlands	Nice to have	Nice to have	Not required	
Estuaries			Not required	
Inland surface water features	Required	Highly desirable	Required	
Bridges/culverts	Required	Required		
Landmark features	Nice to have	Nice to have	Not required	
Cultural resources	Not required	Not required	Not required	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL2 lidar and contours collected by USGS after Hurricane Sandy (2015), DC (OCTO) has also collected QL1 lidar (2015), and DC is getting new QL2 lidar (2018)	Not sure	Not sure	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes	Yes	

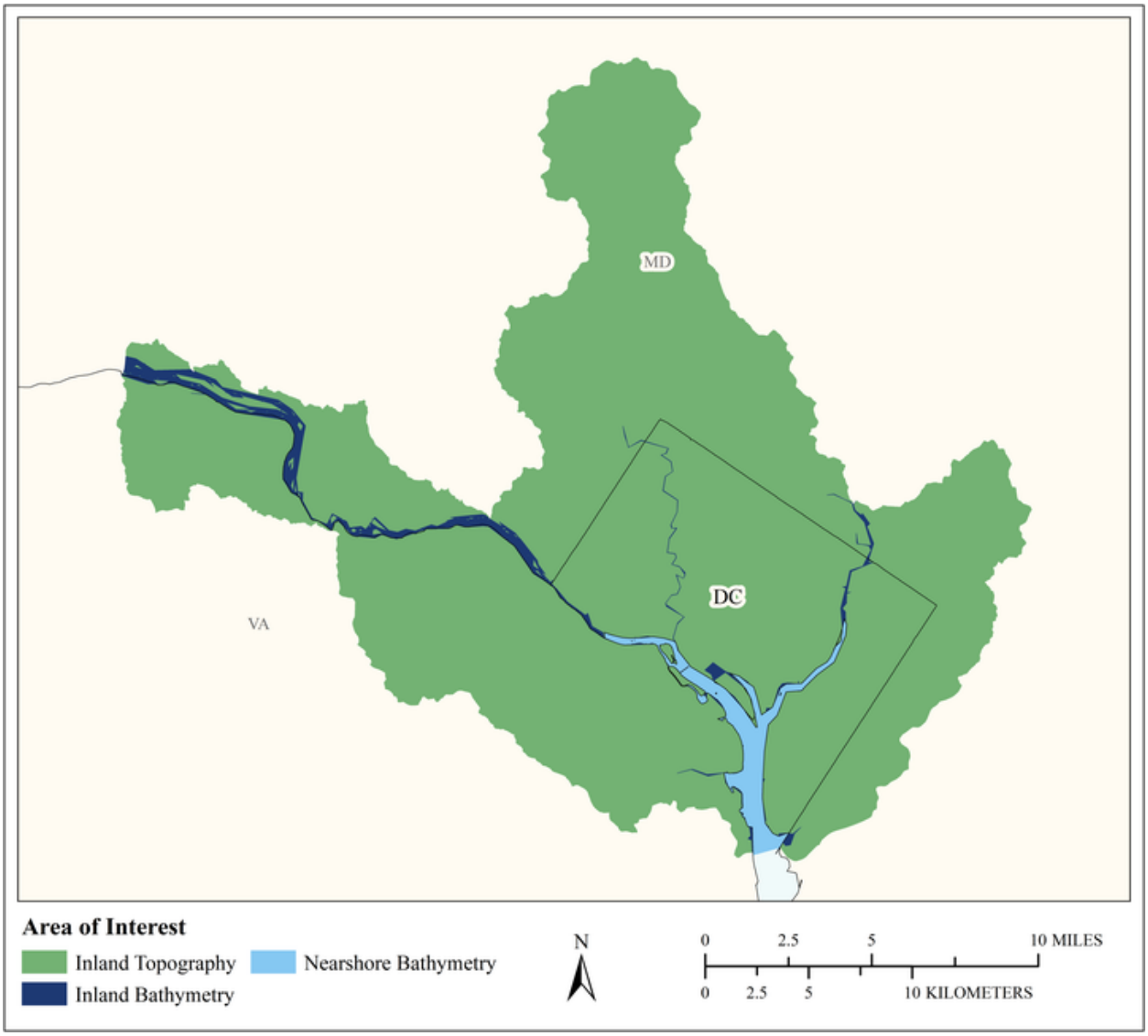
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
State repositories used	Opendata.dc.gov, together with access to offline archives maintained by DC's Office of the Chief Technology Officer.	Opendata.dc.gov, together with access to offline archives maintained by DC's Office of the Chief Technology Officer.	Opendata.dc.gov, together with access to offline archives maintained by DC's Office of the Chief Technology Officer.	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Major	
Cost savings/cost reduction	Major	Major	Major	
Cost avoidance	Moderate	Minor	Minor	
Increased revenues	None	None	None	
Mission-driven performance improvements	Moderate	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	
Improved response or timeliness	Major	Major	Major	
Improved customer experience	Major	Major	Major	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Moderate	
Environmental	Minor	Minor	Minor	
Public safety, including life and property	Major	Major	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	None			None			None					
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Other operational benefits	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Other operational benefits description												
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Other customer service benefits	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Other customer service benefits description												
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Moderate					
Environmental	Minor			Minor			None					
Public safety, including life and property	Major			Major			Moderate					
Other												
Other benefits	Major			Major			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps				
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes	Yes	
Hydrologic Flow Accumulation Grids	Yes	Yes	Yes	
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement	Yes	Yes	Yes	
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Flood Risk Assessment for the District



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Custom description	Custom description	Custom description	
Sub Area Requirements	HUC12s that cover DC	HUC12s that cover DC	HUC12s that cover DC	

MCA Description	Response
Mission Critical Activity	The National Flood Insurance Program Coordinating Agency in the District of Columbia
MCA Title	Flood Risk Assessment for the District
MCA ID	21598
Organization Type	State or U.S. Territorial government
Organization Name	DC Department of Energy and Environment
Sub-Agency or Division	
Organization Mission	DOEE's mission is to improve the quality of life for the residents and natural inhabitants of the nation's capital by protecting and restoring the environment, conserving our natural resources, mitigating pollution, increasing access to clean and renewable energy, and educating the public on ways to secure a sustainable future. The agency's core responsibilities include, but are not limited to, enforcing environmental regulations; monitoring and assessing environmental risks; developing energy and environmental policies; issuing permits; and providing residents and local businesses with funding, technical assistance, and information on initiatives designed to ensure a more resilient and sustainable city. We perform all agency mission activities with the highest integrity to uphold the public trust.
Program Name	The DC Flood Risk Management Program
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 16 - Sea Level Rise and Subsidence
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Small features that can be modeled in 2D flood modeling in an urban environment

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	(a) QL1 (b) QL2	QL2B	QL2B	
Update Frequency	Annually	Annually	Annually	
Event type(s)				
Quality Level and/or update frequency variability across AOI	DC proper has higher requirements than surrounding areas. QL2 for surrounding areas			
Acceptable Horizontal Error	I don't know	Up to 2 meters	Up to 5 meters	
Acceptable Vertical Error	I don't know	Up to 50 cm	Up to 1 meter	
How far onshore needed			I don't know	
How far down the beach profile needed	Below MLLW		I don't know	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Highly desirable

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required		Required	Required
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Required	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Required	Required	Required	
Classified point cloud	Required	Required	Required	
Edited/cube XYZ				
Full waveform	Required	Required	Required	
Bathymetric Attributed Grid (BAG)		Required	Required	
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Required	
Intensity imagery/sidescan imagery	Required	Required	Required	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required	Required	Required	
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents			Required	
Tide/wave heights			Required	
Sea ice conditions			Required	
Habitat distribution and classification			Required	
Boundaries			Required	
Routes			Required	
Offshore cadastral			Required	
Lease areas			Required	
Fixed obstructions			Required	
Floating observation/navigation systems			Required	
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Required	Required	Required	
Wetlands	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Required	Required	Required	
Cultural resources	Required	Required	Required	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL2 lidar and contours collected by USGS after Hurricane Sandy (2015), DC (OCTO) has also collected QL1 lidar (2015), and DC is getting new QL2 lidar (2018)	None	Best available	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI			Yes	
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts			Yes	
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	DC Office of the Chief Technology Official			
Data that meet my needs are not available		Yes		

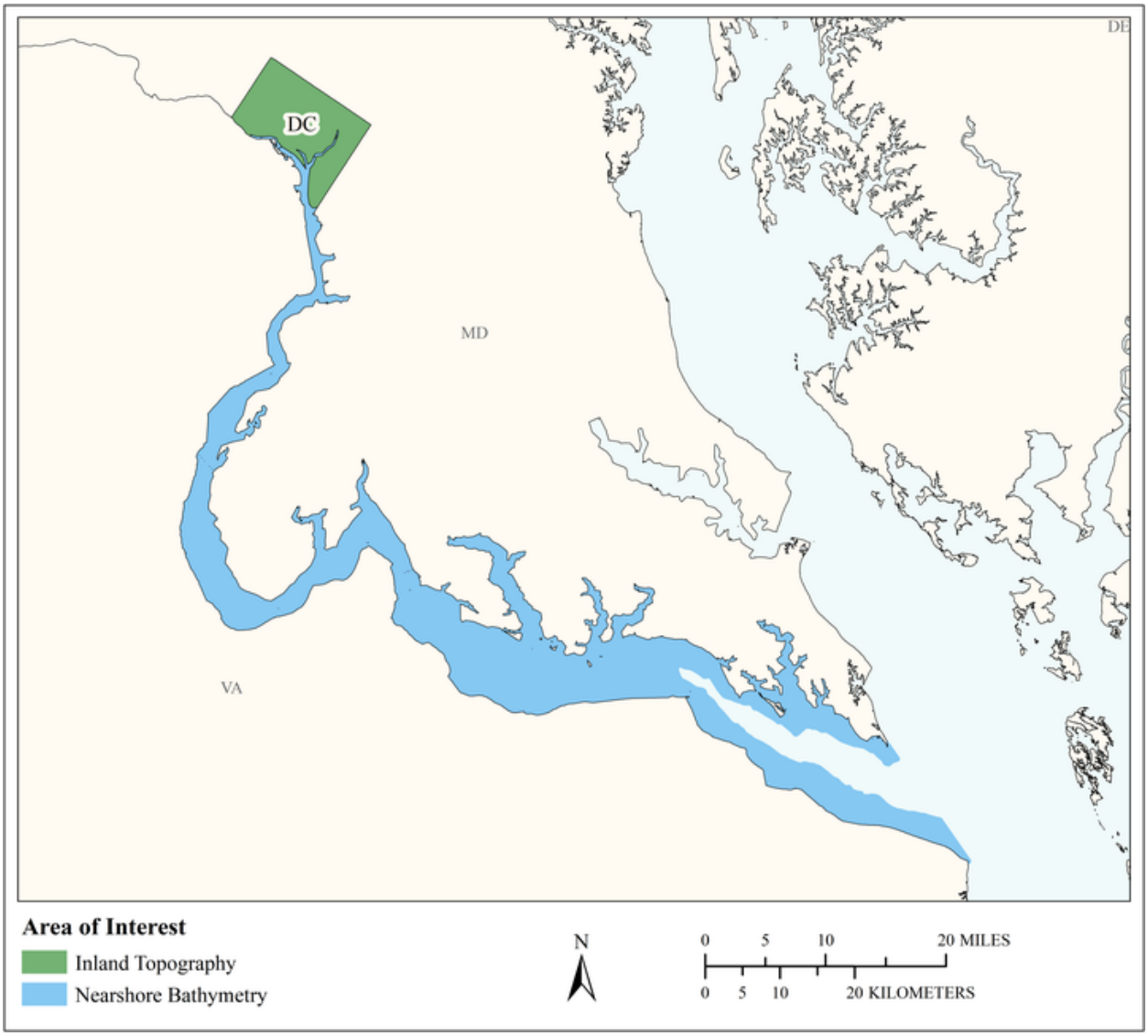
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available		
Cost savings/cost reduction	Major	Inland bathy data not available		
Cost avoidance	Moderate	Inland bathy data not available		
Increased revenues	Moderate	Inland bathy data not available		
Mission-driven performance improvements	Major	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available		
Improved response or timeliness	Major	Inland bathy data not available		
Improved customer experience	Major	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Inland bathy data not available		
Environmental	Major	Inland bathy data not available		
Public safety, including life and property	Major	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major					
Environmental	Major			Major			Major					
Public safety, including life and property	I don't know			I don't know			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes	Yes	Yes	
Viewshed maps	Yes	Yes	Yes	
Hydrologic Flow Direction Grids	Yes	Yes	Yes	
Hydrologic Flow Accumulation Grids	Yes	Yes	Yes	
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement	Yes	Yes	Yes	
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: District-wide Geospatial Data Provisioning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	One or more states, territories, or counties		Custom description	
Sub Area Requirements			Potomac and Anacostia Rivers	

MCA Description	Response
Mission Critical Activity	Urban and Regional Planning; Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
MCA Title	District-wide Geospatial Data Provisioning
MCA ID	21906
Organization Type	State or U.S. Territorial government
Organization Name	OCTO/DC GIS, District of Columbia
Sub-Agency or Division	
Organization Mission	The Office of the Chief Technology Officer (OCTO) is the central technology organization of the District of Columbia Government. OCTO develops, implements, and maintains the District's technology infrastructure; develops and implements major enterprise applications; establishes and oversees technology policies and standards for the District; provides technology services and support for District agencies, and develops technology solutions to improve services to businesses, residents and visitors in all areas of District government. Mission OCTO's mission is to direct the strategy, deployment, and management of DC Government technology with an unwavering commitment to IT excellence, efficiency, and value for government, residents, businesses and visitors. DC GIS's Mission Improve the quality and lower the cost of District Columbia government services, through collective investment, stewardship, and sharing of data; and reach beyond District Government by making data freely and publicly available to the fullest extent possible in consideration of privacy and security.
Program Name	HSEMA Office of Planning
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Low veg.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2		Cross sections and/or transects meet needs	
Update Frequency	2-3 years		2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter		Up to 1 meter	
Acceptable Vertical Error	Up to 20 cm		Up to 50 cm	
How far onshore needed			None	
How far down the beach profile needed	Not applicable		None	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs			Yes	
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required		Not required			Nice to have
Entire AOI under same environmental conditions	Required		Not required			Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Not required			Nice to have
DEM for entire AOI needs to be seamless	Required		Not required			Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		I don't know			I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required		Nice to have	
DTM	Required		Nice to have	
DEM	Required		Nice to have	
Raw point cloud data	Required		Nice to have	
Classified point cloud	Required		Nice to have	
Edited/cube XYZ			Nice to have	
Full waveform	Highly desirable		Nice to have	
Bathymetric Attributed Grid (BAG)			Nice to have	
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Not required	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Required		Nice to have	
Ground control/ground truthing	Required		Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Highly desirable		Nice to have	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Not required		Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Not required		Nice to have	
Land use/land cover	Not required		Nice to have	
Wetlands	Nice to have		Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Nice to have	
Inland surface water features	Highly desirable		Nice to have	
Bridges/culverts	Required			
Landmark features	Not required		Nice to have	
Cultural resources	Not required		Nice to have	
Coastal and riverine structures	Highly desirable		Nice to have	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL-2 LiDAR flown spring (April) of 2018		Not sure	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes		Yes	
State repositories used	http://opendata.dc.gov/pages/dc-from-above http://opendata.dc.gov/		http://opendata.dc.gov/	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate		Minor	
Cost savings/cost reduction	Major		Minor	
Cost avoidance	Minor		Minor	
Increased revenues	None		Minor	

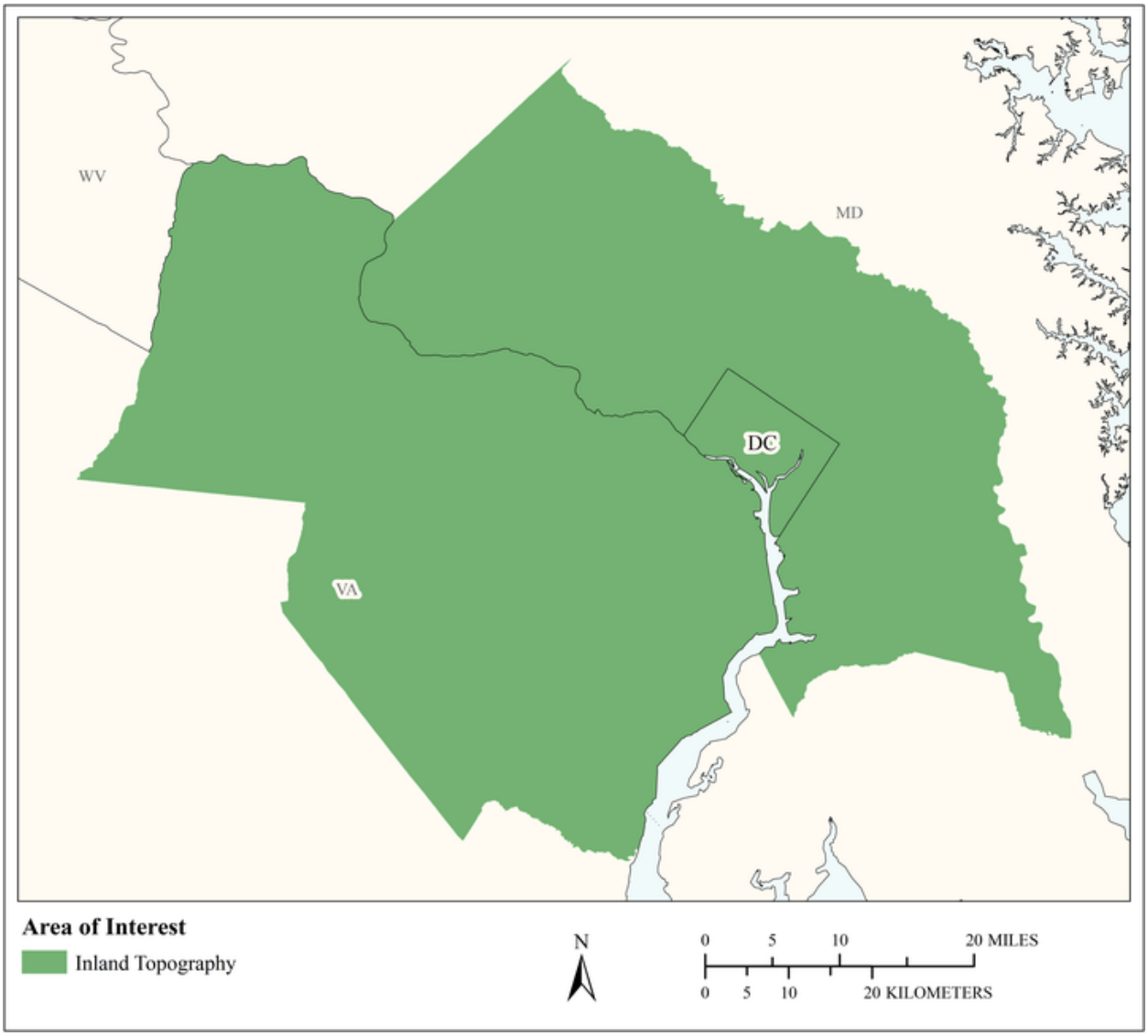
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Mission-driven performance improvements	Minor		Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate		Minor	
Improved response or timeliness	Major		Minor	
Improved customer experience	Major		Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate		Minor	
Environmental	Major		Minor	
Public safety, including life and property	Moderate		Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide					I don't know	Unable to provide				
Cost savings/cost reduction	I don't know	Unable to provide					I don't know	Unable to provide				
Cost avoidance	I don't know	Unable to provide					I don't know	Unable to provide				
Increased revenues	I don't know	Unable to provide					I don't know	Unable to provide				
Mission-driven performance improvements	I don't know	Unable to provide					I don't know	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide					I don't know	Unable to provide				
Improved response or timeliness	I don't know	Unable to provide					I don't know	Unable to provide				
Improved customer experience	I don't know	Unable to provide					I don't know	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know						I don't know					
Environmental	I don't know						I don't know					
Public safety, including life and property	I don't know						I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Urban and Regional Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements	National Capital Region			

MCA Description	Response
Mission Critical Activity	Urban and Regional Planning. Protect people, parks, resources and facilities from the risks of flooding. Elevation data are needed for viewshed analysis; evaluation of impacts of new development on the skyline, views of the White House and Capitol; building height restrictions.
MCA Title	Urban and Regional Planning
MCA ID	22181
Organization Type	Federal Agencies and Commissions
Organization Name	National Capital Planning Commission
Sub-Agency or Division	
Organization Mission	The National Capital Planning Commission works with federal agencies as it seeks to preserve and enhance the extraordinary historical, cultural, and natural resources and federal assets of the National Capital Region to support the needs of the federal government and enrich the lives of the region's visitors, workers, and residents.
Program Name	Land Development and Plan review.
Total Annual Program Budget	$4,000,000
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 16 - Sea Level Rise and Subsidence

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Not required
Other	Required
Other description	Water Surface Elevation for Potomac and Anacostia Rivers at MHHW

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Trees, buildings, viewsheds, street lights, outdoor sculptures, levees, dams.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	2-3 years			
Event type(s)				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Less than 5 cm			
How far onshore needed				
How far down the beach profile needed	To MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	For flood modeling, unsure of what is more important, accuracy or seamlessness. But for individual project review, seamlessness not that important.					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Required			
Land use/land cover	Required			
Wetlands	Required			
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL2 lidar and contours collected by USGS after Hurricane Sandy (2015)			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	OCTO			
Data that meet my needs are not available				

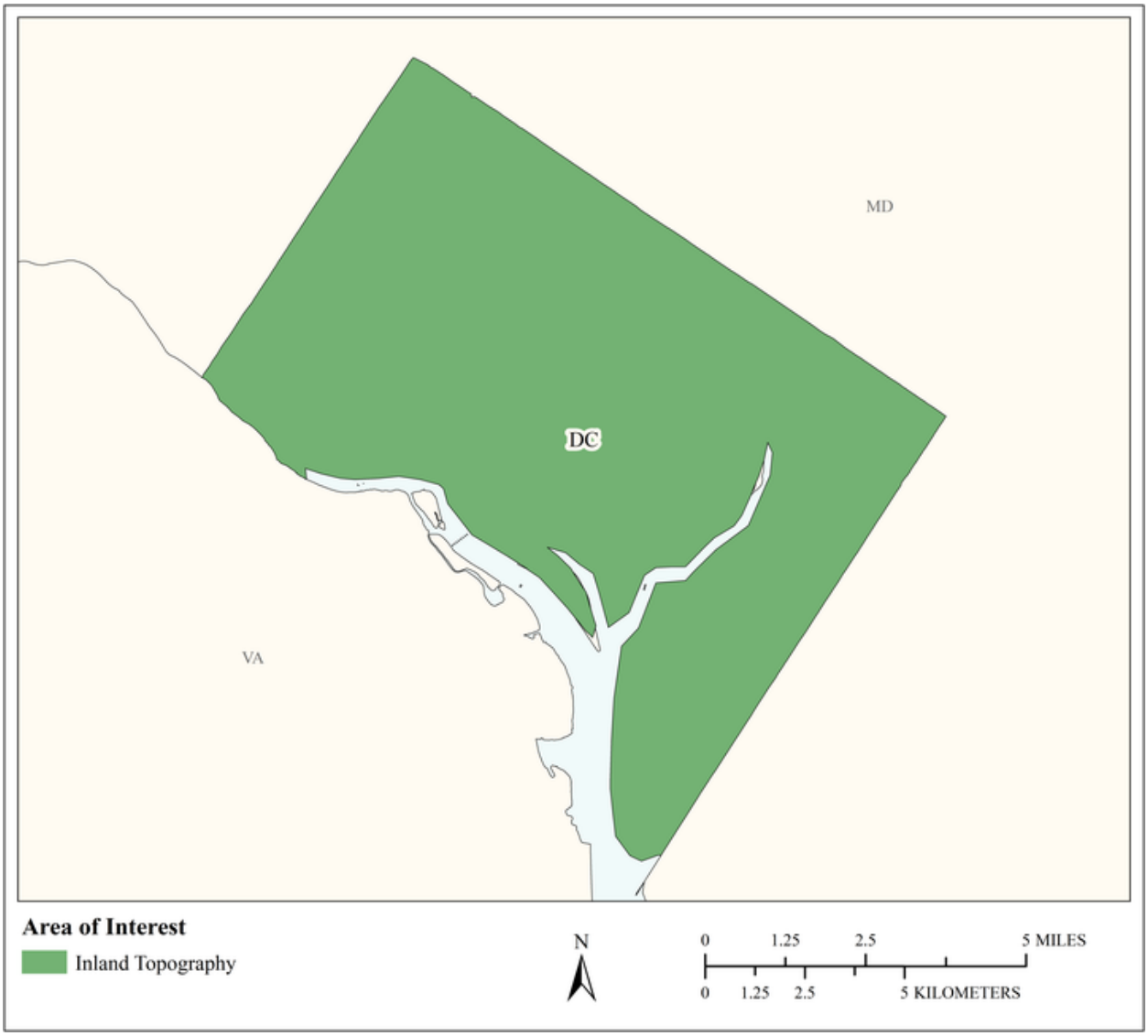
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know			
Cost savings/cost reduction	I don't know			
Cost avoidance	I don't know			
Increased revenues	I don't know			
Mission-driven performance improvements	I don't know			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know			
Improved response or timeliness	I don't know			
Improved customer experience	I don't know			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know			
Environmental	I don't know			
Public safety, including life and property	I don't know			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide										
Cost savings/cost reduction	I don't know	Unable to provide										
Cost avoidance	I don't know	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	I don't know	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide										
Improved response or timeliness	I don't know	Unable to provide										
Improved customer experience	I don't know	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	1
Update frequency	3

MCA Title: Urban Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Visualizing the city to enable effective decision-making in urban planning, including urban design and risk mitigation, historic preservation, and guiding local zoning and land use decisions. Classified mass points are very important to us for delineation of buildings, vegetation, etc. 3D building extraction and building elevations tied accurately to known ground surfaces are needed for visualization. Consistent elevation data sets through time are also needed for change detection.
MCA Title	Urban Planning
MCA ID	22505
Organization Type	District of Columbia (effectively Federal, State AND City)
Organization Name	DC Office of Planning
Sub-Agency or Division	
Organization Mission	The Office of Planning's mission is to guide development of the District of Columbia, including the preservation and revitalization of our distinctive neighborhoods, by informing decisions, advancing strategic goals, encouraging the highest quality outcomes, and engaging all communities.
Program Name	Urban design and review of proposed development. Also historic preservation.
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Accurate roof feature delineation sufficient to build acceptable 3D models of the built environment for casual use. Individual trees and plantings.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	Annually			
Event type(s)				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 40 cm			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	LIDAR for DC is available at various QLs and dates. QL2 lidar and contours collected by USGS after Hurricane Sandy (2015), DC (OCTO) has also collected QL1 lidar (2015), and DC is getting new QL2 lidar (2018)			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
State repositories used	Opendata.dc.gov, together with access to offline archives maintained by DC's Office of the Chief Technology Officer.			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor			
Cost savings/cost reduction	I don't know			
Cost avoidance	I don't know			
Increased revenues	None			
Mission-driven performance improvements	Minor			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			
Improved response or timeliness	None			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	I don't know			
Public safety, including life and property	I don't know			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Cost savings/cost reduction	I don't know	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	Minor											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps				
Aspect maps				
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

Florida

Current status of elevation data for Florida

From 2018 to 2019, 34,873 square miles of Quality Level 1 (QL1) lidar survey and mapping data was collected over peninsular Florida. The collection is the result of a joint funding agreement signed on 10/4/18 between the Florida Division of Emergency Management (FDEM) committing $15 million of funding provided through 2018-2019 appropriation and the USGS committing another $7.6 million. This data collection effort will result in high-resolution digital elevation models to update and inform flooding and storm surge analysis. Data deliverables began in 2019 and are expected to continue through 2020. As required by the State of Florida, work will be performed under the supervision of a Florida Licensed Professional Surveyor and Mapper (PSM) and comply with Florida Statute 472 and Florida Administrative Code 5J-17. When added to the more than 20,000 square miles of other lidar data collected since 2009 by efforts between counties, Water Management Districts, and FDEM's Coastal Lidar Project, Florida will have almost complete terrestrial coverage. However, the seafloor adjacent to Florida's terrestrial landscape is poorly mapped, and a recent gap analysis conducted by the Florida Coastal Mapping Program (FCMaP) indicates that only 20% of Florida's seafloor has been mapped with modern high-resolution technologies.

Importance of elevation data to Florida

High-resolution elevation data support the production of a complete and accurate 3D map of the entire state for use in emergency management, flood inundation, sinkhole hazard mitigation, infrastructure planning, agriculture, forestry, and geologic mapping, among other purposes, and the 3D map must meet the requirements of all state agencies. High-resolution elevation data will be used both by the newly appointed Florida Chief Science Officer and stakeholders to address statewide concerns.

Florida's coastal waters are an economic driver for the state supporting, recreation, tourism, navigation, ecosystems, and detailed elevation data for Florida's coastal region supports storm surge and red tide modeling, navigational safety, identifying resources for beach nourishment among many other applications.

High-level summary of elevation data requirements

To map Florida most effectively in any multi-year cycle, the following elevation data principles apply:

- Large, seamless onshore-offshore, temporally consistent;
- Consistent with existing aerial photography flight schedule;
- Systematic collection;
- Prioritize existing data gaps; and
- Prioritize major business uses.

Planning, acquisition, processing and derivative products of QL1 and QL2 lidar data require aggregate nominal pulse densities between 2-8 points per square meter with ideal collection conditions of minimal water levels and leaf decline with tidal considerations within one mile of the coastal boundary for streams, rivers, and inlets for terrestrial data.

High-level summary of benefits that would come from higher resolution elevation data

In addition to the uses in emergency management, infrastructure planning, agriculture, and forestry, higher-resolution elevation data will also support Florida's coastal zone, which represents a major economic concern within the state. Florida's beaches define the "state brand," according to a January

2015 study by Florida's Office of Economic and Demographic Research: "Economic Evaluation of Florida's Investment in Beaches." Additionally, almost half of Florida's 825 miles of shoreline is critically eroding, according to the Florida DEM study in 2010. When collected at higher densities, elevation data are capable of aiding with the management of estuarine and marine sanctuaries as small details related to the submerged topography can be extracted from the data. This includes areas where motorized watercraft cause damage to the subaquatic vegetation. Additionally, the coastal area could be quickly collected using a topographic lidar sensor while the water elevations are near mean lower low tide to measure the elevations and width of beaches. When collected over multiple temporal periods, this would allow the State of Florida to manage beach erosion and determine where beaches may need to be extended or repaired to help mitigate storm surge related flooding.

In 2018 and 2019, FCMaP undertook a statewide mapping prioritization study for Florida's coastal waters from the shoreline to the edge of the continental shelf. The study asked stakeholder groups to vote on which one-kilometer grid tiles are most important. The results are shown in Figure 1.

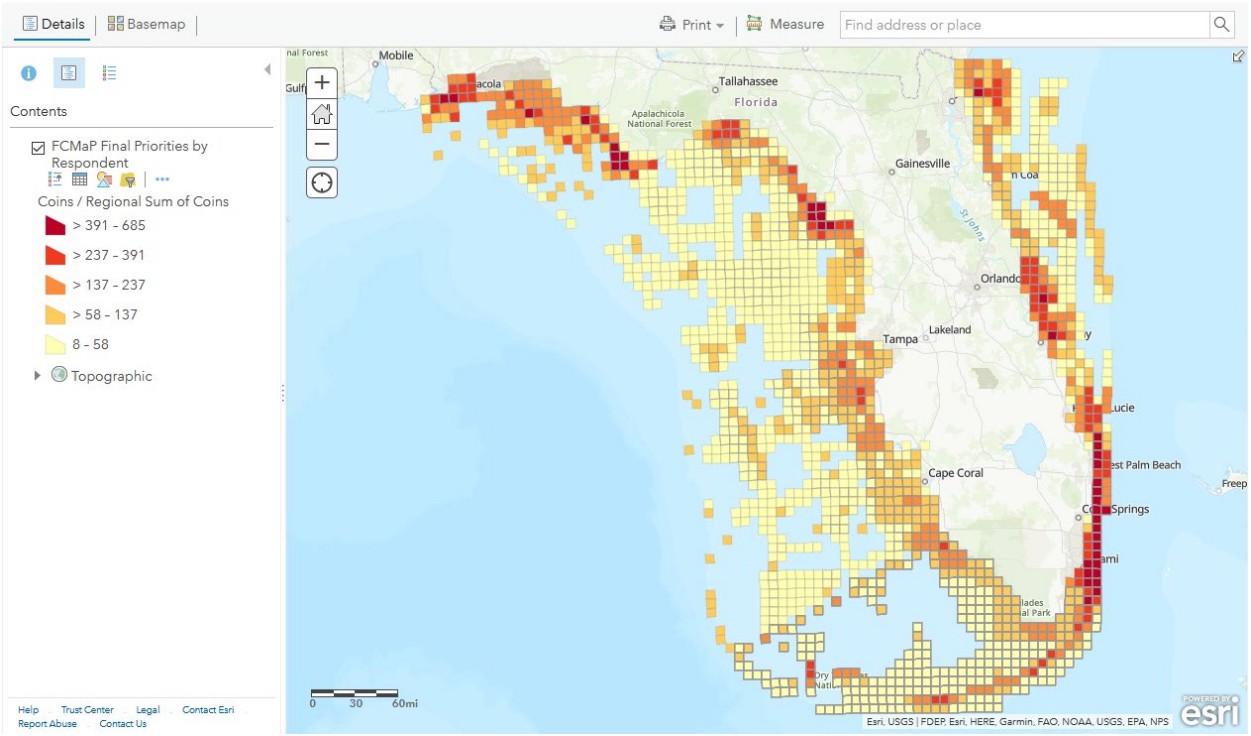


Figure 1. Coastal mapping prioritization results showing study area tiles by number of votes (coins).

The availability of modern, high-resolution bathymetric data for Florida's coastal waters would benefit a broad array of applications including but not limited to baseline management and restoration data, baseline habitat mapping data, baseline monitoring data, quantifying change, siting instruments, sediment budgets and sources of sand for beach nourishment, storm surge modeling, coastal processes research, coral processes research, and geologic history investigations. NOAA has had numerous requests from Florida for improved nautical charts to support coral reef programs and commerce in general.

The State of Florida has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

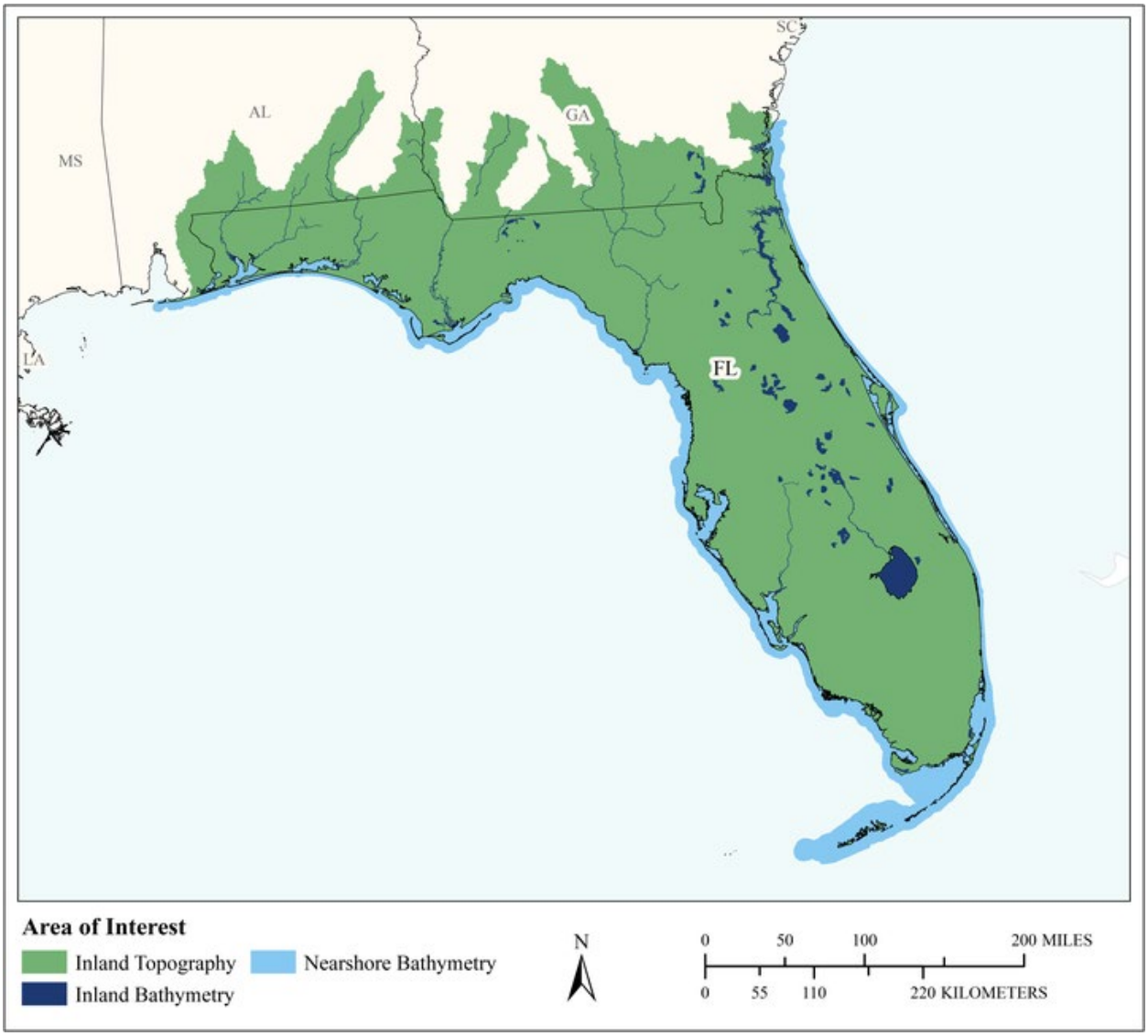
MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	Florida DEP DEAR	32991	Total Maximum Daily Load (TMDL) Development	Inland Topo	QL1	Annually	$311,137	$83,338	Minor	Moderate	Minor
				Inland Bathy	QL0B	Event driven	$1,346,008	$140,662	I don't know	Minor	None
				Nearshore Bathy	I don't know	Ideally, they would be more frequent to capture tidal durations	$288,609	$475,449	I don't know	Moderate	I don't know
BU 03 – Coastal Zone Management	FL DEP, Florida Coastal Office	21554	Conserving and Restoring Florida Coastal Aquatic Resources	Inland Bathy	QL0B	2-3 years	$632,751	$365,421	Major	Major	Minor
				Nearshore Bathy	QL0B	2-3 years	$235,124	$378,949	Moderate	Major	Moderate
				Offshore Bathy	Order 1	4-5 years	$79,028	$14,889	None	Moderate	Minor
BU 03 – Coastal Zone Management	Florida Division of Emergency Management	21733	Emergency Management	Inland Topo	QL1	2-3 years	$2,893,110	$505,776	Moderate	Minor	Major
				Inland Bathy	Cross sections and/or transects meet needs	4-5 years	$620,752	$363,914	Minor	Minor	Moderate
				Nearshore Bathy	Cross sections and/or transects meet needs	2-3 years	$869,570	$1,470,983	I don't know	I don't know	I don't know
				Offshore Bathy	Cross sections and/or transects meet needs	Event driven	$67,028	$13,382	I don't know	I don't know	I don't know
BU 03 – Coastal Zone Management	Florida Department of Environmental Protection	32992	Coastal Zone Management	Nearshore Bathy	QL1B	4-5 years	$869,570	$1,470,983	I don't know	I don't know	I don't know
				Offshore Bathy	Order 1	4-5 years	$67,028	$13,382	I don't know	I don't know	I don't know
BU 03 – Coastal Zone Management	State of Florida	50002	Florida Coastal Mapping Program	Nearshore Bathy	QL0B	6-10 years	$869,570	$1,470,983	I don't know	I don't know	I don't know
				Offshore Bathy	Special Order	>10 years	$67,028	$13,382	I don't know	I don't know	I don't know
BU 04 – Forest Resource Management	Florida Forest Service	1355	Forest Resources Management	Inland Topo	QL2	2-3 years	$221,869	$321,626	Moderate	Major	I don't know
				Nearshore Bathy	QL3B	4-5 years	Unable to quantify	Unable to quantify	Moderate	Major	I don't know
BU 04 – Forest Resource Management	Florida Department of Revenue Property Tax oversight	21748	Property Assessment and Taxation	Inland Topo	Cross sections and/or transects meet needs	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 04 – Forest Resource Management	State of Florida	60080	Forest Resources Management	Inland Topo	QL1	2-3 years	$221,869	$321,626	Major	Major	Major
BU 06 – Natural Resource Management	Florida Department of Environmental Protection	1232	Protection, Conservation and Management of Florida's Natural Resources and Enforcement of Environmental Laws	Inland Topo	QL1	2-3 years	$2,201,012	$8,082,789	Moderate	Major	Major
				Inland Bathy	QL2B	4-5 years	$298,322	$13,429	Major	Major	Major
				Nearshore Bathy	QL2B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Offshore Bathy	Cross sections and/or transects meet needs	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 06 – Natural Resource Management	Leon County	21596	Topographic Mapping and Analysis to Support City and County Departments	Inland Topo	QL0	2-3 years	$3,042,210	Unable to quantify	Moderate	Major	Major
				Inland Bathy	QL1B	6-10 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 07 – Wildlife and Habitat Management	The Nature Conservancy	21511	The Nature Conservancy Oyster Reef Restoration	Nearshore Bathy	QL0B	6-10 years	Unable to quantify	Unable to quantify	Moderate	Major	I don't know
BU 07 – Wildlife and Habitat Management	Florida Dept of Environmental Protection	21547	Coral Reef Conservation	Nearshore Bathy	QL2B	Annually	$4,824	Unable to quantify	Moderate	Major	I don't know
				Offshore Bathy	Order 1	Annually	$4,824	Unable to quantify	Moderate	Major	I don't know
BU 07 – Wildlife and Habitat Management	State of Florida	60081	Wildlife and Habitat Management	Inland Topo	QL2	4-5 years	$13,367	$38,607	Moderate	Major	Moderate
				Inland Bathy	QL2B	4-5 years	$107,125	$64,751	Moderate	Moderate	Moderate
				Nearshore Bathy	QL0B	4-5 years	$12,519	$740	Moderate	Major	Moderate
				Offshore Bathy	Special Order	4-5 years	$3,377	$235	Moderate	Major	Major
BU 09 – Fisheries Management and Aquaculture	State of Florida	60082	Fisheries Management and Aquaculture	Inland Bathy	QL0B	6-10 years	$112,281	$51,103	Major	Major	Moderate
				Nearshore Bathy	QL0B	6-10 years	$1,986,254	$145,874	Moderate	Major	Minor
BU 10 – Geologic Assessment	Florida Geological Survey	33010	Mapping of Geological Features and Seafloor Feature Extraction	Inland Topo	QL1	6-10 years	Unable to quantify	Unable to quantify	Minor	Moderate	Moderate
				Inland Bathy	QL1B	6-10 years	$31,657	$9,045	Minor	Moderate	Moderate
				Nearshore Bathy	QL1B	6-10 years	$21,105	Unable to quantify	Minor	Minor	Minor
				Offshore Bathy	Order 1a	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	Minor

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 14 – Cultural Resource Management	Florida Division of Historical Resources	1235	Discovery, Analysis, and Preservation of Cultural and Historical Resources	Inland Topo	QL1	>10 years	$10,285	$8,992	Moderate	Minor	None
				Inland Bathy	QL0B	>10 years	$24,665	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	QL0B	2-3 years	$36,186	Unable to quantify	I don't know	I don't know	I don't know
				Offshore Bathy	Order 1	2-3 years	$8,314	Unable to quantify	I don't know	I don't know	I don't know
BU 15 – Flood Risk Management	Florida Water Management Districts	22151	Managing and Protecting Water Resources for Flood Control, Water Supply, Water Quality and Natural Systems	Inland Topo	QL1	4-5 years	$40,991,305	$9,891,356	Major	Major	Major
				Inland Bathy	QL2B	4-5 years	$4,462,066	$2,746,484	Major	Major	Major
				Nearshore Bathy	QL2B	4-5 years	$653,621	$1,064,686	Major	Major	Major
				Offshore Bathy	Order 1	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 15 – Flood Risk Management	Volusia County	22270	Volusia County Emergency Management and Public Works Support	Inland Topo	QL1	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Inland Bathy	Cross sections and/or transects meet needs	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	I don't know	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 15 – Flood Risk Management	Manatee County	22334	Manatee County Emergency Management	Inland Topo	QL1	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Minor	Moderate	Major
				Nearshore Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 16 – Sea Level Rise and Subsidence	South Florida County Governments	22157	South Florida Adaptation Planning	Inland Topo	(a) QL0 (b) QL1	4-5 years	Unable to quantify	Unable to quantify	Major	Moderate	I don't know
				Inland Bathy	Cross sections and/or transects meet needs	6-10 years	Unable to quantify	Unable to quantify	Major	Major	I don't know
				Nearshore Bathy	Cross sections and/or transects meet needs	Annually	Unable to quantify	Unable to quantify	Major	Major	I don't know
BU 16 – Sea Level Rise and Subsidence	State of Florida	60083	Sea Level Rise and Subsidence	Inland Topo	QL1 HD	4-5 years	$2,954,336	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Minor
BU 17 – Wildfire Management	State of Florida	60084	Wildfire Management, Planning, and Response	Inland Topo	QL1	4-5 years	$301,500	Unable to quantify	Major	Major	Major

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 18 – Homeland Security	State of Florida	60085	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management	Inland Topo	QL2	4-5 years	$1,655,416	$29,258	Major	Moderate	Major
				Inland Bathy	QL0B	4-5 years	$466,207	$29,744	Major	Moderate	Major
BU 20 – Marine and Riverine Navigation	State of Florida	60086	Marine and Riverine Navigation and Safety	Inland Topo	QL0 HD	2-3 years	$2,149,688	Unable to quantify	None	None	Minor
				Inland Bathy	QL0B	2-3 years	$1,023,593	$134,716	Moderate	Moderate	Moderate
				Nearshore Bathy	QL0B	2-3 years	$9,691,986	$328,142	Minor	Major	Major
BU 21 – Aviation Navigation	State of Florida	60087	Aviation Navigation and Safety	Inland Topo	QL1 HD	Annually	$189,701	$236,266	Minor	Moderate	Moderate
BU 22 – Infrastructure Management	Florida Department of Transportation	22188	Planning, Design, Construction, and Maintenance of Transportation Infrastructure	Inland Topo	(a) QL0 HD (b) QL1	2-3 years	$1,366,432	$3,710,597	None	Major	Major
				Inland Bathy	QL1B	4-5 years	$424,820	$44,112	I don't know	Moderate	Major
				Nearshore Bathy	Cross sections and/or transects meet needs	6-10 years	$132,105	$18,164	None	Moderate	Major
BU 22 – Infrastructure Management	Florida Department of Environmental Protection	33009	Infrastructure Planning, Design, and Construction	Inland Topo	QL1	4-5 years	$1,260,907	$3,710,597	I don't know	I don't know	I don't know
				Inland Bathy	QL1B	4-5 years	$424,820	$44,112	I don't know	I don't know	I don't know
				Nearshore Bathy	QL1B	4-5 years	$132,105	$18,164	I don't know	I don't know	I don't know
BU 27 – Recreation	State of Florida	60088	Recreation	Inland Topo	QL1	4-5 years	$12,876	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	4-5 years	$7,754	Unable to quantify	Major	Major	Moderate
				Nearshore Bathy	QL0B	4-5 years	$1,636,274	Unable to quantify	Major	Major	Moderate
BU 28 – Telecom-munications	State of Florida	60089	Telecommunications	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 30 – Maritime and Land Boundary Management	State of Florida	60090	Maritime and Land Boundary Management	Inland Topo	QL1	6-10 years	$63,144	$242,100	Moderate	Minor	None
				Inland Bathy	QL2B	6-10 years	$47,388	Unable to quantify	Major	Major	Moderate
				Nearshore Bathy	QL0B	2-3 years	$2,904,274	Unable to quantify	Moderate	Major	Moderate

MCA Title: Total Maximum Daily Load (TMDL) Development



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more Hydrologic Units (HUC8s)	One or more Hydrologic Units (HUC8s)	Nearshore areas along the coast (including the Great Lakes) off one or more Hydrologic Units (HUC8s)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Total Maximum Daily Load (TMDL) Development. This activity determines the maximum amount of a given pollutant that a surface water can absorb and still meet the water quality standards that protect human health and aquatic life.
MCA Title	Total Maximum Daily Load (TMDL) Development
MCA ID	32991
Organization Type	State or U.S. Territorial government
Organization Name	Florida DEP DEAR
Sub-Agency or Division	
Organization Mission	The Department of Environmental Protection protects, conserves and manages Florida's natural resources and enforces the state's environmental laws.
Program Name	Water Quality Evaluation and TMDL Program
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	The hydrology in urban systems often includes flow control structures and human-made channels. These structures are critical and could save valuable time if easily available (visually).

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	I don't know	
Update Frequency	Annually	Event driven only – Data need to coincide with a specific event.	Ideally, they would be more frequent to capture tidal durations	
Event type(s)		Event driven only		
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	I don't know	
Acceptable Vertical Error	Up to 10 cm	Up to 20 cm	I don't know	
How far onshore needed			To MHW	
How far down the beach profile needed	To MLLW		To MLLW	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs		Partial		

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross section/transect requirement		Vertical accuracy should be within 15cm. In many cases we could just use average lake depth and width. However, it could be useful to have more detailed bathymetry data to determine if lake depth is changing much over time. The area of interest really just depends on our project, but we would only need it for the lake we model rather than all waterbodies in the watershed.		

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Not required	Nice to have		Not required	Not required
Entire AOI under same environmental conditions	Nice to have	Highly desirable	Required		Not required	Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Not required		Not required	Not required
DEM for entire AOI needs to be seamless	Required	Highly desirable	Nice to have		Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Nice to have	Nice to have	
DTM	Nice to have	Highly desirable	Nice to have	
DEM	Required	Required	Highly desirable	
Raw point cloud data	Not required	Not required	Not required	
Classified point cloud	Not required	Not required	Not required	
Edited/cube XYZ		Not required	Nice to have	
Full waveform	Not required	Not required	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Not required	Not required		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Not required	Not required	Nice to have	
Ground control/ground truthing	Not required	Not required	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required	Required	Nice to have	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Nice to have	
Submerged features			Not required	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Nice to have	
Land use/land cover	Required	Not required	Nice to have	
Wetlands	Required	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Nice to have	
Bridges/culverts	Required	Not required		
Landmark features	Not required	Not required	Not required	
Cultural resources	Not required	Not required	Not required	
Coastal and riverine structures	Required	Highly desirable	Nice to have	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Topographic Lidar usually older than 2010. Also not available state-wide.	We usually get a contour map and need to digitize it in GIS.	I don't believe we currently use any.	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Florida Department of Environmental Protection Geospatial Open Data			
Other		Yes		
Other description		Source of bathymetric data varies widely. We usually obtain that data from County or City Agencies (if they have it).		

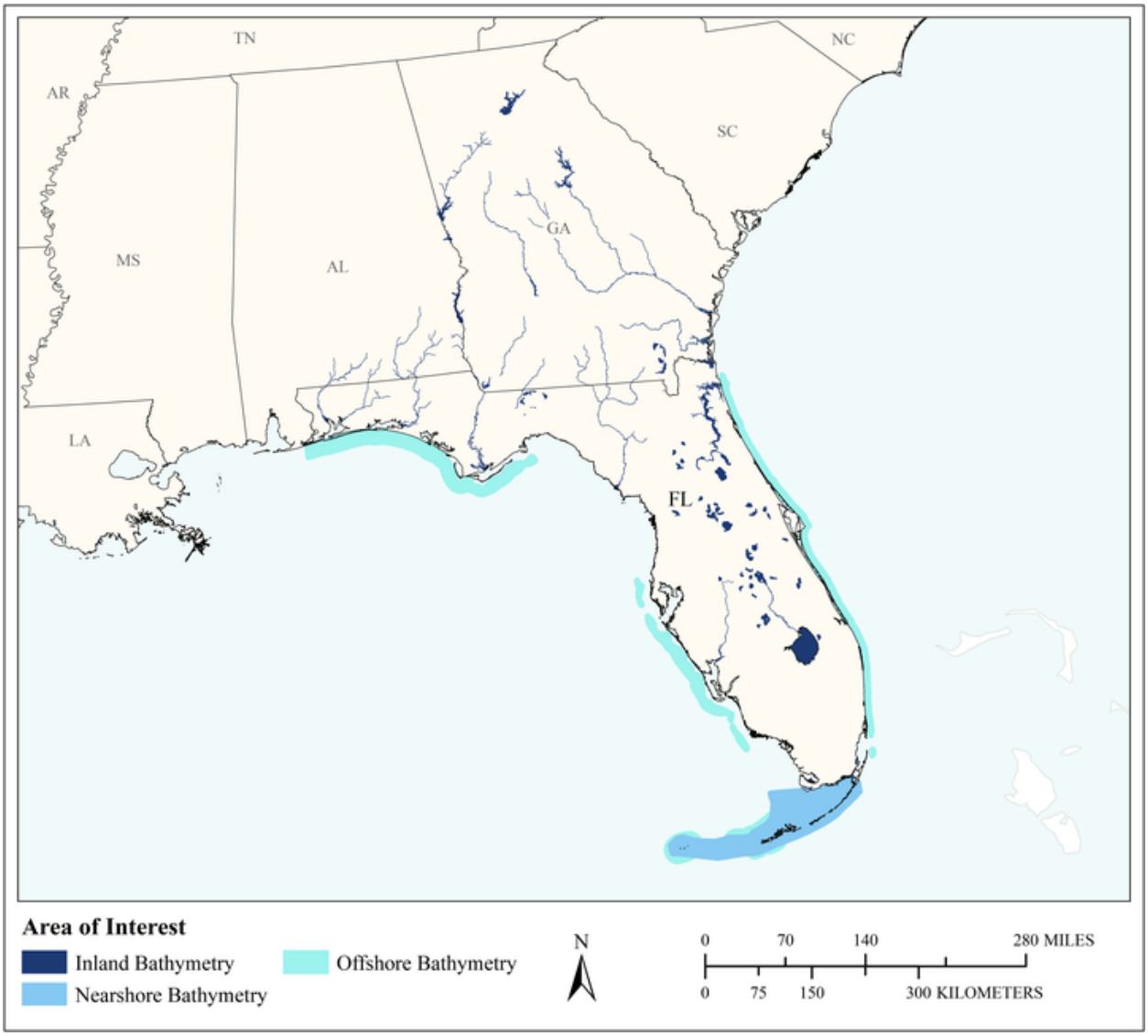
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Major	I don't know	
Cost savings/cost reduction	I don't know	I don't know	I don't know	
Cost avoidance	I don't know	I don't know	I don't know	
Increased revenues	I don't know	I don't know	I don't know	
Mission-driven performance improvements	Moderate	Moderate	I don't know	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None	I don't know	I don't know	
Improved response or timeliness	None	I don't know	I don't know	
Improved customer experience	None	I don't know	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	I don't know	I don't know	
Environmental	Major	I don't know	I don't know	
Public safety, including life and property	Minor	I don't know	I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide				
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost avoidance	I don't know	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Increased revenues	I don't know	Unable to provide		None			I don't know	Unable to provide				
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$311,137		Annual dollars saved/ realized	$1,346,008		Annual dollars saved/ realized	$288,609			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		None			I don't know	Unable to provide				
Improved response or timeliness	I don't know	Unable to provide		None			I don't know	Unable to provide				
Improved customer experience	I don't know	Unable to provide		None			None					
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$83,338		Annual dollars saved/ realized	$140,662		Annual dollars saved/ realized	$475,449			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			I don't know			I don't know					
Environmental	Moderate			Minor			Moderate					
Public safety, including life and property	Minor			None			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Conserving and Restoring Florida Coastal Aquatic Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type		Required	Required	Required
Geographic Area Requirements		One or more Hydrologic Units (HUC4s)	Custom description	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements			Straits of Florida	

MCA Description	Response
Mission Critical Activity	Conserving and restoring Florida coastal aquatic resources. Bathymetry is needed for GIS analysis for projects including coral mapping, oyster bar recovery, and post –disaster impacts. Also for beach renourishment projects which dovetail with seagrass and smothering issues.
MCA Title	Conserving and Restoring Florida Coastal Aquatic Resources
MCA ID	21554
Organization Type	State or U.S. Territorial government
Organization Name	FL DEP, Florida Coastal Office
Sub-Agency or Division	
Organization Mission	The Florida Coastal Office coordinates the protection of the state's natural, cultural and economic coastal resources. DEP manages more than 4 million acres of submerged lands and coastal uplands. With support from NOAA, the Florida Coastal Office manages the Florida Coastal Management Program, 41 aquatic preserves, three National Estuarine Research Reserves, the Florida Coral Reef Conservation Program, and the Florida Keys National Marine Sanctuary.
Program Name	National Estuarine Research Reserves Aquatic Preserves Florida Coastal Management Program Florida Resilient Coastline Outer Continental Shelf Program Florida Keys National Marine Sanctuary
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 07 - Wildlife and Habitat Management
Tertiary Business Use	BU 02 - Riverine Ecosystem Management

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Not required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	200,000 sq mi - 2 million sq mi (e.g. large state, large multi-state region such as the Great Basin, standard Federal region, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Sea grass scarring

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order		QL0B	QL0B	Order 1
Update Frequency		2-3 years	2-3 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error		The best horizontal accuracy achievable for the vertical accuracy I need	Less than 50 cm	The best horizontal accuracy achievable for the vertical accuracy I need
Acceptable Vertical Error		Up to 20 cm	Less than 10 cm	Less than 1 meter
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed			Below MLLW	
Tide correction requirement			I don't know	I don't know
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season		Nice to have	Required	Nice to have		Nice to have
Entire AOI under same environmental conditions		Nice to have	Required	Nice to have		Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless		Highly desirable	Required	Highly desirable		Highly desirable
DEM for entire AOI needs to be seamless		Highly desirable	Required	Highly desirable		Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM		Nice to have	Nice to have	Nice to have
DTM		Nice to have	Nice to have	Nice to have
DEM		Required	Required	Required
Raw point cloud data		Not required	Not required	Not required
Classified point cloud		Nice to have	Nice to have	
Edited/cube XYZ		Not required	Not required	Not required
Full waveform		Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Nice to have

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening		Nice to have		
Additional breaklines for hydro-enforcement of culverts				
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery		Nice to have	Highly desirable	Nice to have
Ground control/ground truthing		Nice to have	Nice to have	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Nice to have	Nice to have
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery		Nice to have	Required	Highly desirable
Underwater videography			Highly desirable	Highly desirable
Bottom texture			Highly desirable	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data		Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Highly desirable	Nice to have
Tide/wave heights			Highly desirable	Not required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Required	Highly desirable
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Not required
Offshore cadastral			Highly desirable	Highly desirable
Lease areas			Required	Nice to have
Fixed obstructions			Nice to have	Highly desirable
Floating observation/navigation systems			Nice to have	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates		Highly desirable	Required	
Land use/land cover		Nice to have	Highly desirable	Not required
Wetlands		Highly desirable	Required	Not required
Estuaries			Required	Not required
Inland surface water features		Highly desirable	Required	
Bridges/culverts		Not required		
Landmark features		Not required	Nice to have	
Cultural resources		Nice to have	Nice to have	
Coastal and riverine structures		Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used		Current resources are a patchwork of different scale and quality resources. Sources include Water Management District data, county and local government sources as well as data derived from individually funded projects.	Hodgepodge of publicly available data on the Marine Cadastre, water management districts, counties and local governments, and specific projects.	NOAA Marine Cadastre
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	Yes
NCEI				
Open Topography				
NOAA nautical charts				Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS			Yes	Yes

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State Repositories			Yes	
State repositories used			Florida Department of Environmental Protection Florida Geographic Data Library	
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings		Inland bathy data not available	Minor	Minor
Cost savings/cost reduction		Inland bathy data not available	Moderate	Minor
Cost avoidance		Inland bathy data not available	Moderate	I don't know
Increased revenues		Inland bathy data not available	None	None
Mission-driven performance improvements		Inland bathy data not available	Minor	None
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services		Inland bathy data not available	Minor	I don't know
Improved response or timeliness		Inland bathy data not available	Minor	Minor
Improved customer experience		Inland bathy data not available	Minor	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach		Inland bathy data not available	Minor	None
Environmental		Inland bathy data not available	Moderate	I don't know
Public safety, including life and property		Inland bathy data not available	I don't know	I don't know

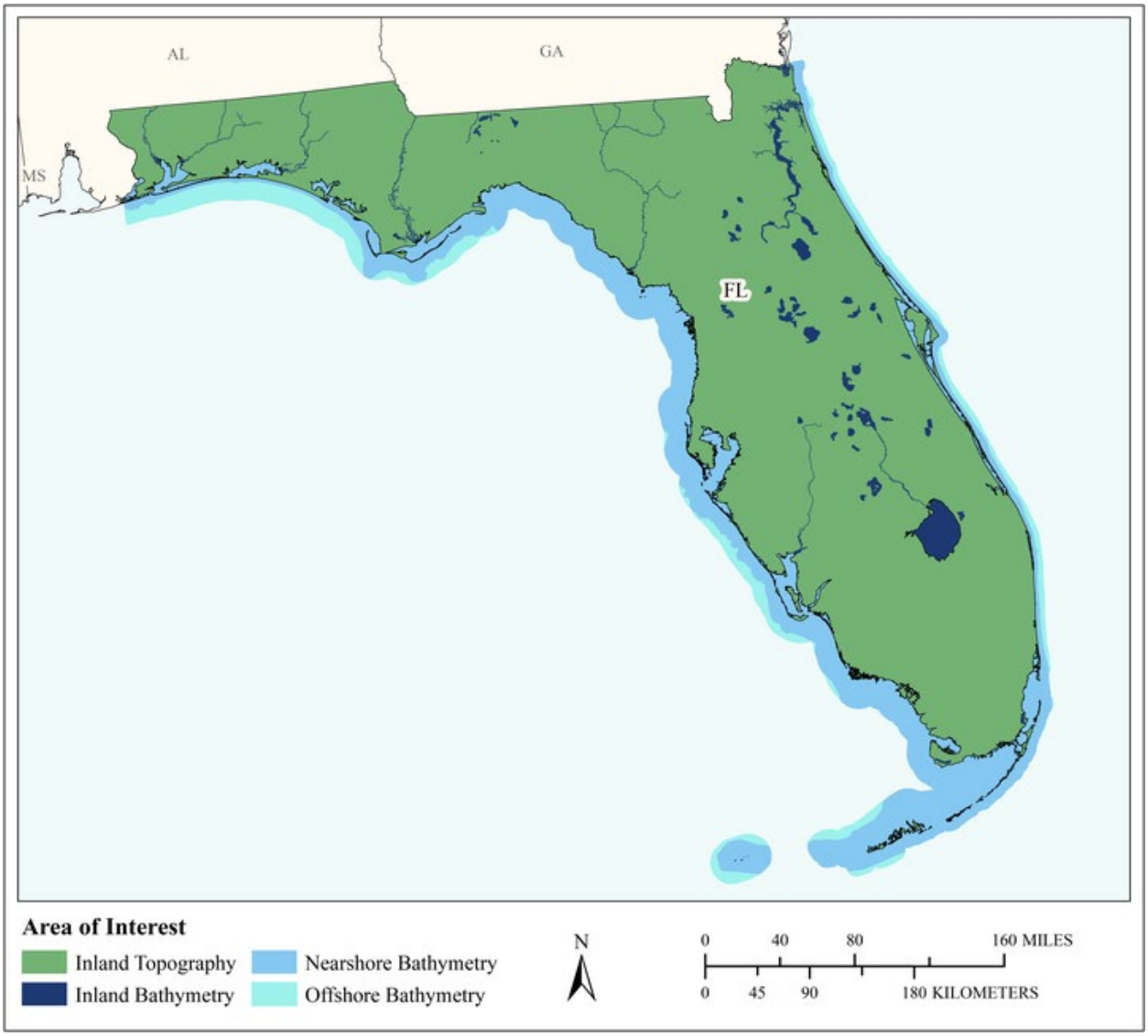
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings				Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Time savings description				Time saved from having to stitch together different data sources. Better able to develop restoration projects and management plans. Better mapping data helps better assess resources and develop restoration projects and management plans. Reduced staff time assessing resources and projects.			Development of maps for management plans. Greater ability to assess the progress and status of restoration projects, and monitor submerged resources. Easier access when having all the data in the same place, and reduced chance of errors.			Faster analysis of project locations. Easier access to data when it's in the same place. Easier access to data in the same place. Easier access to data and faster analysis.		
Cost savings/cost reduction				Minor	Annual dollars saved/realized	$12,000	Moderate	Annual dollars saved/realized	$12,000	Moderate	Annual dollars saved/realized	$12,000
Cost savings/cost reduction description				Better information to develop restoration projects, such as oxbow reconnections. Reduced time finding funding for data acquisition and contracting.			Submerged resource data and mapping is a major component for our office, and having better data helps everything we do. Reduced costs for materials such as those for living shorelines.			Reduced cost for agencies collecting data that we use.		
Cost avoidance				Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance description				Ability to map ingress and egress routes, as well as have proper equipment for response (and not excessive amounts of equipment). Having all the data in one spot and matching. Ability to create and prioritize resources for protection and prepare cost-effective measures in advance.			Allow more accurate mapping and assessment of areas to prioritize for resilience. Reducing errors in merging GIS files. Allow for increased information when preparing for potential incidents and responding to incidents and post-disaster recovery efforts, and protection/restoration of natural resources.			More accurate mapping and assessment of areas to prioritize for resilience. Reduced errors in merging GIS files. Increased information when preparing for potential incidents and responding to those incidents.		
Increased revenues				None			Minor	Unable to provide		Minor	Unable to provide	
Increased revenues description							Better able to identify new access points (boat or paddlecraft launches) and developing paddling trails.			Better able to analyze areas for artificial reefs or aquaculture.		
Mission-driven performance improvements				Moderate	Unable to provide		Major	Annual percent improvement	75%	Major	Unable to provide	
Mission-driven performance improvements description				Conserving and restoring Florida's coastal and aquatic resources for the benefit of people and the environment.			Submerged resource data and mapping is a major component for our office, and having better data helps everything we do.			Submerged resource data and mapping is a major component for our office, and having better data improves efficiencies.		
Future annual operational benefits added during validation					Annual dollars saved/ realized	$620,751		Annual dollars saved/ realized	$223,124		Annual dollars saved/ realized	$67,028
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services				Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Value added to products or services description				Identifying appropriate public access areas. Management plan mapping.			Better mapping of sensitive habitats to avoid or use caution around, such as seagrass beds. Brochures, maps, and improved mapping for management planning and submerged resource protection, as well as development of paddling trails.			Better mapping of sensitive habitats to avoid or use caution around helps protect them.		
Improved response or timeliness				Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Improved response or timeliness description				Our office doesn't issue permits, but does provide comments on submerged resources.			Better able to assess which areas are likely to be impacted and prioritize areas for recovery/restoration. Our office doesn't produce navigational products, but does produce informative signs about seagrasses or other sensitive resources. Provide improved visualization and mapping to identify sensitive resources, shallow areas, and management areas. We don't handle permitting, but provide comments on potential impacts to submerged resources.			We don't directly respond, but could help with coordinating. Better able to coordinate recovery by anticipating which areas are impacted. We don't handle permitting, but provide comments on potential impacts to submerged resources. Provide improved visualization and mapping to identify sensitive areas.		
Improved customer experience				Major	Annual dollars saved/realized	$1,508	Major	Annual dollars saved/realized	$1,508	Moderate	Annual dollars saved/realized	$1,508
Improved customer experience description				Timely and accurate maps increase customer confidence in products and services. Having all of the data in one place reduces time to collect data, and errors from combining data.			Up-to-date and accurate mapping of resources and protected areas increases customer confidence in products and services. (Fewer false positives.). Improved background maps for online applications such as the beach access guide. Having all the data in one place saves staff time, resources, and cloud storage space.			Having data in one place saves time, resources, and cloud storage.		
Future annual customer service benefits added during validation					Annual dollars saved/ realized	$363,914		Annual dollars saved/ realized	$377,441		Annual dollars saved/ realized	$13,382
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach				Major			Moderate			None		
Education or outreach description				Increased public awareness and education of the importance of submerged resources and protected areas helps protect those resources for current and future generations.			Increased awareness and public education about submerged natural resources helps better protect those resources for us and future generations.					
Environmental				Major			Major			Moderate		
Environmental description				Better information on the current status of submerged resources increases protection of those resources, improves restoration efforts, and those help protect traditional uses such as boating and fishing.			Better resource data helps us better protect and manage submerged natural resources.			We currently have limited knowledge of offshore natural resources. Better resource data helps us better protect and manage submerged natural resources.		
Public safety, including life and property				Minor			Moderate			Minor		
Public safety, including life and property description				Better mapping helps boaters avoid hazardous areas.			Submerged resources are a key component in coastal resilience.			Submerged resources are a key component to coastal resilience.		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	
Contours		Yes	Yes	Yes
Hillshades		Yes	Yes	
Slope maps		Yes	Yes	
Aspect maps				
Curvature maps		Yes	Yes	
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids		Yes	Yes	
Hydrologic Flow Accumulation Grids		Yes	Yes	
Hydrologic networks (e.g. streams, lakes)		Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes	Yes	
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness		Yes	Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Emergency Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Emergency management. Plan for and respond to both natural and man-made disasters. These range from floods and hurricanes to incidents involving hazardous materials or nuclear power. Prepare and implement a statewide Comprehensive Emergency Management Plan. Conduct exercises to test state and county emergency response capabilities. Provide technical assistance to local governments as they prepare emergency plans and procedures. Conduct emergency operations training for state and local governmental agencies. Conduct post-event damage assessment surveys and advise the Governor on whether to declare an emergency and seek federal relief funds. Maintain and operate the state's Emergency Operations Center (EOC) in Tallahassee, which serves as the communications and command center for reporting emergencies and coordinating state response activities, and the State Warning Point, a state emergency communications center staffed 24 hours each day.
MCA Title	Emergency Management
MCA ID	21733
Organization Type	State or U.S. Territorial government
Organization Name	Florida Division of Emergency Management
Sub-Agency or Division	
Organization Mission	The Division of Emergency Management plans for and responds to both natural and man-made disasters. These range from floods and hurricanes to incidents involving hazardous materials or nuclear power. The division prepares and implements a statewide Comprehensive Emergency Management Plan, and routinely conducts extensive exercises to test state and county emergency response capabilities. The division is the state's liaison with federal and local agencies on emergencies of all kinds. Division staff members provide technical assistance to local governments as they prepare emergency plans and procedures. They also conduct emergency operations training for state and local governmental agencies. After a disaster, the division conducts damage assessment surveys and advises the Governor on whether to declare an emergency and seek federal relief funds. The division maintains a primary Emergency Operations Center (EOC) in Tallahassee. The EOC serves as the communications and command center for reporting emergencies and coordinating state response activities. The division also operates the State Warning Point, a state emergency communications center staffed 24 hours each day. The center maintains statewide communications with county emergency officials.
Program Name	Mitigation, Preparedness, Response, Recovery
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable

What Needs to be Measured in 3D	Response
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	3D buildings

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	Cross sections and/or transects meet needs	Cross sections and/or transects meet needs	Cross sections and/or transects meet needs
Update Frequency	2-3 years	4-5 years	2-3 years	Event driven only – Data need to coincide with a specific event.
Event type(s)				A natural or man-made disaster.
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	Less than 50 cm	Less than 50 cm	Less than 50 cm
Acceptable Vertical Error	Up to 10 cm	Up to 20 cm	Up to 20 cm	Up to 20 cm
How far onshore needed			1 kilometer inland	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MHW	MHW

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross sections and/or transects meet needs		Yes	Yes	Yes
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable	Nice to have	Nice to have	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Nice to have	Highly desirable	Nice to have	Nice to have	Highly desirable	Highly desirable
Other	Required					
Other description	Regional AOI need to be collected in same acquisition season and under similar environmental conditions					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable	Highly desirable	Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Nice to have	Nice to have
DTM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Not required	Nice to have	Nice to have	Nice to have
Classified point cloud	Required	Required	Highly desirable	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Edited/cube XYZ		Nice to have	Not required	Not required
Full waveform	Nice to have	Nice to have	Not required	Not required
Bathymetric Attributed Grid (BAG)		Not required	Not required	Not required
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)			Not required	Not required
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Nice to have
Ground control/ground truthing	Highly desirable	Required	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Not required	Not required
Bottom type			Not required	Not required
Submerged features			Nice to have	Nice to have
Subbottom characteristics			Not required	Not required
Geologic and seismic data	Nice to have	Nice to have	Not required	Not required
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Not required	Not required
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Nice to have	Nice to have
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Nice to have	
Land use/land cover	Highly desirable	Highly desirable	Nice to have	Nice to have
Wetlands	Highly desirable	Highly desirable	Nice to have	Nice to have
Estuaries			Nice to have	Nice to have
Inland surface water features	Required	Nice to have	Nice to have	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Nice to have	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	42 counties - QL3 from 2007-2009 1 counties - QL2 from 2015	Best available	Best available	Best available
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes	Yes	Yes	Yes
NCEI			Yes	Yes
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts			Yes	Yes
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			

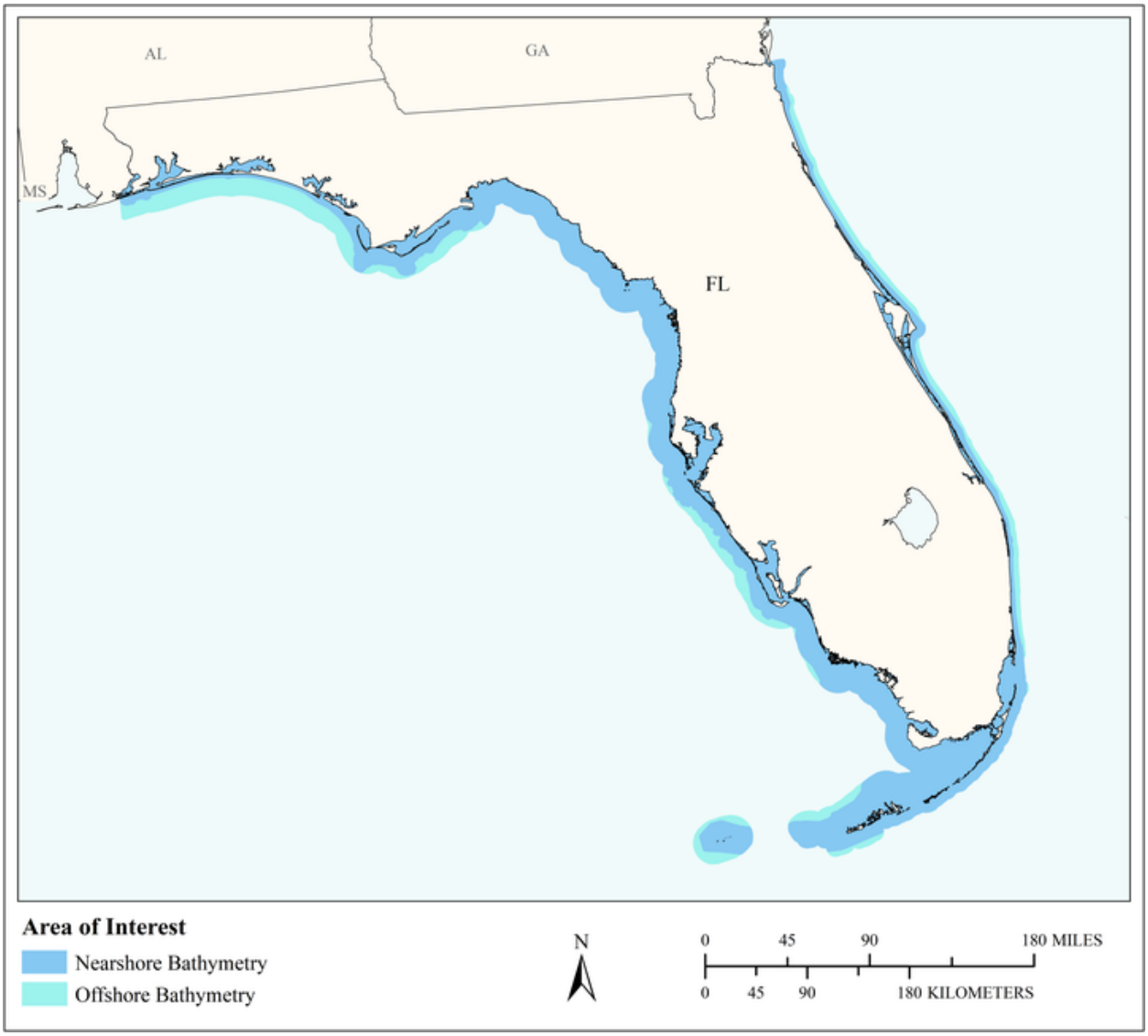
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
State repositories used	Florida Water Management Districts University of Florida Geographic Data Library Florida International University for more information visit - https://floridadisaster.org/gis/lidar			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Moderate	Minor	Minor
Cost savings/cost reduction	Minor	Minor	Minor	Minor
Cost avoidance	Major	None	None	None
Increased revenues	Minor	None	None	None
Mission-driven performance improvements	Major	Minor	Minor	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor	Minor	Minor
Improved response or timeliness	Moderate	Minor	Minor	Minor
Improved customer experience	Major	Moderate	Minor	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	Minor	Minor
Environmental	Moderate	Minor	Minor	Minor
Public safety, including life and property	Major	Major	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Time savings description	Hours saved during evacuations from hurricanes.											
Cost savings/cost reduction	Moderate	Unable to provide		None			I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues	None			None			I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,893,110		Annual dollars saved/ realized	$620,752		Annual dollars saved/ realized	$869,570		Annual dollars saved/ realized	$67,028
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Moderate	Unable to provide		None			I don't know	Unable to provide		I don't know	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$505,776		Annual dollars saved/ realized	$363,914		Annual dollars saved/ realized	$1,470,983		Annual dollars saved/ realized	$13,382
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Minor			I don't know			I don't know		
Environmental	Minor			Minor			I don't know			I don't know		
Public safety, including life and property	Major			Moderate			I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Coastal Zone Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type			Required	Required
Geographic Area Requirements			Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Analysis of coastal erosion and inundation. Hurricane storm surge and wind damage modeling and assessment. Coastal hazard modeling and mapping. Coastal hazard mitigation. Tsunami modeling. Land use and environmental planning. Coastal resiliency. Oil spill modeling. Littoral zone management including dunes and beaches.
MCA Title	Coastal Zone Management
MCA ID	32992
Organization Type	State or U.S. Territorial government
Organization Name	Florida Department of Environmental Protection
Sub-Agency or Division	
Organization Mission	The Department of Environmental Protection protects, conserves and manages Florida's natural resources and enforces the state's environmental laws.
Program Name	Florida Department of Environmental Protection Water Resources.
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Coastal dunes and structures, buildings

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order			QL1B	Order 1
Update Frequency			4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error			Up to 1 meter	Up to 1 meter

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Vertical Error			Less than 10 cm	Less than 1 meter
How far onshore needed			To cover the beach slope	
How far down the beach profile needed			Below MLLW	
Tide correction requirement			No requirement for tide correction	No requirement for tide correction
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season			Required	Required		Highly desirable
Entire AOI under same environmental conditions			Nice to have	Not required		Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless			Required	Not required		Highly desirable
DEM for entire AOI needs to be seamless			Required	Required		Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM			Not required	Not required
DTM			Not required	Not required
DEM			Required	Required
Raw point cloud data			Nice to have	Highly desirable
Classified point cloud			Highly desirable	
Edited/cube XYZ			Not required	Not required
Full waveform			Not required	Not required
Bathymetric Attributed Grid (BAG)			Not required	Not required
Breaklines required for standard hydro-flattening				
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Not required	Not required
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery			Not required	Not required
Ground control/ground truthing			Not required	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Not required	Not required
Acoustic imagery of the seafloor			Not required	Not required
Aerial and/or satellite imagery			Required	Nice to have
Underwater videography			Not required	
Bottom texture			Highly desirable	Not required
Bottom type			Highly desirable	Not required
Submerged features			Not required	Not required
Subbottom characteristics			Not required	Not required
Geologic and seismic data			Not required	Not required
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Not required	Not required
Tide/wave heights			Not required	Not required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Not required	Not required
Boundaries			Not required	Not required
Routes			Not required	Not required
Offshore cadastral			Not required	Not required
Lease areas			Not required	Not required
Fixed obstructions			Not required	Not required
Floating observation/navigation systems			Not required	Not required
Shorelines – current, historic, change rates			Required	
Land use/land cover			Not required	Not required
Wetlands			Not required	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Not required	Not required
Inland surface water features			Not required	
Bridges/culverts				
Landmark features			Not required	
Cultural resources			Not required	
Coastal and riverine structures			Not required	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used			Previous DEM from USACE	Usace
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	Yes
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings			None	I don't know
Cost savings/cost reduction			Moderate	Moderate
Cost avoidance			Major	Major
Increased revenues			None	I don't know
Mission-driven performance improvements			Major	I don't know

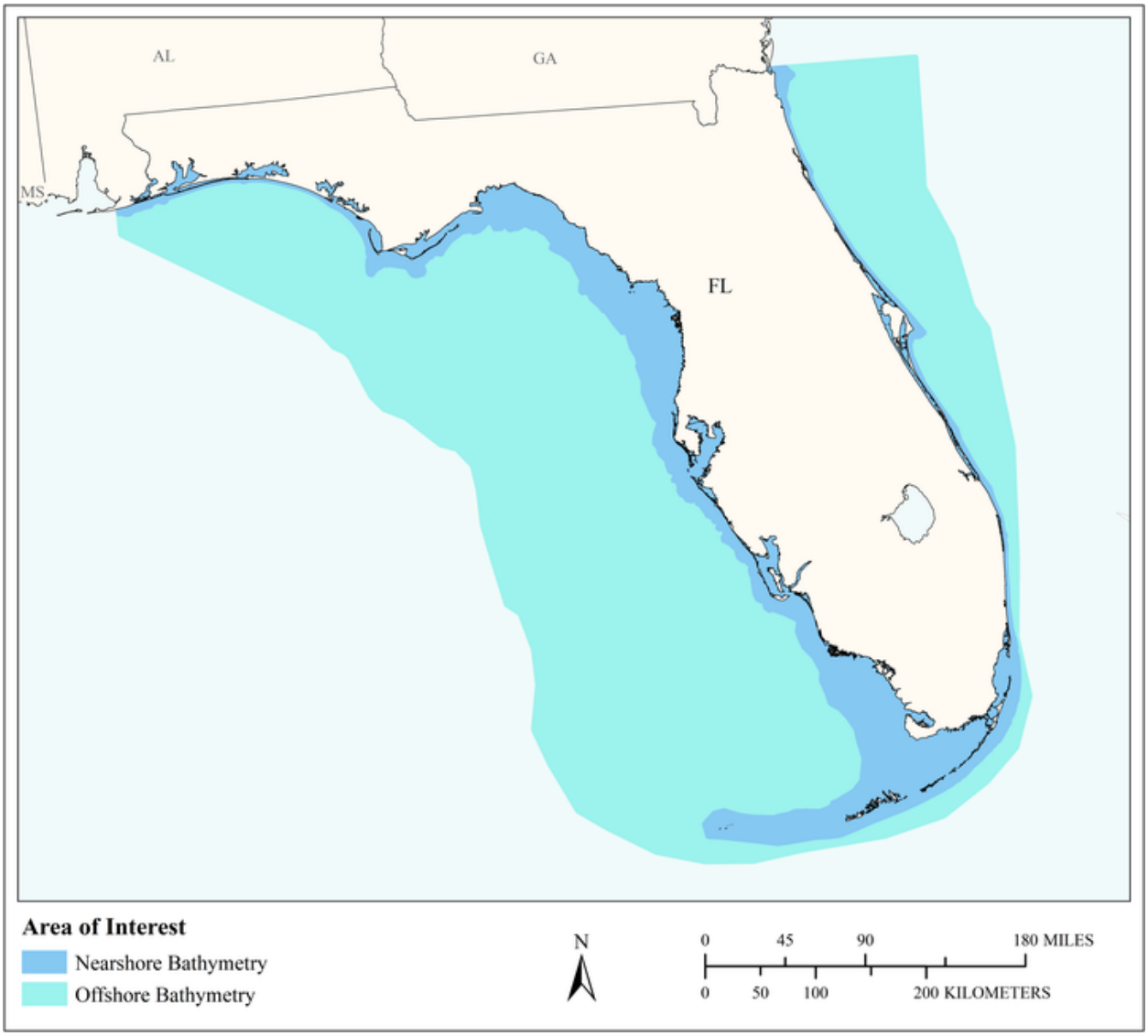
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services			None	I don't know
Improved response or timeliness			None	I don't know
Improved customer experience			None	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach			None	I don't know
Environmental			None	I don't know
Public safety, including life and property			None	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings							I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction							I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance							I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues							I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements							I don't know	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation								Annual dollars saved/ realized	$869,570		Annual dollars saved/ realized	$67,028
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services							I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness							I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience							I don't know	Unable to provide		I don't know	Unable to provide	
Future annual customer service benefits added during validation								Annual dollars saved/ realized	$1,470,983		Annual dollars saved/ realized	$13,382
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach							I don't know			I don't know		
Environmental							I don't know			I don't know		
Public safety, including life and property							I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours			Yes	
Hillshades			Yes	
Slope maps			Yes	
Aspect maps			Yes	
Curvature maps				
Cross sections			Yes	Yes
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Florida Coastal Mapping Program



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type			Required	Required
Geographic Area Requirements			Respondent provided own shapefile, KML, or geodatabase	Respondent provided own shapefile, KML, or geodatabase
Sub Area Requirements			Florida Coastal Mapping Program priority areas	Florida Coastal Mapping Program priority areas

MCA Description	Response
Mission Critical Activity	The Florida Coastal Mapping Program (FCMaP) is an initiative between Federal and Florida State agencies and institutions to assess existing data, and develop a prioritization and strategy for filling gaps with high resolution data for all of Florida's coastal waters from the shore to the shelf edge. Bathymetry is needed for management of statewide interests to include shell-fish (oyster) hatcheries, packing fish and western oil interests, recreation, and game fishing among others.
MCA Title	Florida Coastal Mapping Program
MCA ID	50002
Organization Type	State or U.S. Territorial government
Organization Name	State of Florida
Sub-Agency or Division	
Organization Mission	To assess existing data, and develop a prioritization and strategy for filling gaps with high resolution data for all of Florida's coastal waters from the shore to the shelf edge.
Program Name	Florida Coastal Mapping Program
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 20 - Marine and Riverine Navigation and Safety

What Needs to be Measured in 3D	Response
Bare earth ground	Not required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Oyster beds, hard bottom colony features (not single individuals), sink holes

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order			QL0B	Special Order
Update Frequency			6-10 years	>10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI			The Gulf Coast does not require an update frequency as frequently as the Atlantic Coast	The Gulf Coast does not require an update frequency as frequently as the Atlantic Coast

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Horizontal Error			Less than 50 cm	Up to 1 meter
Acceptable Vertical Error			Up to 30 cm	Less than 1 meter
How far onshore needed			500 meters inland	
How far down the beach profile needed			500 meters	
Tide correction requirement			MHW	MHW
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season			Not required	Not required		Not required
Entire AOI under same environmental conditions			Highly desirable	Highly desirable		Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless			Highly desirable	Highly desirable		Nice to have
DEM for entire AOI needs to be seamless			Highly desirable	Highly desirable		Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM			Required	Required
DTM			Required	Required
DEM			Required	Required
Raw point cloud data			Required	Required
Classified point cloud			Required	
Edited/cube XYZ			Highly desirable	Highly desirable
Full waveform			Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)			Nice to have	Highly desirable

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening				
Additional breaklines for hydro-enforcement of culverts				
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery			Nice to have	Nice to have
Ground control/ground truthing			Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery			Not required	Not required
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Nice to have	Nice to have
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data			Nice to have	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Nice to have	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Highly desirable	Highly desirable
Routes			Highly desirable	Highly desirable
Offshore cadastral			Highly desirable	Highly desirable
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates			Highly desirable	
Land use/land cover			Highly desirable	Highly desirable
Wetlands			Highly desirable	Not required
Estuaries			Highly desirable	Not required
Inland surface water features			Required	
Bridges/culverts				
Landmark features			Highly desirable	
Cultural resources			Highly desirable	
Coastal and riverine structures			Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used			NOAA Nav charts (where available), some topobathy lidar (NOAA along coast) and some US-ACOE acoustic in channels	NOAA Nav Charts Acoustic (small patchy areas surveyed)
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	Yes
NCEI			Yes	Yes
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts			Yes	Yes
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				

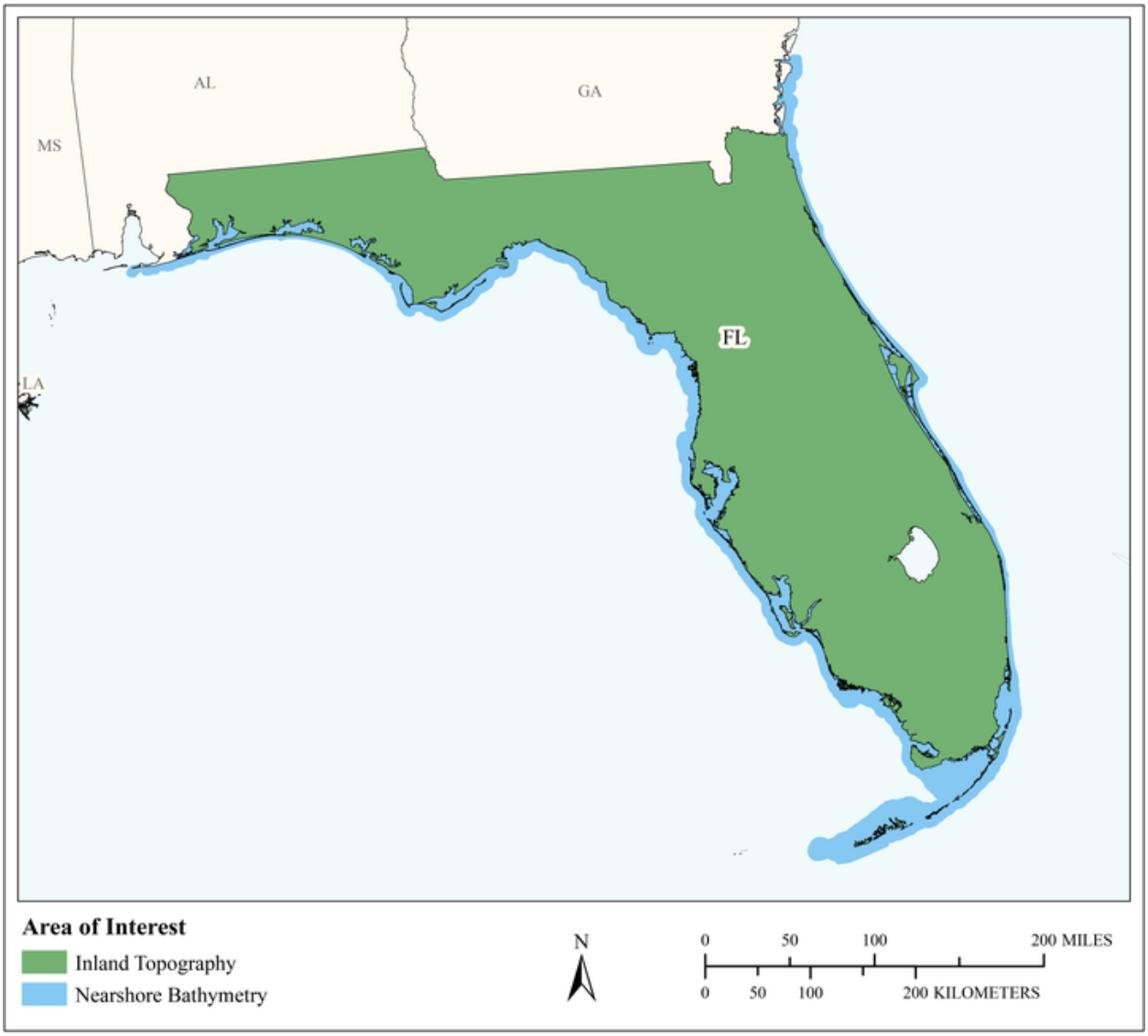
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings			Major	Major
Cost savings/cost reduction			Major	Major
Cost avoidance			Moderate	Moderate
Increased revenues			Moderate	Moderate
Mission-driven performance improvements			Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services			Major	Major
Improved response or timeliness			Moderate	Moderate
Improved customer experience			Major	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach			Major	Major
Environmental			Major	Major
Public safety, including life and property			Moderate	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings							I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction							I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance							I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues							I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements							I don't know	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation								Annual dollars saved/ realized	$869,570		Annual dollars saved/ realized	$67,028
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services							I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness							I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience							I don't know	Unable to provide		I don't know	Unable to provide	
Future annual customer service benefits added during validation								Annual dollars saved/ realized	$1,470,983		Annual dollars saved/ realized	$13,382
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach							I don't know			I don't know		
Environmental							I don't know			I don't know		
Public safety, including life and property							I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	Yes
Contours			Yes	Yes
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Forest Resources Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast (including the Great Lakes) off one or more Hydrologic Units (HUC4s)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	The Florida Forest Service (FFS) consists of more than 1,250 dedicated employees with the mission to protect and manage the forest resources of Florida, ensuring that they are available for future generations. Wildfire prevention and suppression are key components in our efforts to protect homeowners from the threat of damage in a natural, fire-dependent environment. We are dedicated to training individuals to meet these goals. In addition to managing over one million acres of state forests for multiple public uses including timber, recreation and wildlife habitat, we also provide services to landowners throughout the state with technical information and grant programs. The Florida Forest Service's forestry programs are implemented by its Field Operations staff within 15 field units across the state. Field personnel and equipment provide a more responsive and comprehensive approach to land management and wildfire control statewide. The Florida Forest Service is currently investing in a helicopter to collect site-specific lidar. Statewide collections would be beneficial for temporal analysis.
MCA Title	Forest Resources Management
MCA ID	1355
Organization Type	State or U.S. Territorial government
Organization Name	Florida Forest Service
Sub-Agency or Division	
Organization Mission	The mission of the Florida Forest Service is to protect Florida and its people from the dangers of wildland fire and manage the forest resources through a stewardship ethic to assure they are available for future generations. Our core program areas are: Wildfire Prevention, Detection and Suppression, State Land Management, and Forestry Technical Assistance
Program Name	Forest Management/ Protection
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	BU 17 - Wildfire Management, Planning, and Response
Tertiary Business Use	BU 07 - Wildlife and Habitat Management

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Not required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)

General Geographic Area and Size	
Description of smallest 3D features	Small shrubs

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2		QL3B	
Update Frequency	2-3 years		4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI	Quality levels can vary in state			
Acceptable Horizontal Error	Up to 50 cm		Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm		Up to 40 cm	
How far onshore needed			To Mean Lower Low Water (MLLW)	
How far down the beach profile needed	To MLLW		None	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs			Partial	
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable		Not required			Not required
Entire AOI under same environmental conditions	Highly desirable		Not required			Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable		Nice to have			Nice to have
DEM for entire AOI needs to be seamless	Highly desirable		Not required			Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required		Nice to have	
DTM	Required		Nice to have	
DEM	Highly desirable		Nice to have	
Raw point cloud data	Nice to have		Highly desirable	
Classified point cloud	Highly desirable		Highly desirable	
Edited/cube XYZ			Not required	
Full waveform	Not required		Not required	
Bathymetric Attributed Grid (BAG)			Not required	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)			Not required	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Not required		Not required	
Ground control/ground truthing	Nice to have		Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Not required	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required		Highly desirable	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Not required	
Submerged features			Not required	
Subbottom characteristics			Not required	
Geologic and seismic data	Not required		Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required		Nice to have	
Land use/land cover	Required		Required	
Wetlands	Highly desirable		Highly desirable	
Estuaries			Highly desirable	
Inland surface water features	Highly desirable		Not required	
Bridges/culverts	Highly desirable			
Landmark features	Nice to have		Not required	
Cultural resources	Highly desirable		Not required	
Coastal and riverine structures	Highly desirable		Not required	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Statewide lidar		Best available	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	LABINS			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate		I don't know	
Cost savings/cost reduction	Moderate		I don't know	
Cost avoidance	Major		I don't know	
Increased revenues	Moderate		I don't know	

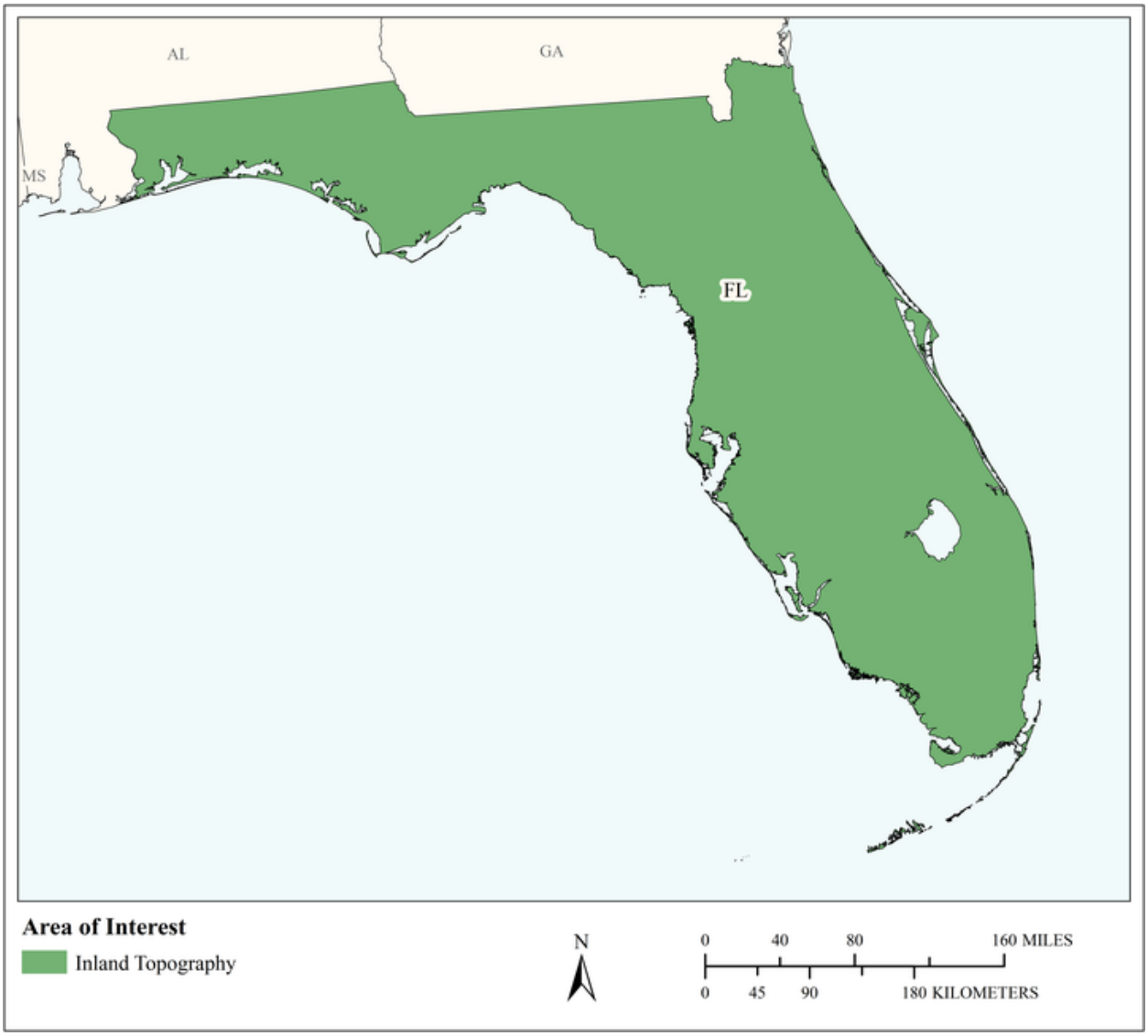
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Mission-driven performance improvements	Moderate		Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		I don't know	
Improved response or timeliness	Moderate		I don't know	
Improved customer experience	Major		I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate		Major	
Environmental	Major		Major	
Public safety, including life and property	Major		I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide					Major	Unable to provide				
Cost avoidance	Major	Unable to provide					Major	Unable to provide				
Increased revenues	Major	Unable to provide					Major	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide					Major	Unable to provide				
Other operational benefits	Moderate	Unable to provide					Moderate	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$221,869									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide					Major	Unable to provide				
Improved customer experience	Major	Unable to provide					Major	Unable to provide				
Other customer service benefits							Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$321,626									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate						Moderate					
Environmental	Major						Major					
Public safety, including life and property	I don't know						I don't know					
Other												
Other benefits							Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes		Yes	
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Property Assessment and Taxation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Equitable taxation between and among all 67 counties of the state.
MCA Title	Property Assessment and Taxation
MCA ID	21748
Organization Type	State or U.S. Territorial government
Organization Name	Florida Department of Revenue Property Tax oversight
Sub-Agency or Division	
Organization Mission	Property tax oversight.
Program Name	Property Tax Oversight.
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	BU 08 - Agriculture and Precision Farming
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Single family dwellings/mobile homes, vegetation

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	Cross sections and/or transects meet needs			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	I don't know			
How far onshore needed				
How far down the beach profile needed	Not applicable			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs	Yes			
Cross section/transect requirement	I don't know			

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Nice to have					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have					
DEM for entire AOI needs to be seamless	Nice to have					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Nice to have			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Highly desirable			
Landmark features	Not required			
Cultural resources	Not required			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Dfirm_fldhaz_may16			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	NRCS			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor			
Cost savings/cost reduction	None			
Cost avoidance	None			
Increased revenues	None			
Mission-driven performance improvements	Minor			

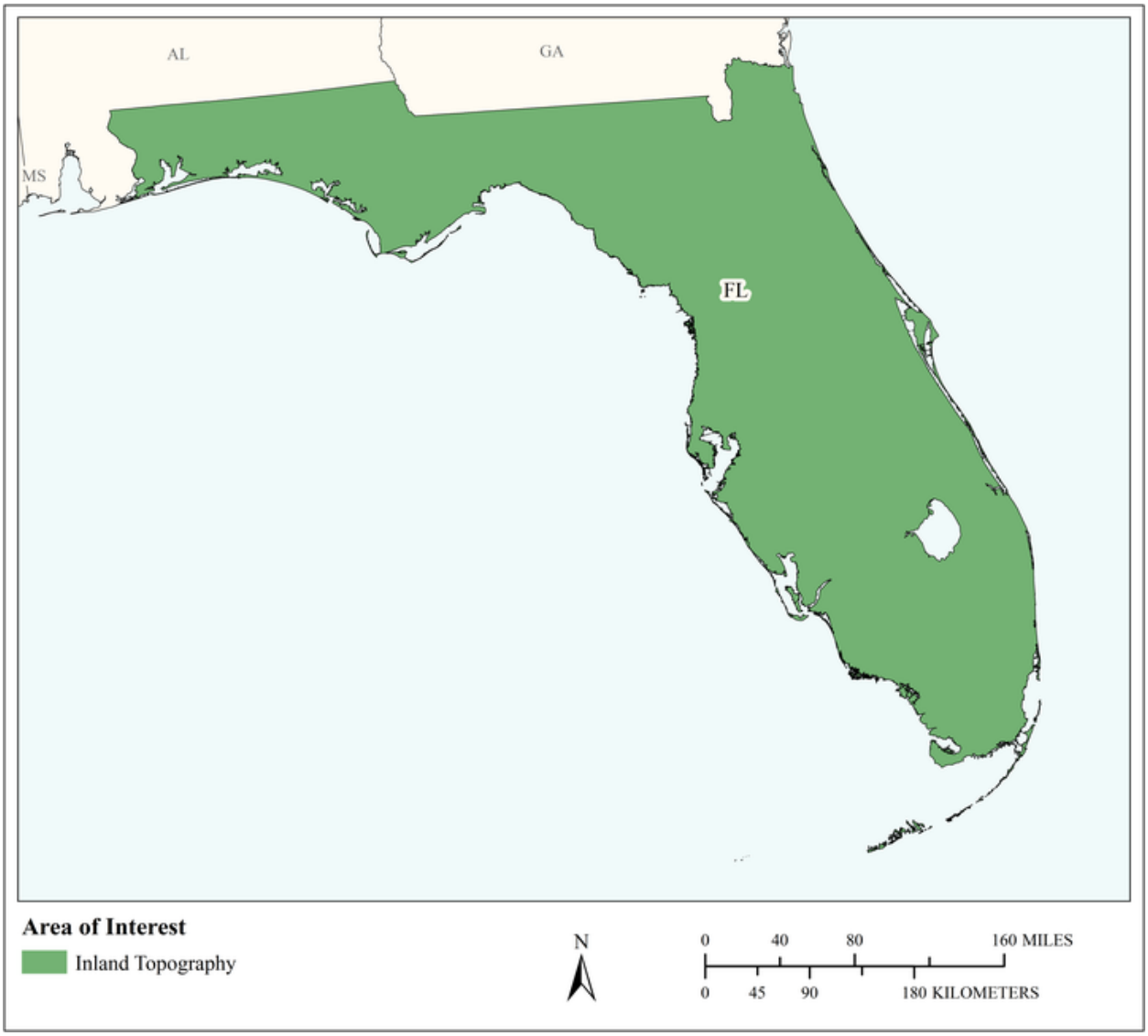
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			
Improved response or timeliness	None			
Improved customer experience	None			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	None			
Public safety, including life and property	None			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Cost savings/cost reduction	None											
Cost avoidance	I don't know	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Moderate	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	I don't know	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Forest Resources Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Forest health assessment. Determination of standing inventory of forest resources. Prescribed burn planning. Analysis of carbon stocks for trade. Harvest systems planning.
MCA Title	Forest Resources Management
MCA ID	60080
Organization Type	State or U.S. Territorial government
Organization Name	State of Florida
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Highly desirable			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

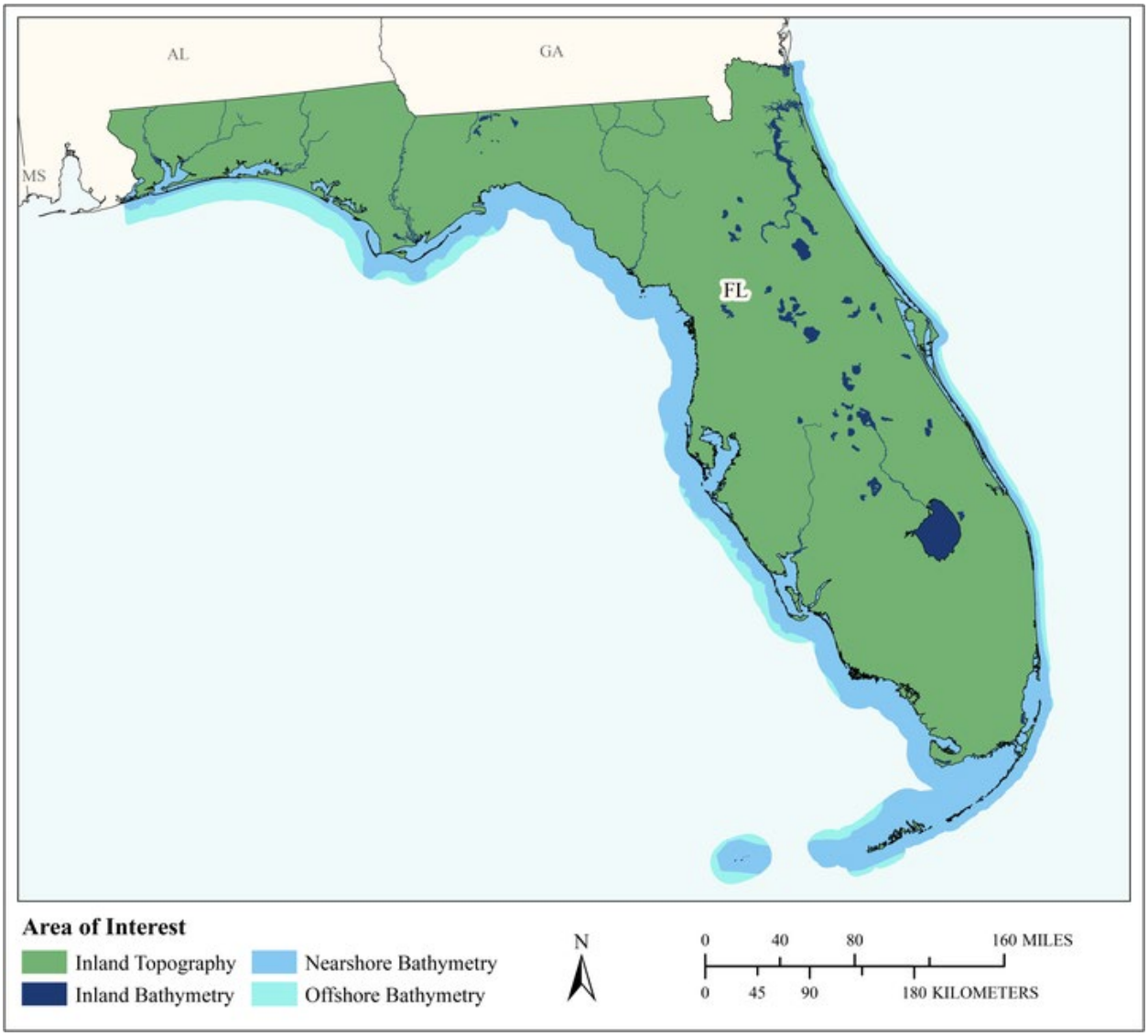
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$221,869									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$321,626									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Protection, Conservation and Management of Florida's Natural Resources and Enforcement of Environmental Laws



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	The Department protects, conserves and manages Florida's natural resources and enforces the State's environmental laws. The department shall act as the lead agency of the 1712 executive branch for the development and review of policies, practices, and standards related to geospatial data. The department shall coordinate and promote geospatial data sharing throughout the state government and serve as the primary point of contact for statewide geographic information systems projects, grants, and resources. Lidar will support the Governor's initiative to research blue-green algae blooms and protect water quality for Floridians, and support ongoing modeling and protection measures.
MCA Title	Protection, Conservation and Management of Florida's Natural Resources and Enforcement of Environmental Laws
MCA ID	1232
Organization Type	State or U.S. Territorial government
Organization Name	Florida Department of Environmental Protection
Sub-Agency or Division	
Organization Mission	Serves as the State of Florida's Geographic Information Officer (GIO). This executive level position performs a variety of professional and administrative work in support of statewide Geographic Information System (GIS) programs.
Program Name	Statewide Geographic Information coordination of geospatial data development, review, policies, and standards
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	BU 01 - Water Supply and Quality
Tertiary Business Use	BU 27 - Recreation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Building footprints, roadways, channel delineations and shape, waterbody features (including wetland delineations), statewide smaller features may be desirable in the future (e.g. signs, docks, curbs, sidewalks).

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B	QL2B	Cross sections and/or transects meet needs
Update Frequency	2-3 years	4-5 years	4-5 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need
Acceptable Vertical Error	Up to 10 cm	Less than 10 cm	I don't know	I don't know
How far onshore needed			To MHW	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			I don't know	I don't know
Cross sections and/or transects meet needs				Yes
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Required	Highly desirable	Required	Required	Required
Entire AOI under same environmental conditions	Required	Required	Required	Required	Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DTM	Highly desirable	Required	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Required	Required	Required	Required
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Highly desirable	Highly desirable	Highly desirable
Full waveform	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Bathymetric Attributed Grid (BAG)		Highly desirable	Required	Highly desirable
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery	Required	Highly desirable	Required	Highly desirable
Ground control/ground truthing	Required	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Highly desirable
Underwater videography			Highly desirable	Highly desirable
Bottom texture			Required	Required
Bottom type			Required	Required
Submerged features			Required	Highly desirable
Subbottom characteristics			Required	Highly desirable
Geologic and seismic data	Nice to have	Highly desirable	Required	Highly desirable
Water column properties - Physical			Required	Highly desirable
Water column properties - Chemical			Required	Highly desirable
Water column properties - Biological			Required	Highly desirable
Currents			Highly desirable	Highly desirable
Tide/wave heights			Required	Highly desirable
Sea ice conditions			Nice to have	Highly desirable
Habitat distribution and classification			Required	Highly desirable
Boundaries			Required	Highly desirable
Routes			Required	Highly desirable
Offshore cadastral			Required	Highly desirable
Lease areas			Required	Highly desirable
Fixed obstructions			Required	Highly desirable
Floating observation/navigation systems			Required	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Highly desirable	Required	Required	Required
Wetlands	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Required	
Cultural resources	Highly desirable	Highly desirable	Required	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Majority of the state is QL 1 or 2 and the areas being flown this year (2018) are QL1.	Best available	Best available	Best available
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast		Yes	Yes	
NCEI		Yes	Yes	Yes
Open Topography				
NOAA nautical charts		Yes		Yes
USACE navigation charts		Yes	Yes	
USGS Inland Waters server		Yes		
USGS data series		Yes		
Marine Minerals Program GIS			Yes	
State Repositories	Yes	Yes		
State repositories used	FSU FREAC Water Management Districts Statewide repository is being developed for dissemination of data acquired in 2018 statewide collect	Water management districts		
Data that meet my needs are not available				

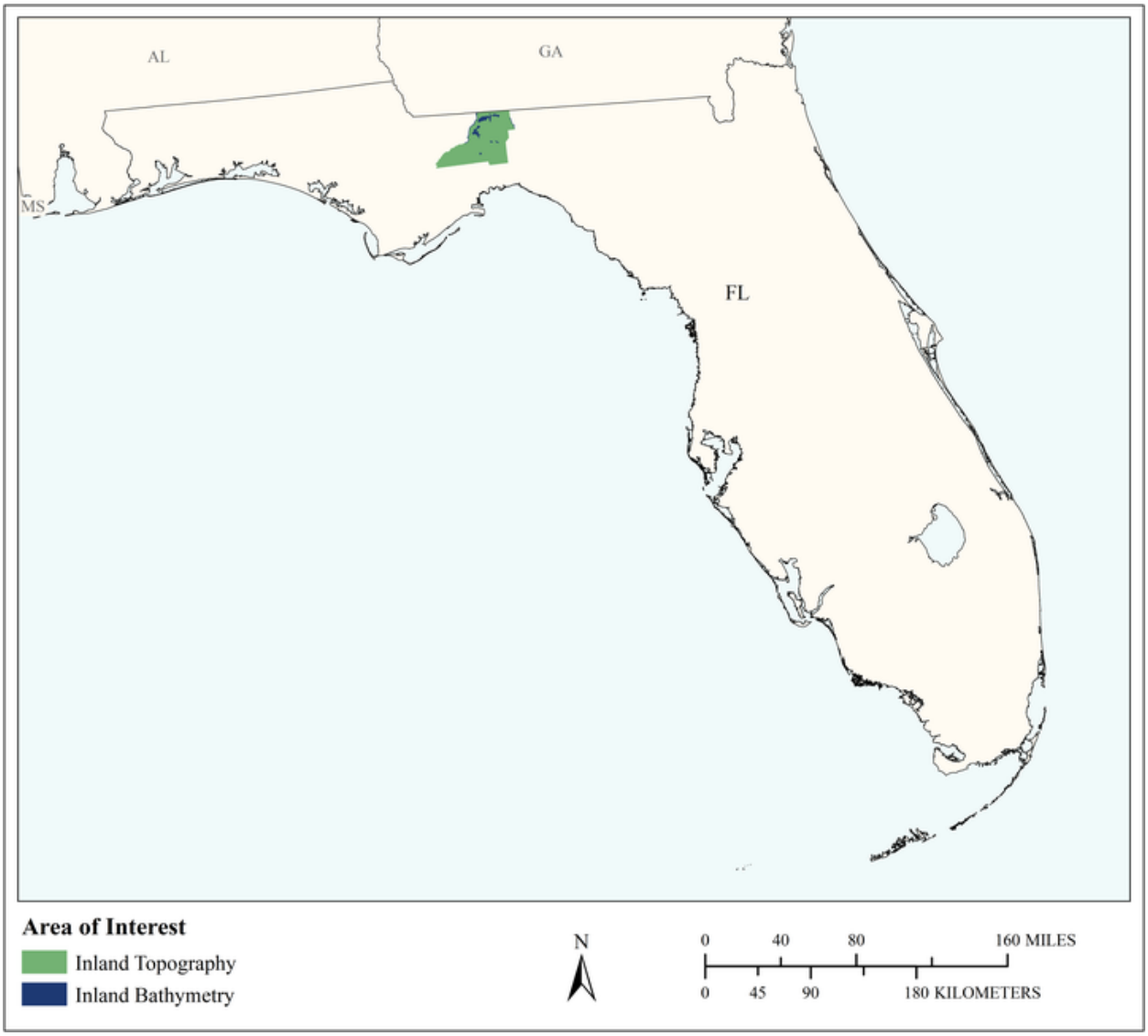
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Major	Major
Cost savings/cost reduction	Major	I don't know	Major	Major
Cost avoidance	Major	I don't know	I don't know	I don't know
Increased revenues	I don't know	I don't know	I don't know	I don't know
Mission-driven performance improvements	Major	Major	Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	Major
Improved response or timeliness	Major	Major	Major	Major
Improved customer experience	Major	I don't know	I don't know	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major	Major	Major
Environmental	Major	Major	Major	Major
Public safety, including life and property	Major	Major	Major	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Increased revenues	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Other operational benefits				Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,201,012		Annual dollars saved/ realized	$298,322						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$8,082,789		Annual dollars saved/ realized	$13,429						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Major			I don't know		
Environmental	Major			Major			Major			I don't know		
Public safety, including life and property	Major			Major			Major			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	Yes
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Topographic Mapping and Analysis to Support City and County Departments



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements	Leon County, FL	Leon County, FL		

MCA Description	Response
Mission Critical Activity	Topographic mapping and analysis to support city and county departments
MCA Title	Topographic Mapping and Analysis to Support City and County Departments
MCA ID	21596
Organization Type	Regional, County, City, or other local government
Organization Name	Leon County
Sub-Agency or Division	
Organization Mission	Local Government GIS agency. Maintain central GIS database repository, contract updates to LiDAR and photogrammetric basemap (3-year rotation), provide GIS services to the City of Tallahassee, Leon County, and the Leon County Property Appraiser.
Program Name	As a local government GIS agency, we provide topographic analytical services to many departments and programs. These include roadway maintenance and design, parks and recreation facilities and trails, stormwater pond design and maintenance, stormwater inventory design and maintenance, flood mitigation, land development regulation, 3-D cityscapes, communications tower and billboard site analysis, urban forest management, and emergency response. Most frequent users are the Public Works and Growth Management agencies, (roadway maintenance and design, and land development regulation).
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	BU 22 - Infrastructure and Construction Management
Tertiary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Stormwater inlets, curbs, pond control structures

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Nice to have
51 - 100 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Highly desirable
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL1B		
Update Frequency	2-3 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 30 cm	Up to 2 meters		
Acceptable Vertical Error	Less than 5 cm	Up to 40 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required			Not required	
Entire AOI under same environmental conditions	Required	Highly desirable			Highly desirable	
Other	Required					
Other description	Leaf off conditions are required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Not required	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	We require that the LiDAR data be reflown anew every 3 years. We do not want to merge multi-temporal data into a single mosaic. This is also true for breakline data.	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Not required		
DTM	Required	Highly desirable		
DEM	Required	Highly desirable		
Raw point cloud data	Not required	Not required		
Classified point cloud	Required	Highly desirable		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Not required		
Ground control/ground truthing	Required	Not required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Not required		
Land use/land cover	Nice to have	Not required		
Wetlands	Nice to have	Not required		
Estuaries				
Inland surface water features	Required	Not required		
Bridges/culverts	Required	Not required		
Landmark features	Not required	Not required		
Cultural resources	Not required	Not required		
Coastal and riverine structures	Not required	Not required		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We are currently using the LiDAR and breakline data that was collected as part of our 2015 aerial mapping services contract. The Lidar aggregate nominal pulse density (ANPD) is 6 points per square meter. The FVA is 0.17 ft, (5.5 cm). The data was collected January 20 - February 5, 2015. We are currently under contract for our 2018 aerial basemap update. The LiDAR has been collected and is currently being processed.	Not currently using bathymetric LiDAR data		

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	Local procurement contract			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available		
Cost savings/cost reduction	Major	Inland bathy data not available		
Cost avoidance	None	Inland bathy data not available		
Increased revenues	None	Inland bathy data not available		
Mission-driven performance improvements	Major	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Inland bathy data not available		
Improved response or timeliness	Moderate	Inland bathy data not available		
Improved customer experience	Moderate	Inland bathy data not available		

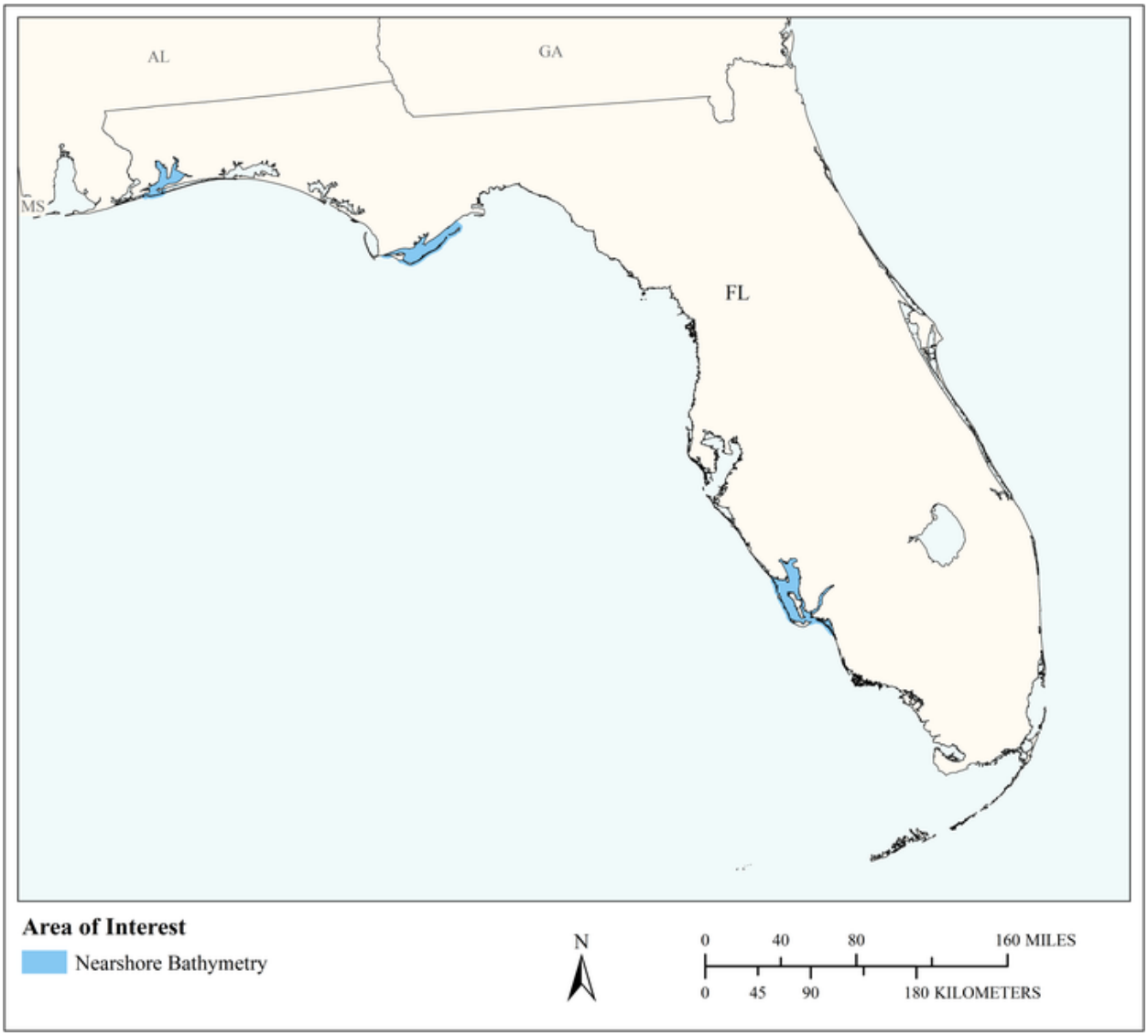
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Inland bathy data not available		
Environmental	Major	Inland bathy data not available		
Public safety, including life and property	Moderate	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$42,210	Moderate	Unable to provide							
Cost savings/cost reduction	Moderate	Annual dollars saved/realized	$1,000,000	Moderate	Unable to provide							
Cost savings/cost reduction description	Savings on pre-construction ground-based topographic surveys.											
Cost avoidance	Moderate	Annual dollars saved/realized	$2,000,000	Moderate	Unable to provide							
Cost avoidance description	Reduces cost of hiring consultants. Reduces ground-based topographic survey errors.											
Increased revenues	None			None								
Mission-driven performance improvements	Major	Unable to provide		Minor	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Minor	Unable to provide							
Improved customer experience	Major	Unable to provide		I don't know	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			I don't know								
Education or outreach description	Improved communication with the public, improved outreach											
Environmental	Major			I don't know								
Environmental description	Better protection of environmentally sensitive features											
Public safety, including life and property	Major			I don't know								
Public safety, including life and property description	Better flood delineation/modeling											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: The Nature Conservancy Oyster Reef Restoration



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type			Required	
Geographic Area Requirements			Respondent provided own shapefile, KML, or geodatabase	
Sub Area Requirements			The Nature Conservancy Restoration Critical Habitat	

MCA Description	Response
Mission Critical Activity	Restoration of critical habitats. Bathymetry is needed for identification of oyster reefs, sometimes less than 12”.
MCA Title	The Nature Conservancy Oyster Reef Restoration
MCA ID	21511
Organization Type	Academic or Not-for-Profit
Organization Name	The Nature Conservancy
Sub-Agency or Division	
Organization Mission	To conserve the lands and waters on which all life depends.
Program Name	Marine & Coastal Program
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Not required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	1 m2 oyster reef sitting on bottom of bay

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order			QL0B	
Update Frequency			6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error			Less than 50 cm	
Acceptable Vertical Error			Up to 20 cm	
How far onshore needed			To Mean Higher High Water (MHHW)	
How far down the beach profile needed			5 meters	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement			NAVD88	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season			Not required			
Entire AOI under same environmental conditions			Highly desirable			
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless			Nice to have			
DEM for entire AOI needs to be seamless			Highly desirable			
Amount of acceptable vertical manipulation to achieve spatial seamlessness			I don't know			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM			Required	
DTM			Required	
DEM			Required	
Raw point cloud data			Not required	
Classified point cloud			Nice to have	
Edited/cube XYZ			Nice to have	
Full waveform			Not required	
Bathymetric Attributed Grid (BAG)			Not required	
Breaklines required for standard hydro-flattening				
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery			Required	
Ground control/ground truthing			Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Required	
Aerial and/or satellite imagery			Highly desirable	
Underwater videography			Highly desirable	
Bottom texture			Required	
Bottom type			Required	
Submerged features			Required	
Subbottom characteristics			Required	
Geologic and seismic data			Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates			Highly desirable	
Land use/land cover			Not required	
Wetlands			Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features			Not required	
Bridges/culverts				
Landmark features			Not required	
Cultural resources			Not required	
Coastal and riverine structures			Highly desirable	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used			25m Bathymetric ArcRaster Grid of Apalachicola Bay and St. George Sound G130_30087D1_BIG 30m cell raster bathymetry generated by Duke University Marine Geospatial Ecology Laboratory	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories			Yes	

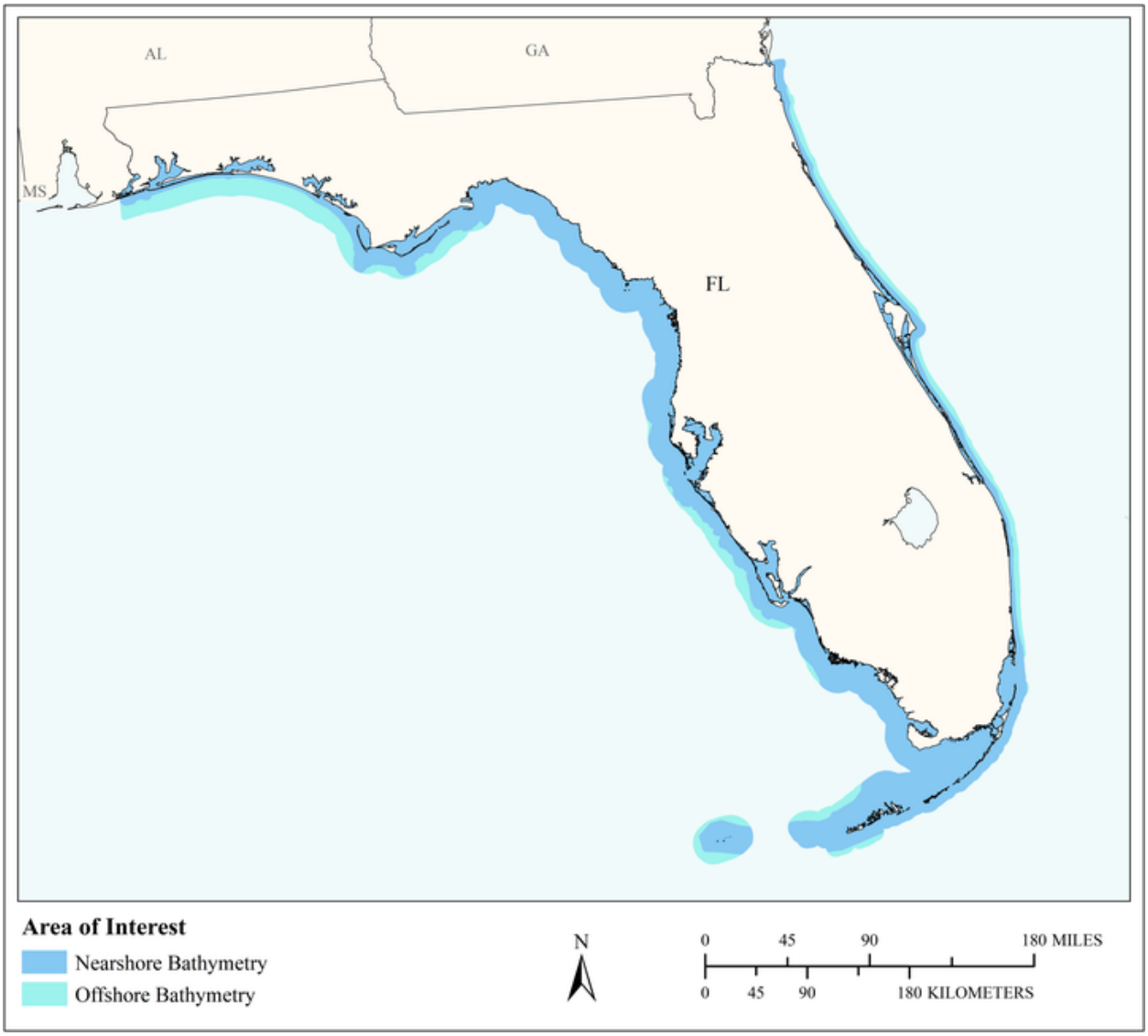
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
State repositories used			Florida's water management districts, and Florida Dept. of Emergency Management.	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings			None	
Cost savings/cost reduction			Minor	
Cost avoidance			Minor	
Increased revenues			None	
Mission-driven performance improvements			Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services			None	
Improved response or timeliness			None	
Improved customer experience			None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach			Minor	
Environmental			Minor	
Public safety, including life and property			None	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings							I don't know	Unable to provide				
Time savings description							Authoritative, accessible data would result in time savings in the siting, design and permitting of oyster reefs. Authoritative, accessible data would result in time savings in the siting, design and permitting of oyster reefs. This applies to all benefits.					
Cost savings/cost reduction							I don't know	Unable to provide				
Cost avoidance							I don't know	Unable to provide				
Increased revenues							None					
Mission-driven performance improvements							Major	Unable to provide				
Mission-driven performance improvements description							Ultimately, the probability of success of the oyster reef restoration would be increased by better data. Better and more efficient planning and implementation of oyster reef restoration.					
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services							None					
Improved response or timeliness							I don't know	Unable to provide				
Improved response or timeliness description							Permit reviewers would be more confident in data submitted.					
Improved customer experience							None					
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach							Moderate					
Education or outreach description							Oyster reefs can be used as educational examples. Increased benefits to the community and volunteer opportunities.					
Environmental							Major					
Environmental description							Healthy oyster reefs provide numerous benefits					
Public safety, including life and property							I don't know					
Public safety, including life and property description							Oyster reefs have the potential to buffer the shoreline					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps			Yes	
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness			Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Coral Reef Conservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type			Required	Required
Geographic Area Requirements			Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Coral Reef Conservation
MCA Title	Coral Reef Conservation
MCA ID	21547
Organization Type	State or U.S. Territorial government
Organization Name	Florida Dept of Environmental Protection
Sub-Agency or Division	
Organization Mission	The vision of the Florida Department of Environmental Protection is to create strong community partnerships, safeguard Florida's natural resources and enhance its ecosystems. The department is focusing on six strategic goals to help achieve this vision: Focus taxpayer resources on projects that provide a direct benefit to the environment and local communities. Establish and consistently use clear metrics to evaluate and strengthen the department's programs, activities and services. Partner with communities and businesses to protect natural resources and promote economic growth. Improve the quality of natural resources through long-term planning, restoration and maintenance. Empower employees to solve problems through innovation and efficiency. Proactively communicate a clear and consistent message both internally and externally
Program Name	Coral Reef Conservation Program
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Not required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Coral outcrops.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order			QL2B	Order 1
Update Frequency			Annually	Annually
Event type(s)				
Quality Level and/or update frequency variability across AOI				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Horizontal Error			Up to 5 meters	Up to 5 meters
Acceptable Vertical Error			Up to 40 cm	Less than 1 meter
How far onshore needed			To MHW	
How far down the beach profile needed			To MHW	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season			Highly desirable	Highly desirable		Highly desirable
Entire AOI under same environmental conditions			Highly desirable	Highly desirable		Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless			Not required	Not required		Not required
DEM for entire AOI needs to be seamless			Nice to have	Nice to have		Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM			Nice to have	Nice to have
DTM			Highly desirable	Highly desirable
DEM			Required	Required
Raw point cloud data			Not required	Not required
Classified point cloud			Nice to have	
Edited/cube XYZ			Not required	Not required
Full waveform			Not required	Not required
Bathymetric Attributed Grid (BAG)			Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening				
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery			Highly desirable	Highly desirable
Ground control/ground truthing			Nice to have	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	Nice to have
Nautical and/or navigation charts			Nice to have	Nice to have
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery			Highly desirable	Highly desirable
Underwater videography			Highly desirable	Highly desirable
Bottom texture			Required	Required
Bottom type			Required	Required
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data			Not required	Not required
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Not required	Not required
Tide/wave heights			Not required	Not required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries				
Routes			Not required	Not required
Offshore cadastral			Not required	Not required
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates			Not required	
Land use/land cover			Not required	Not required
Wetlands			Not required	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Not required	Not required
Inland surface water features			Not required	
Bridges/culverts				
Landmark features			Not required	
Cultural resources			Not required	
Coastal and riverine structures			Nice to have	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used			ArcGIS NOAA bathymetry data from the 40K charts	ArcGIS NOAA bathymetry data from the 40K charts
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings			None	None
Cost savings/cost reduction			None	None
Cost avoidance			Minor	Minor
Increased revenues			None	None
Mission-driven performance improvements			None	None

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services			None	None
Improved response or timeliness			None	None
Improved customer experience			None	None
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach			None	None
Environmental			Moderate	Moderate
Public safety, including life and property			Moderate	Moderate

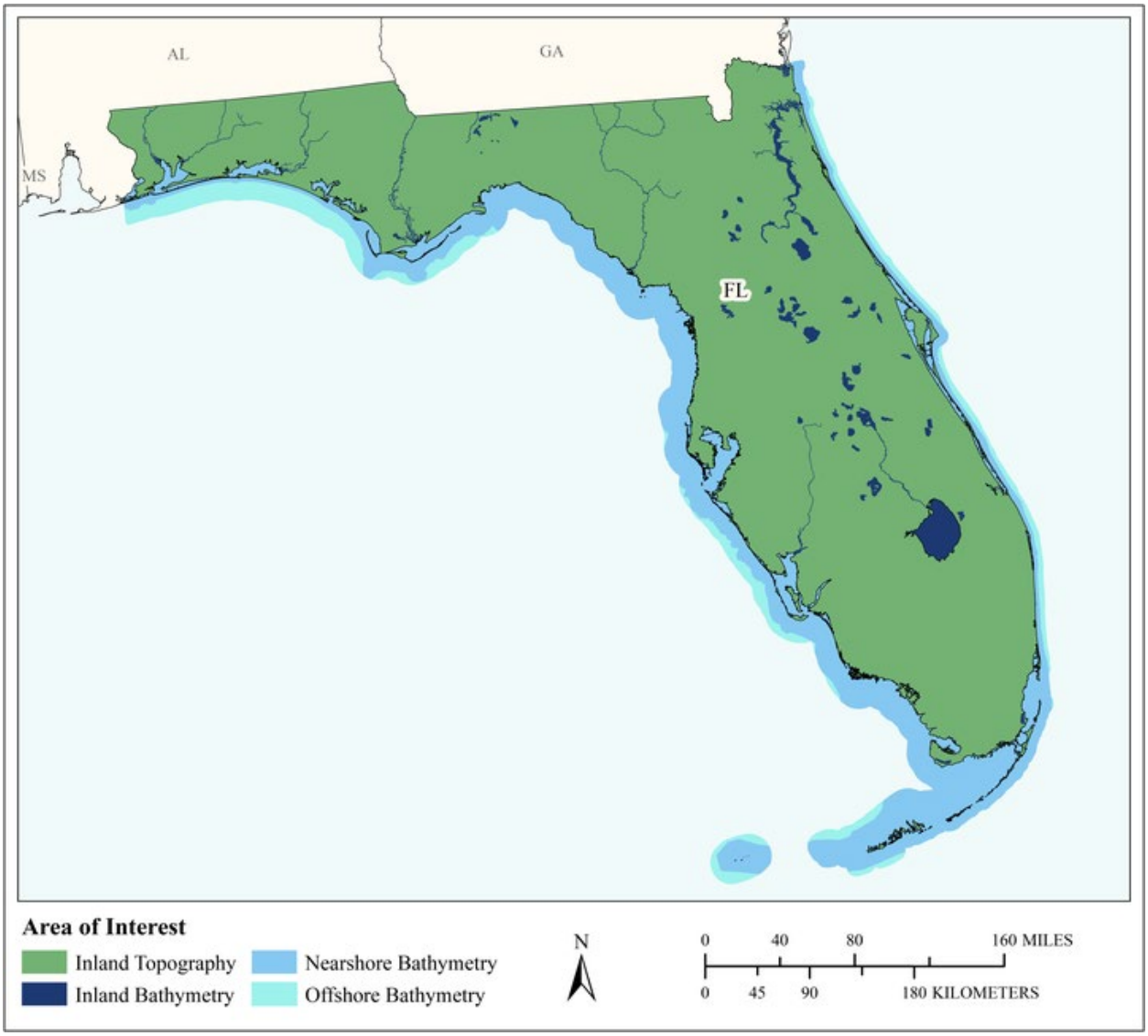
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings							Moderate	Annual dollars saved/realized	$1,206	Moderate	Annual dollars saved/realized	$1,206
Time savings description							Coordinating projects from one common base map.			Coordinating projects from one common base map.		
Cost savings/cost reduction							I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance							I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues							Major	Unable to provide		Major	Unable to provide	
Increased revenues description							Ability to scientifically map and track the growth or die off of existing natural coral populations and to track introduced populations.			Ability to scientifically map and track the growth or die off of existing natural coral populations and to track introduced populations.		
Mission-driven performance improvements							Major	Annual percent improvement	50%	Major	Annual percent improvement	50%
Mission-driven performance improvements description							Better reference maps would allow for 3D modelling and reference to other geospatial data that act as model inputs for multiple branches of coral study science.			Better reference maps would allow for 3D modelling and reference to other geospatial data that act as model inputs for multiple branches of coral study science.		
Other operational benefits							Major	Annual dollars saved/realized	$3,618	Major	Annual dollars saved/realized	$3,618
Other operational benefits description							May eliminate the need for staff to take individual site measurements.			May eliminate the need for staff to take individual site measurements.		
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services							Major	Unable to provide		Major	Unable to provide	
Value added to products or services description							Enhancements to our SE Coral Reef Protection anchorage mobile app.			Enhancements to our SE Coral Reef Protection anchorage mobile app.		
Improved response or timeliness							Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience							Major	Unable to provide		Major	Unable to provide	
Improved customer experience description							More reef protection apps could be created based on more accurate data modelling. Shared via the DEP open Data Portal or through the State GIO office. A comprehensive, shared bathymetric reference would improve data sharing and confidence in modelling results between public and private stakeholders.			More reef protection apps could be created based on more accurate data modelling. Shared via the DEP open Data Portal or through the State GIO office. A comprehensive, shared bathymetric reference would improve data sharing and confidence in modelling results between public and private stakeholders.		
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach							Moderate			Moderate		
Environmental							Major			Major		
Environmental description							This data set would provide an important reference for mapping and researching the impacts of climate change, pollution, and tourism on Florida SE Coral Reefs and the part they play in tourism in the Florida Keys.			This data set would provide an important reference for mapping and researching the impacts of climate change, pollution, and tourism on Florida SE Coral Reefs and the part they play in tourism in the Florida Keys.		
Public safety, including life and property							I don't know			I don't know		
Other												
Other benefits							Minor			Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other description			Support State Park efforts in educating tourists and visitors about the coral reef resource.	Support State Park efforts in educating tourists and visitors about the coral reef resource.

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	Yes
Contours			Yes	Yes
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Wildlife and Habitat Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation planning for wildlife refuges and marine sanctuaries. Conservation of critical habitats. Management of diverse migratory bird habitats, coral reef and coral communities, marine mammals, protected fish species, and trust resources. Elevation data provide opportunities for modeling large, temporally consistent regions and save money on individual collection projects.
MCA Title	Wildlife and Habitat Management
MCA ID	60081
Organization Type	State or U.S. Territorial government
Organization Name	State of Florida
Sub-Agency or Division	Florida Wildlife Conservation Commission
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required

Inland Bathy Feature Size Requirements	Response
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B	QL0B	Special Order
Update Frequency	4-5 years	4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 2 meters	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DTM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Nice to have	Nice to have	Highly desirable
Classified point cloud	Highly desirable	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Highly desirable
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Highly desirable	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Not required	Nice to have
Lease areas			Not required	Nice to have
Fixed obstructions			Nice to have	Highly desirable
Floating observation/navigation systems			Nice to have	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Nice to have
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Highly desirable	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Nice to have	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Minor	Moderate
Cost savings/cost reduction	Major	Minor	Minor	Minor
Cost avoidance	Major	Minor	Moderate	Major
Increased revenues	None	Minor	None	None
Mission-driven performance improvements	Moderate	Moderate	Moderate	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate	Minor	Minor

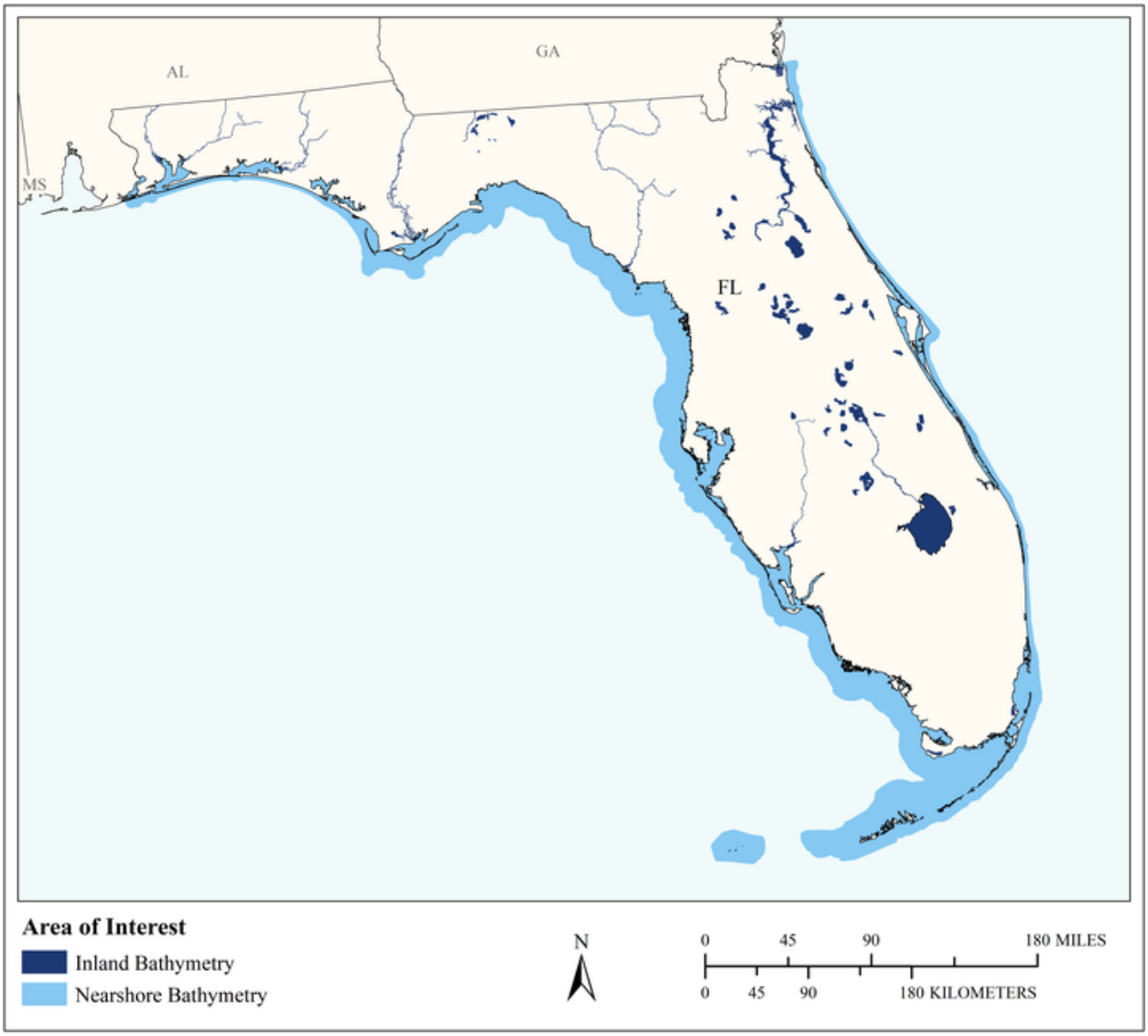
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Minor	Minor	Minor	Minor
Improved customer experience	Minor	Moderate	Minor	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Moderate	Minor	Minor
Environmental	Moderate	Moderate	Moderate	Major
Public safety, including life and property	Minor	Minor	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$13,367		Annual dollars saved/ realized	$107,125		Annual dollars saved/ realized	$12,519		Annual dollars saved/ realized	$3,377
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$38,607		Annual dollars saved/ realized	$64,751		Annual dollars saved/ realized	$740		Annual dollars saved/ realized	$235
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate			Moderate		
Environmental	Major			Moderate			Major			Major		
Public safety, including life and property	Moderate			Moderate			Moderate			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes			Yes
Curvature maps				
Cross sections	Yes			Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Fisheries Management and Aquaculture



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type		Required	Required	
Geographic Area Requirements		One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Management of fisheries. Sustainable aquaculture.
MCA Title	Fisheries Management and Aquaculture
MCA ID	60082
Organization Type	State or U.S. Territorial government
Organization Name	State of Florida
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Nice to have
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order		QL0B	QL0B	
Update Frequency		6-10 years	6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error		Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error		Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season		Highly desirable	Nice to have			Nice to have
Entire AOI under same environmental conditions		Highly desirable	Highly desirable			Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless		Highly desirable	Highly desirable			Highly desirable
DEM for entire AOI needs to be seamless		Required	Highly desirable			Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM		Highly desirable	Highly desirable	
DTM		Highly desirable	Highly desirable	
DEM		Required	Required	
Raw point cloud data		Nice to have	Highly desirable	
Classified point cloud		Nice to have	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform		Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	
Breaklines required for standard hydro-flattening		Highly desirable		
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery		Nice to have	Highly desirable	
Ground control/ground truthing		Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery		Highly desirable	Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data		Nice to have	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates		Highly desirable	Highly desirable	
Land use/land cover		Highly desirable	Nice to have	
Wetlands		Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features		Required	Nice to have	
Bridges/culverts		Highly desirable		
Landmark features		Nice to have	Nice to have	
Cultural resources		Nice to have	Not required	
Coastal and riverine structures		Highly desirable	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings		Major	Moderate	
Cost savings/cost reduction		Moderate	Major	
Cost avoidance		Moderate	Minor	
Increased revenues		Moderate	Minor	
Mission-driven performance improvements		Major	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services		Major	Minor	

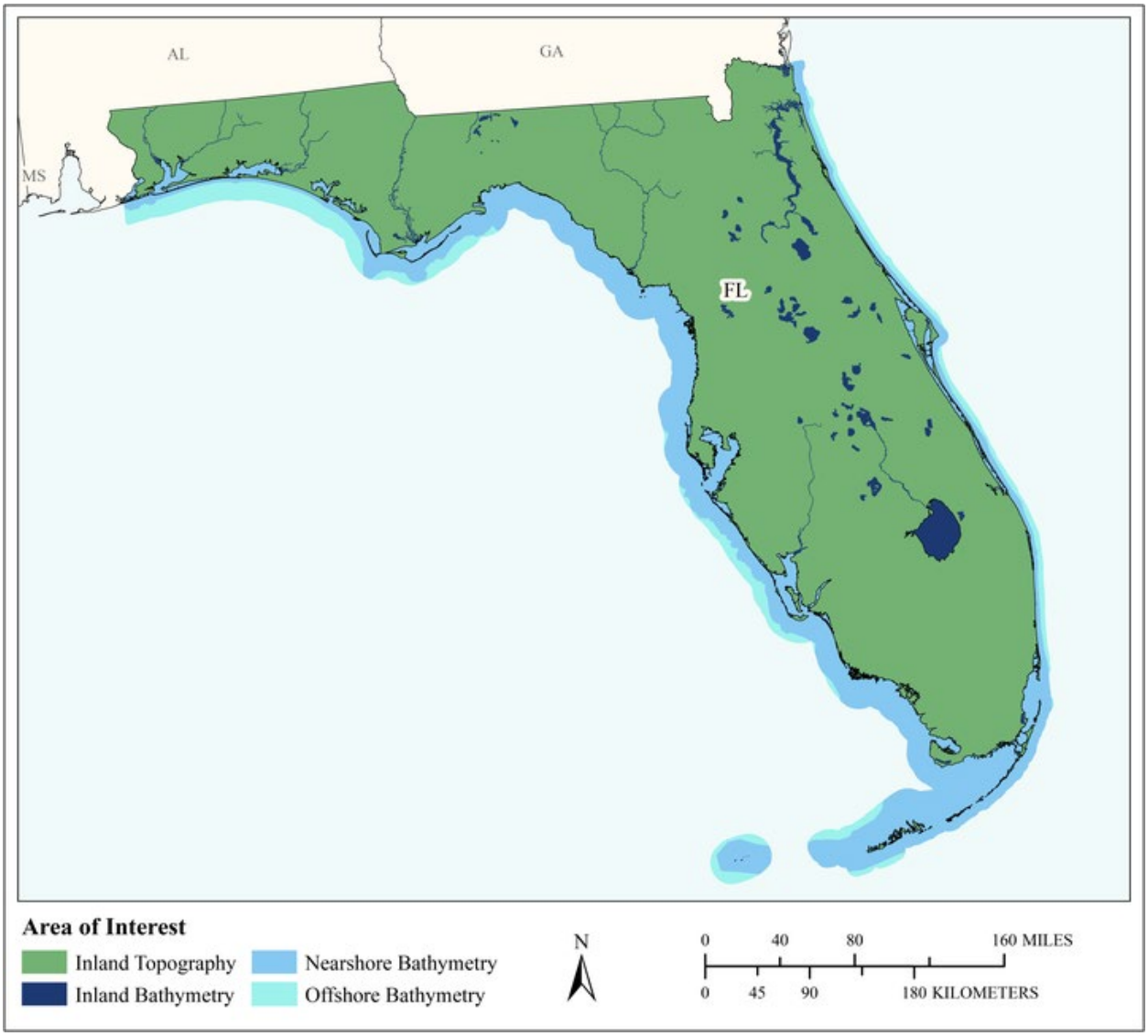
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness		Major	Moderate	
Improved customer experience		Major	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach		Minor	Moderate	
Environmental		Moderate	Moderate	
Public safety, including life and property		Minor	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings				Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction				Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance				Major	Unable to provide		Moderate	Unable to provide				
Increased revenues				None			Minor	Unable to provide				
Mission-driven performance improvements				Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation					Annual dollars saved/ realized	$112,281		Annual dollars saved/ realized	$1,986,254			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services				Major	Unable to provide		Minor	Unable to provide				
Improved response or timeliness				Major	Unable to provide		Major	Unable to provide				
Improved customer experience				Major	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation					Annual dollars saved/ realized	$51,103		Annual dollars saved/ realized	$145,874			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach				Major			Moderate					
Environmental				Major			Major					
Public safety, including life and property				Moderate			Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours		Yes	Yes	
Hillshades		Yes	Yes	
Slope maps			Yes	
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Mapping of Geological Features and Seafloor Feature Extraction



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Coastal mapping of geological features and seafloor feature extraction. We also have an interest in inland bathymetry in an effort to locate and identify sinkhole lakes and swallets.
MCA Title	Mapping of Geological Features and Seafloor Feature Extraction
MCA ID	33010
Organization Type	State or U.S. Territorial government
Organization Name	Florida Geological Survey
Sub-Agency or Division	
Organization Mission	The Florida Geological Survey (FGS) collects, archives, interprets and distributes geologic information to benefit the environment and Florida's communities. The FGS uses geologic, hydrogeologic and related data, as well as mapping and modeling to improve understanding of water and mineral resources, and geological hazards such as sinkholes. Our geoscience products support initiatives related to water-resource conservation and management, improvement of the quality of natural resources, and promotion of economic growth. The FGS is committed to continuously increasing the amount and quality of geoscience data and making it available to the public. Collaboration with local, state, and federal agency partners ensures a robust and cost-efficient approach to addressing Florida's environmental concerns.
Program Name	Geologic Investigations section, STATEMAP program
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 06 - Natural Resources Conservation
Tertiary Business Use	BU 01 - Water Supply and Quality

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Land forms such as sinkholes, swallets and offshore karst
Description of smallest 3D features	Room sized sinkholes, so 2meters or so in diameter and larger. Finer grained would be welcomed but not necessary.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL1B	Order 1a
Update Frequency	6-10 years	6-10 years	6-10 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Less than 50 cm	Less than 50 cm	Up to 5 meters
Acceptable Vertical Error	Up to 10 cm	Less than 10 cm	Up to 20 cm	Less than 1 meter
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed	To MHHW		Below MLLW	
Tide correction requirement			No requirement for tide correction	No requirement for tide correction
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Required	Highly desirable		Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	I don't know		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DTM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Not required	Not required	Not required	Not required
Classified point cloud	Nice to have	Not required	Not required	
Edited/cube XYZ		Not required	Not required	Not required
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Not required	Not required	Not required

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)			Not required	Not required
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Nice to have
Ground control/ground truthing	Highly desirable	Not required	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Nice to have	Nice to have
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required	Required	Highly desirable	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Highly desirable	Highly desirable
Bottom type			Required	Required
Submerged features			Required	Required
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Required	Required	Required	Required
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Not required	Not required
Tide/wave heights			Not required	Not required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Not required	Not required
Boundaries			Not required	Not required
Routes			Not required	Not required
Offshore cadastral			Not required	Not required
Lease areas			Not required	Not required
Fixed obstructions			Not required	Not required
Floating observation/navigation systems			Not required	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Nice to have	Nice to have	Nice to have	Nice to have
Wetlands	Nice to have	Nice to have	Nice to have	Nice to have
Estuaries			Nice to have	Nice to have
Inland surface water features	Required	Required	Nice to have	
Bridges/culverts	Not required	Not required		
Landmark features	Not required	Not required	Not required	
Cultural resources	Not required	Not required	Not required	
Coastal and riverine structures	Nice to have	Nice to have	Nice to have	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	State lidar	Best available	QL1	Best available
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	Yes
NCEI			Yes	Yes
Open Topography				
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Florida			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings		Minor	Minor	Minor
Cost savings/cost reduction		None	Moderate	Moderate
Cost avoidance		None	None	None
Increased revenues		None	None	None

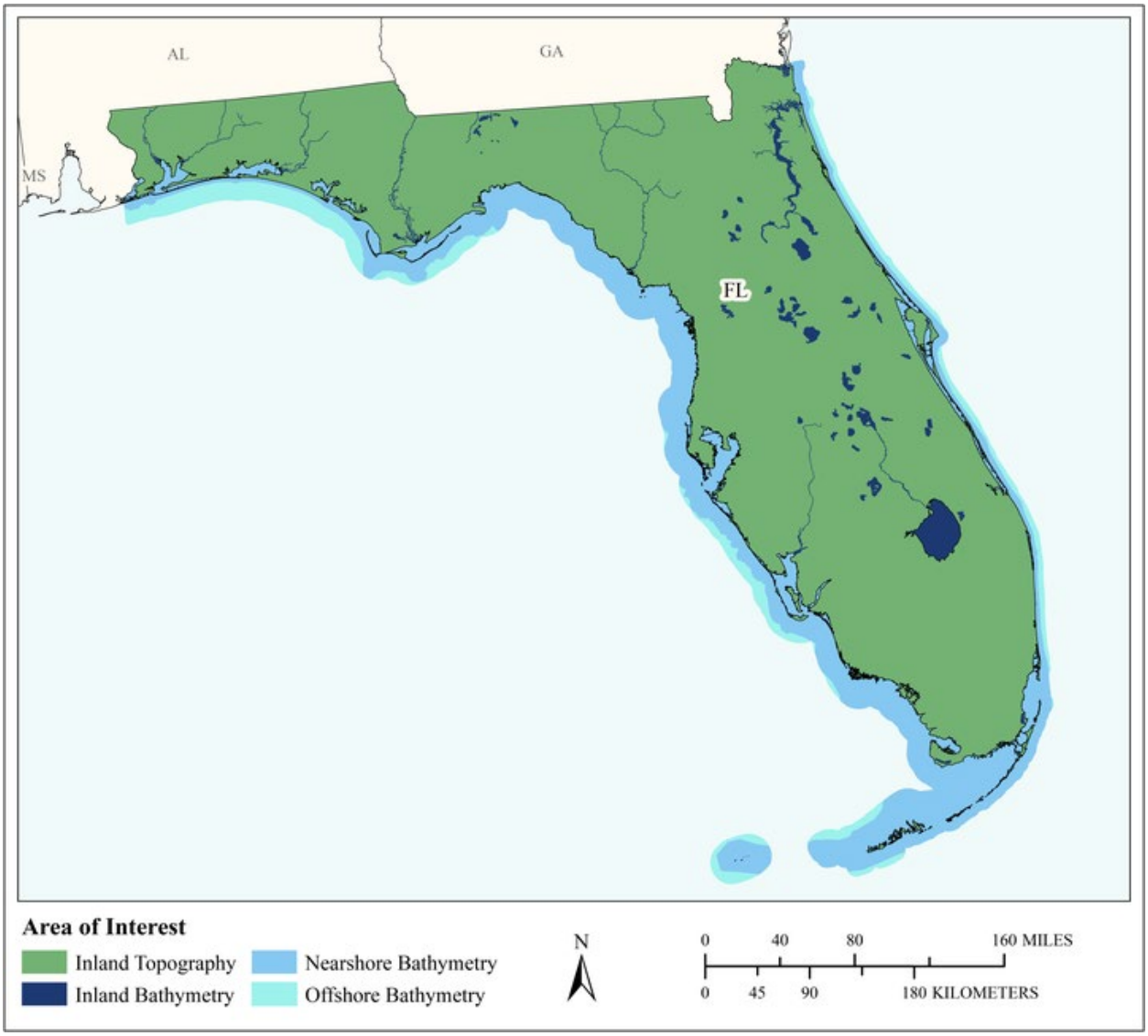
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Mission-driven performance improvements		Minor	Moderate	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services		Minor	I don't know	I don't know
Improved response or timeliness		None	I don't know	I don't know
Improved customer experience		Minor	I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach		None	Minor	Minor
Environmental		Minor	Minor	Minor
Public safety, including life and property		None	Minor	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Moderate	Annual dollars saved/realized	$13,568	Moderate	Annual dollars saved/realized	$12,060	Moderate	Unable to provide	
Time savings description				Will make field teams more efficient at planning trips. Hours saved from reduced or avoided data manipulation. Features will still need to be field verified and notes taken. More resolution of geomorphology.			Must verify field points and features.					
Cost savings/cost reduction	None			None			Moderate	Annual dollars saved/realized	$3,015	Moderate	Unable to provide	
Cost savings/cost reduction description				We have no budget for this type of data collection.								
Cost avoidance	Major	Unable to provide		Major	Annual dollars saved/realized	$18,090	Moderate	Annual dollars saved/realized	$6,030	Moderate	Unable to provide	
Cost avoidance description				At a statewide level it would take a lot of staff time to process data.								
Increased revenues	None			None			None			None		
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Annual percent improvement	18%	Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements description				More efficient mapping. Better mapping and identification of features.								
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide		Minor	Annual dollars saved/realized	$3,015	Minor	Unable to provide		Minor	Unable to provide	
Value added to products or services description				Better identification of geologic hazards.								
Improved response or timeliness	Moderate	Unable to provide		Moderate	Annual dollars saved/realized	$6,030	None			None		
Improved response or timeliness description				Better identification of geologic hazards.								
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			Minor			Minor		
Education or outreach description	Better communication of environments			Better communication of environments								
Environmental	Moderate			Moderate			Minor			Minor		
Environmental description	Improved mapping			Improved mapping								
Public safety, including life and property	Moderate			Moderate			Minor			Minor		
Public safety, including life and property description	Better identification of geologic hazards			Better identification of geologic hazards								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Discovery, Analysis, and Preservation of Cultural and Historical Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Discovery and analysis of underwater archaeological and historical cultural sites. Site protection and preservation planning. Discovery and analysis of Native American and other historical cultural sites and subsistence activities. Elevation data support location and protection of Native American Midden mounds which are located on Florida's coastline and are impacted by hurricanes and sea level rise.
MCA Title	Discovery, Analysis, and Preservation of Cultural and Historical Resources
MCA ID	1235
Organization Type	State or U.S. Territorial government
Organization Name	Florida Division of Historical Resources
Sub-Agency or Division	
Organization Mission	To manage, protect and investigate historical and archaeological resources for the State of Florida
Program Name	Florida Bureau of Archaeological Research and Florida Bureau of Historic Preservation
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Not required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Small structures and landscape features such as a small mounds, underwater archeological sites

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	Order 1
Update Frequency	>10 years	>10 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter	Up to 1 meter	Up to 1 meter
Acceptable Vertical Error	Up to 20 cm	I don't know	Up to 20 cm	Less than 1 meter
How far onshore needed			To MHW	
How far down the beach profile needed	To MLLW		Below MLLW	
Tide correction requirement			I don't know	I don't know
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required	Not required	Not required	Not required	Not required
Entire AOI under same environmental conditions	Nice to have	Not required	Nice to have	Nice to have	Not required	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Not required	Nice to have	Nice to have	Not required	Not required
DEM for entire AOI needs to be seamless	Nice to have	Not required	Nice to have	Nice to have	Not required	Not required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	Required
DTM	Required	Required	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Not required	Not required	Not required	Not required
Classified point cloud	Not required	Not required	Not required	
Edited/cube XYZ		Not required	Not required	Not required
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Not required	Not required	Not required
Breaklines required for standard hydro-flattening	Not required	Not required		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Not required	Not required
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Nice to have	Not required	Not required	Not required
Ground control/ground truthing	Not required	Not required	Not required	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Highly desirable		
Land use/land cover	Nice to have	Nice to have		
Wetlands	Not required	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have	Highly desirable		
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Highly desirable		
Cultural resources	Required	Required		
Coastal and riverine structures	Nice to have	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	State lidar	Best available	Best available	Best available
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast		Yes	Yes	Yes
NCEI				
Open Topography				
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Florida			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know	I don't know	I don't know	I don't know
Cost savings/cost reduction	I don't know	I don't know	I don't know	I don't know
Cost avoidance	I don't know	I don't know	I don't know	I don't know
Increased revenues	None	I don't know	I don't know	I don't know
Mission-driven performance improvements	Moderate	I don't know	I don't know	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know	I don't know	I don't know	I don't know

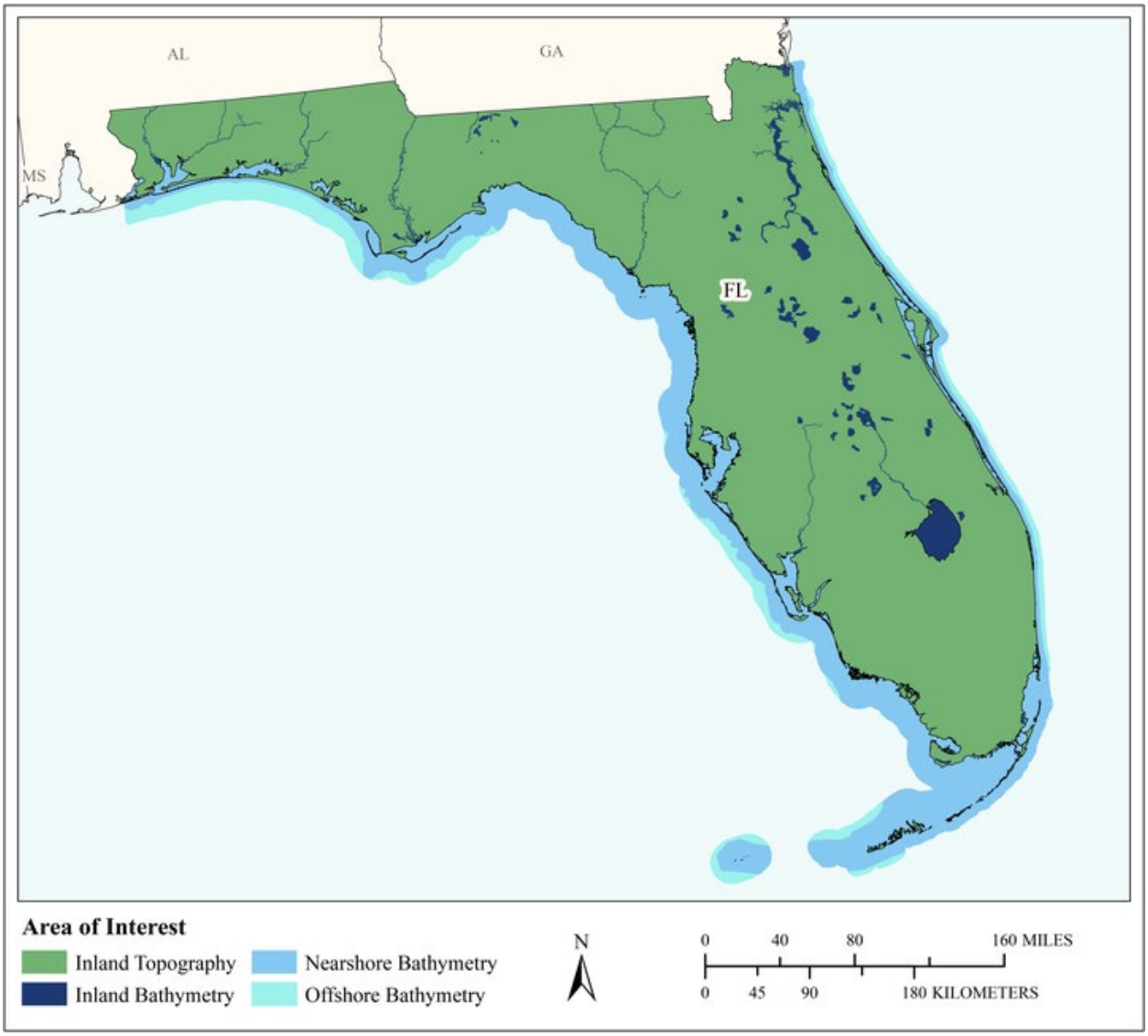
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	I don't know	I don't know	I don't know	I don't know
Improved customer experience	I don't know	I don't know	I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	I don't know	I don't know	I don't know
Environmental	I don't know	I don't know	I don't know	I don't know
Public safety, including life and property	I don't know	I don't know	I don't know	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	None			I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Minor	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues	None			I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$10,285		Annual dollars saved/ realized	$24,665		Annual dollars saved/ realized	$36,186		Annual dollars saved/ realized	$8,314
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Minor	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Minor	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$8,992									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			I don't know			I don't know			I don't know		
Environmental	Minor			I don't know			I don't know			I don't know		
Public safety, including life and property	None			I don't know			I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Managing and Protecting Water Resources for Flood Control, Water Supply, Water Quality and Natural Systems



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Managing and protecting the water resources of Florida by balancing and improving flood control, water supply, water quality and natural systems. Elevation data are needed for modeling sea level rise, planning flood control structures, and storm surge modeling (use NOAA models). Having elevation data improves products, improves work efficiency, and ultimately promotes better decisions. Plus having the data readily available in emergency situations such as flooding and hurricanes is invaluable. Also, Minimum Flow & Levels (MFL) projects would benefit significantly from high resolution lidar bathymetry data and DEM surfaces. MFL is conducted on the most significant rivers and major lakes and springs. Some of the springs are less than 0.1 acre and are over 30 feet deep. These springs play a major role in our studies and applications for water quantity, quality, and flow modeling and measuring. In addition, the lidar bathymetry data would play a significant role in improving the FEMA modeling for determining and improving accuracy for the FEMA flood hazard areas related to the rivers and lakes. A continuous integrated surface model for Florida would support evaluation of sea level rise impacts to Florida and local drainage district water management system operations including impacts to water supply, water quality, and natural systems. Inland bathymetry, particularly for Lakes Okeechobee, Lake Istokpoga, the restored Kissimmee River, and the Kissimmee Chain of Lakes is important to the ability to manage flows and levels in a way that balances and improves flood control, water supply, water quality, and natural systems. Wetland topography, best captured under low water / drought conditions, is important for estimating storage and evaluating hydrologic requirements for wetland sustainability and resiliency. The water management districts and FDEP have responsibility to manage/regulate runoff quantity and quality. To do so, topobathymetric data are needed to model, predict, and visualize as-is and to-be landscapes. Public availability of these data will allow the districts to request and expect more from permit applicants and support better planning and decision making across all governmental agencies.
MCA Title	Managing and Protecting Water Resources for Flood Control, Water Supply, Water Quality and Natural Systems
MCA ID	22151
Organization Type	Regional, County, City, or other local government
Organization Name	Florida Water Management Districts
Sub-Agency or Division	
Organization Mission	The Florida Water Management Districts are regional governmental agencies that manage the water resources for the state. They are responsible for managing and protecting water resources by balancing and improving flood control, water supply, water quality and natural systems.
Program Name	Water Management Operations including Emergency Management, Water Control Structure Operations, H&H Modeling, Infrastructure Management, and Engineering and Construction
Total Annual Program Budget	$1,273,110,368
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 01 - Water Supply and Quality
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required
Other	Highly desirable
Other description	Hard-bottom features (oyster bars)

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Water control structure, i.e. culvert; Building rooftops (driplines) >= 200 sq. ft. Submerged Aquatic Vegetation >= 10,000 sq. ft.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B	QL2B	Order 1
Update Frequency	4-5 years	4-5 years	4-5 years	4-5 years and certain events.
Event type(s)				After major storms to understand bottom changes

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI	QL1 meets most requirements but in difficult areas such as wetlands or thick vegetation areas QL1 HD may be needed just to get enough points to through to create a bare earth DEM that meets specifications			
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need
Acceptable Vertical Error	Up to 10 cm	Less than 10 cm	Less than 10 cm	Less than 1 meter
How far onshore needed			1 kilometer inland	
How far down the beach profile needed	Below MLLW		To MLLW	
Tide correction requirement			MLLW	MLLW
Cross sections and/or transects meet needs		Partial		
Cross section/transect requirement		We typically collect stream profiles at 100 - 400' intervals. Sampling distance along transects vary but generally around 10 - 25 '		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Highly desirable	Required		Highly desirable	Required
Entire AOI under same environmental conditions	Required	Required	Required		Required	Required
Other	Highly desirable					

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Other description	It would be highly desirable to have all the data collected leaf off and dry but if ground conditions are nor dry it is better to wait until it is dry. When wet you get poor or no return on points from the ground. We believe leaf conditions have less of an impact then wet ground conditions. It will also be highly desirable to have streamflow at normal or below normal levels/flows as to get more bare earth point returns. But do not want collection when above normal since that area covered with water would be no data areas if collected.					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required		Required	Required
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Highly desirable	Not required
DTM	Required	Required	Required	Not required
DEM	Required	Required	Required	Required
Raw point cloud data	Required	Required	Required	Nice to have
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Required	Highly desirable	Not required
Full waveform	Nice to have	Required	Required	Nice to have
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	Not required
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Required	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Not required
Intensity imagery/sidescan imagery	Required	Required	Required	Highly desirable
Ground control/ground truthing	Required	Required	Required	Required
Other		Required		
Other description		Signed and sealed Survey		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Not required
Nautical and/or navigation charts			Highly desirable	Not required
Acoustic imagery of the seafloor			Highly desirable	Not required
Aerial and/or satellite imagery	Required	Required	Required	Highly desirable
Underwater videography			Highly desirable	Not required
Bottom texture			Highly desirable	Not required
Bottom type			Highly desirable	Not required
Submerged features			Highly desirable	Not required
Subbottom characteristics			Highly desirable	Not required
Geologic and seismic data	Highly desirable	Required	Highly desirable	Not required
Water column properties - Physical			Highly desirable	Not required
Water column properties - Chemical			Highly desirable	Not required
Water column properties - Biological			Highly desirable	Not required
Currents			Nice to have	Not required
Tide/wave heights			Required	Highly desirable
Sea ice conditions			Not required	
Habitat distribution and classification			Required	Not required
Boundaries			Highly desirable	Not required
Routes			Nice to have	Not required
Offshore cadastral			Nice to have	Not required
Lease areas			Nice to have	Not required
Fixed obstructions			Highly desirable	Not required
Floating observation/navigation systems			Highly desirable	Not required
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Required	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Nice to have
Wetlands	Required	Required	Required	Required
Estuaries			Required	Required
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Not required	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	SFWMD LiDAR areas of interest to complete acquisition of QL2 or better data throughout our areas of interest are in the 3DEP Sea Sketch LiDAR mapping applications. Acquisition of QL2 or better data initiated in 2015. Data collected prior to that date were more than 7 years old with quality levels worse than QL3; Currently the SWFWMD has a mixture of QL2 and QL3 elevation for the greater portion of the AOI. Two counties (Hillsborough and Pasco) were collected in FY2017 at QL1+, however, the State of Florida will be updating the remaining counties in the SWFWMD to QL1 in FY2019.	Gridded soundings and shoreline / littoral zone cross sections processed into DEM	We have very limited nearshore bathymetry data collected for project purposes	We have very limited nearshore bathymetry data collected for project purposes
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes		Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other	Yes	Yes	Yes	Yes
Other description	SFWMD repository; Other Water Management Districts and State agencies (DEP, DOT, FWC)	SFWMD and USACE acquired data; In house contracting survey	Project specific data only	Project specific data only
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	None
Cost savings/cost reduction	Major	Major	Major	None
Cost avoidance	Major	Major	Major	None
Increased revenues	None	Moderate	Moderate	None
Mission-driven performance improvements	Major	Moderate	Major	None
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	None
Improved response or timeliness	Major	Major	Moderate	None
Improved customer experience	Major	Moderate	Moderate	None
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Moderate	None
Environmental	Major	Moderate	Moderate	None
Public safety, including life and property	Major	Moderate	Minor	Minor
Other Current Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other	Major		Major	
Other description	Decreased time required for permit approval		For water quality, quantity, and flow modeling we are searching for fresh water springs in the near shore area. LIDAR bathymetric data would be a major help in locating these unknown springs.	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$2,504,681	Major	Annual dollars saved/realized	$933,866	Major	Annual dollars saved/realized	$608,548	Minor	Unable to provide	
Time savings description	SFWMD: 5% of Modeling, Surveying, & Engineering FTE; SWFWMD: Field inspections avoided by Environmental Resource Permitters, 8 staff, 10 hrs/wk. Scaled up to statewide. SFWMD: 5% of Engineering, Surveying, & Regulation Permitting FTE; SWFWMD: 8 permitters saving 1 hour/day (probably an underestimate). Scaled up to statewide. SWFWMD: Preparing data for desktop review. Scaled up to statewide. SFWMD: 5% of Modeling, Surveying, & Engineering FTE; SWFWMD: Determining watersheds for modeling, cost estimation. Scaled up to statewide. SFWMD: 50% of 1 FTE; SWFWMD: Preparing data for desktop review, 3 watersheds/year (on average), 40 hrs/watershed. Scaled up to statewide. SFWMD: 5% of Modeling, Surveying, & Engineering FTE; SWFWMD: Desktop review for watershed modeling, 3 watersheds/year (on average), 160 hrs/watershed. Scaled up to statewide.			SFWMD: 5% of 50 FTE involved or supporting water control operations and maintenance; SWFWMD: 3 watersheds/year @ 50 hrs/watershed. Scaled up to statewide. SWFWMD: 3 watersheds/year @ 50 hrs/watershed. Scaled up to statewide.			SWFWMD: Actually biannual, we map every other year (0.5 FTE). Scaled up to statewide. SFWMD: 5% of 25 FTE involved in operational planning and maintenance of coastal structures; SWFWMD: Actually biannual, we map every other year (0.5 FTE). Scaled up to statewide.					
Cost savings/cost reduction	Major	Annual dollars saved/realized	$37,823,500	Major	Annual dollars saved/realized	$3,214,250	Major	Unable to provide		None		
Cost savings/cost reduction description	Suwannee WMD: To use DEM data during natural disasters to determine were to pump water from flooded areas to clear major roads and properties. SFWMD: 5% of Operations, Construction, & Engineering Costs; SWFWMD: On average we spend $100,000/watershed for 3 watersheds/year. Scaled up to statewide.			SFWMD: Estimated from previous inland lake bathymetry acquisition costs for Lake Okeechobee, Lake Istokpoga, Kissimmee River, Kissimmee Chain of Lakes; SWFWMD: 3 watersheds/year @ $50k/watershed. Scaled up to statewide.								
Cost avoidance	Major	Annual dollars saved/realized	$598,000	Major	Annual dollars saved/realized	$89,700	Major	Unable to provide		None		
Cost avoidance description	Suwannee WMD: To use DEM data during natural disasters to determine were to evacuate people from rising flood waters. SWFWMD: We reserve approx. $100,000 for hurricane mitigation and cleanup. Scaled up to statewide. SWFWMD: On average we spend $100,000/watershed for 3 watersheds/year. Scaled up to statewide.			SWFWMD: 3 watersheds/year @ $10k/watershed. Scaled up to statewide.								
Increased revenues	Major	Unable to provide		None			Major	Unable to provide		None		
Increased revenues description	Suwannee WMD: Present the DEM data to the public for their own applications.											
Mission-driven performance improvements	Major	Annual percent improvement	56%	Major	Annual percent improvement	22%	Major	Annual percent improvement	24%	Major	Unable to provide	

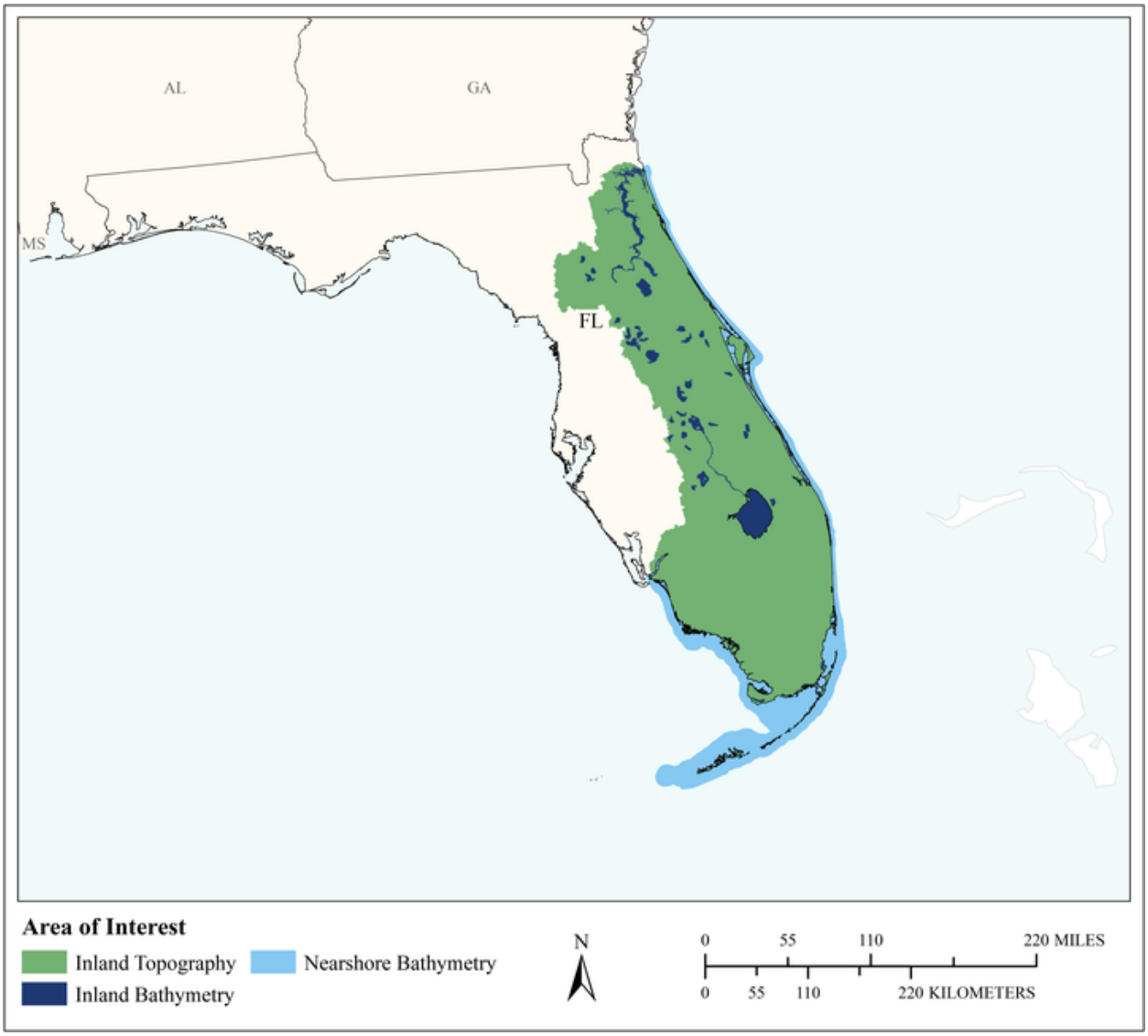
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Mission-driven performance improvements description	SFWMD: Cost and time savings from above will all staff time to be spent on other mission critical tasks; SWFWMD: DTMs are effective in increasing communication to public. SFWMD: Elevation data are critical to water resources planning, design, and emergency response. and District wide current high quality data will allow better assessment, results, and response; SWFWMD: The watershed management program is founded in elevation data and floodplain modeling. SFWMD: Information will be immediately available and activities will not have to be put on hold for data acquisition; SWFWMD: Elevation data are critical to mission.			SFWMD: Operational decision making is about trade-offs and impact minimization. Seamless, consistent topobathymetric data for the water control system will allow water managers and planners to more realistically evaluate operational trade-offs and risks; SWFWMD: We are using profiles and soundings currently. SFWMD: Current data are outdated. Information is critical to operational planning, risk analyses, and modeling. SWFWMD: 3 watersheds/year @ 10% ea.			SFWMD: Total percentage from time savings; SWFWMD: Actually biannual, we map every other year.					
Other operational benefits	Moderate	Annual dollars saved/realized	$65,124	Major	Annual dollars saved/realized	$224,250	Major	Annual dollars saved/realized	$45,074			
Other operational benefits description	SWFWMD: 12 staff engineers @ 10 hrs/ea (just a guess). Scaled up to statewide. SWFWMD: Finished Floor elevations.			Suwannee WMD: Springs and spring runs. SWFWMD: 3 watersheds/year @ $50k/watershed; Suwannee WMD: For water quality, quantity, and flow modeling high resolution 3D inland bathymetric data would play a major role. There are over 400 springs of all magnitude in our District and as small as .1 acre and over 30 feet deep. Scaled up to statewide.			SWFWMD: Actually biannual, we map every other year (0.5 FTE). Scaled up to statewide.					
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$279,386	Major	Annual dollars saved/realized	$10,854	Major	Annual dollars saved/realized	$45,074	Major	Unable to provide	
Value added to products or services description	SWFWMD: Increased efficiency for recreational programs, controlled hunting, and land management. Scaled up to statewide. SWFWMD: 12 civil engineers (modelers) and GIS mappers @ 20hrs/month. Scaled up to statewide.			SFWMD: Current updated information for the water control system will allow water managers and planners to more realistically evaluate operational trade-off and risks; SWFWMD: 3 watersheds/year, maybe 40 hrs/watershed. Scaled up to statewide. SWFWMD: 3 watersheds/year, maybe 40 hrs/watershed. Scaled up to statewide.			SWFWMD: Actually biannual, we map every other year (0.5 FTE). Scaled up to statewide. SFWMD: Will support development of operational planning and decision making tools for better design, management and maintenance of coastal, tidally dependent water management system structures.			Will support development of operational planning and decision making tools for better design, management and maintenance of coastal, tidally dependent water management system structures.		
Improved response or timeliness	Major	Annual dollars saved/realized	$1,064,114	Major	Annual dollars saved/realized	$27,105	Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness description	SWFWMD: 3 GISstaff/3 staff engineers @ 5 hrs/wk. Scaled up to statewide. SWFWMD: 4 staff engineers @ 5 hrs/wk during peak hurricane season (3 months). Scaled up to statewide. SFWMD: 5% of Engineering; SWFWMD: 4 staff engineers @ 5 hrs/wk during peak hurricane season (3 months). Scaled up to statewide. SWFWMD: 3 GIS help staff at 5 hrs/wk. Scaled up to statewide. SWFWMD: 3 watersheds/yr at 40 hrs/watershed preparing public notices, meetings, etc. Scaled up to statewide. SFWMD: 5% of Engineering & Regulation Permitting FTE; SWFWMD: 8 staff engineers at 10hrs/wk. Scaled up to statewide.			SWFWMD: Post hurricane clean-up planning. Scaled up to statewide. SFWMD: Better storage-area-volume tables and visualization and evaluation tools for our water control system; SWFWMD: Post hurricane clean-up planning. Scaled up to statewide. SWFWMD: 3 watersheds/year, maybe 40 hrs/watershed Scaled up to statewide. SFWMD: We are able to provide a better level of service to our citizens and local, county, state, and federal agency partners; SWFWMD: Better flood models. Scaled up to statewide. SFWMD: We will be able to provide more and better information for situational awareness and assessment.			Will support coastal structure operations, maintenance and management; SWFWMD: Mapping for sea grass bed recovery. SWFWMD: Mapping for sea grass bed recovery. SFWMD: Will support coastal structure operations, maintenance and management; SWFWMD: Mapping for sea grass bed recovery.			Will support coastal structure operations, maintenance and management.		
Improved customer experience	Major	Annual dollars saved/realized	$8,547,857	Major	Annual dollars saved/realized	$2,708,525	Major	Annual dollars saved/realized	$1,019,613	Moderate	Unable to provide	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved customer experience description	SFWMD: Total of hours savings realized through use of data and tools; SWFWMD: 3 watershed/year at 40 hrs/watershed. Scaled up to statewide. SFWMD: 50% of an FTE; SWFWMD: One GIS staff filling records requests (10 hrs/wk). Scaled up to statewide. SFWMD: 2% of all FTE hours; SWFWMD: Web services are required to be public, there would be no additional cost/hourly savings. Scaled up to statewide.	SFWMD: Total of time savings benefits. Scaled up to statewide. SFWMD: Total of time savings benefits; SWFWMD: Public meetings for three watersheds. Scaled up to statewide.	SFWMD: Total of time savings benefit. Scaled up to statewide. SFWMD: Total of time savings benefit; SWFWMD: Public meetings. Scaled up to statewide.	
Other customer service benefits		Major Unable to provide	Major Unable to provide	
Other customer service benefits description				
Societal Benefits	**Benefits**	**Benefits**	**Benefits**	**Benefits**
Education or outreach	Major	Major	Major	Major
Education or outreach description	SFWMD: Improved customer situational awareness of elevation factors affecting local and regional water management, regulation, and restoration activities; SWFWMD: Data would be more available to research students requesting data.	SFWMD: Better data and tools to communicate with stakeholders; SWFWMD: Public meetings for three watershed models.	SFWMD: Better data and tools to communicate with stakeholders; SWFWMD: Mapping for sea grass bed recovery.	Better data and tools to communicate with stakeholders
Environmental	Major	Major	Major	Major
Environmental description	SFWMD: Improved ability to achieve goals and objectives of our environmentally focused program mission; SWFWMD: No additional benefit to what we already provide.	SFWMD: Improved ability to balance flood control, water supply, and natural system operational trade-offs; SWFWMD: Public meetings for three watershed models.	SFWMD: Improved ability to operate and manage coastal structures; SWFWMD: Better sea grass maps.	Improved ability to operate and manage coastal structures
Public safety, including life and property	Major	Major	Major	Major
Public safety, including life and property description	SFWMD: Improved information and efficiencies to accomplish the flood control component of our program mission; SWFWMD: Better delineation of evacuation routes, and repetitive loss.	SFWMD: Improved operation planning and risk assessment; SWFWMD: Public meetings for three watershed models.	SFWMD: Improved operations planning and risk assessment	Improved operations planning and risk assessment
Other				
Other benefits		Major	Major	

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes	Yes	Yes
Hydrologic Flow Accumulation Grids	Yes	Yes	Yes	Yes
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	Yes
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	Yes
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Volusia County Emergency Management and Public Works Support



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)	One or more Hydrologic Units (HUC4s)	Nearshore areas along the coast (including the Great Lakes) off one or more Hydrologic Units (HUC4s)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Volusia County Emergency Management and Public Works Support. As a central office we deal with most of your example Mission Critical Activities. Our group mans the EOC during events, maps wildfires and supports every department within the county.
MCA Title	Volusia County Emergency Management and Public Works Support
MCA ID	22270
Organization Type	Regional, County, City, or other local government
Organization Name	Volusia County
Sub-Agency or Division	
Organization Mission	To nourish good citizenship by promoting democratic values and earning public trust; to respond effectively to citizens' needs for health, safety and general welfare; to allocate limited public resources fairly and efficiently; to provide leadership and high quality service by consistently communicating with the citizens about their needs and aspirations.
Program Name	Local Mitigation Strategy (LMS)
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 23 - Urban and Regional Planning
Tertiary Business Use	BU 28 - Telecommunications

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Structures, significant fence lines

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required

Inland Bathy Feature Size Requirements	Response
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	Cross sections and/or transects meet needs	I don't know	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	
Acceptable Vertical Error	Up to 50 cm	I don't know	I don't know	
How far onshore needed			To the fall line	
How far down the beach profile needed	To MHHW		To MHW	
Tide correction requirement			MHW	
Cross sections and/or transects meet needs	Partial	Yes	Partial	
Cross section/transect requirement	I don't know, please suggest if for QA purposes			

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Nice to have	Nice to have		Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Nice to have	Nice to have		Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Nice to have	Nice to have		Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have	Nice to have	
DTM	Highly desirable	Nice to have	Nice to have	
DEM	Highly desirable	Nice to have	Nice to have	
Raw point cloud data	Nice to have	Nice to have	Nice to have	
Classified point cloud	Nice to have	Highly desirable	Nice to have	
Edited/cube XYZ		I don't know	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			I don't know	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	
Ground control/ground truthing	Required	Required	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Nice to have	Nice to have	Nice to have	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Not required	
Submerged features			Nice to have	
Subbottom characteristics			Not required	
Geologic and seismic data	Not required	Nice to have	Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological				
Currents			Not required	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Not required	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Nice to have	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Required	Highly desirable	
Estuaries			Highly desirable	
Inland surface water features	Highly desirable	Required	Nice to have	
Bridges/culverts	Highly desirable	Required		
Landmark features	Highly desirable	Highly desirable	Nice to have	
Cultural resources	Nice to have	Highly desirable	Highly desirable	
Coastal and riverine structures	Highly desirable	Required	Highly desirable	
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	2006 Volusia County Florida Lidar, Mar 2006, QUALITY LEVEL 3	2006 Volusia County Florida Lidar, Mar 2006, QUALITY LEVEL 3	Very limited site specific data available	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI	Yes			
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Minor	Minor	
Cost savings/cost reduction	Moderate	Minor	Minor	

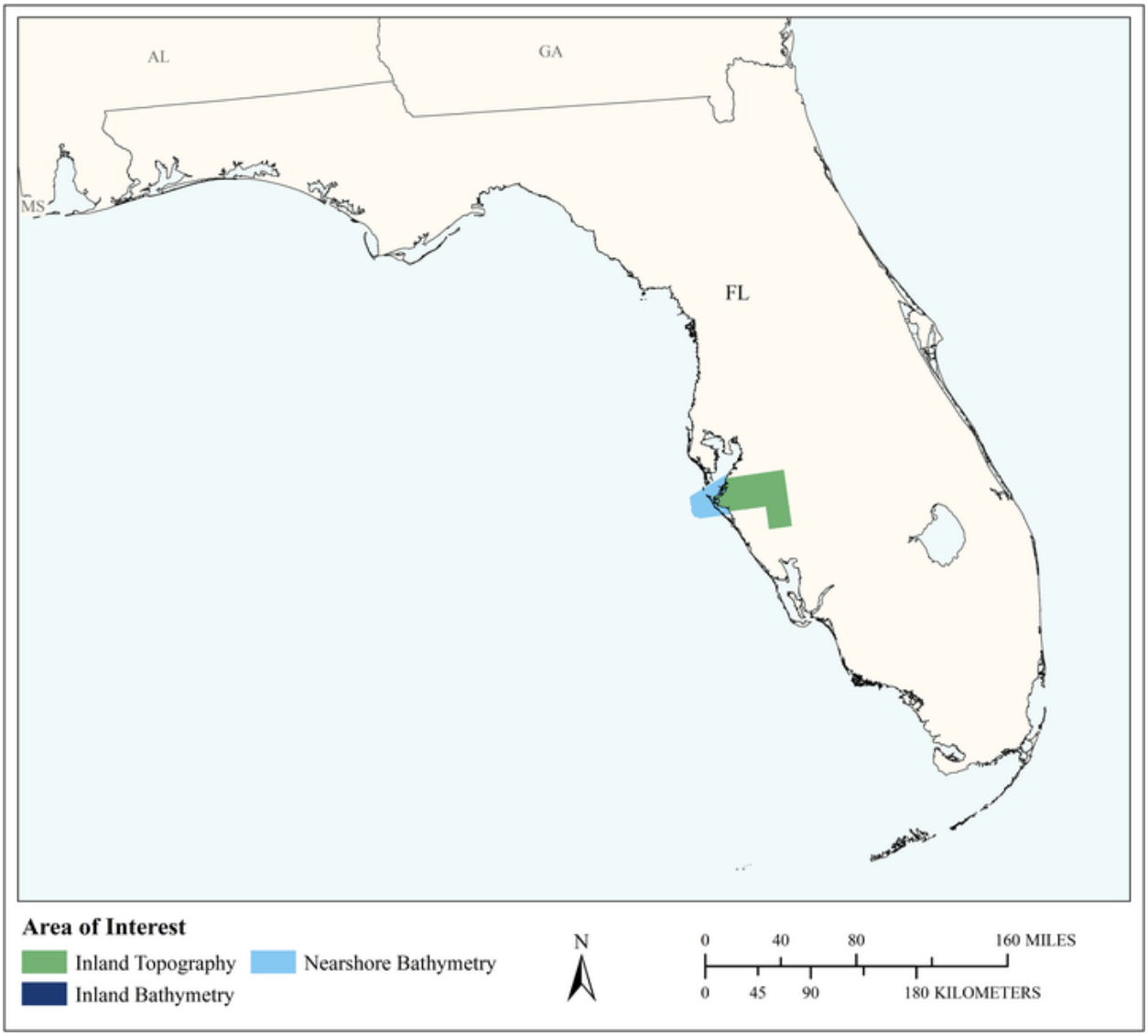
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Cost avoidance	Moderate	Moderate	Minor	
Increased revenues	None	None	None	
Mission-driven performance improvements	Moderate	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor	Minor	
Improved response or timeliness	Moderate	Minor	Minor	
Improved customer experience	Moderate	Minor	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	Moderate	
Environmental	Moderate	Moderate	Moderate	
Public safety, including life and property	Moderate	Minor	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved customer experience	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			I don't know			I don't know					
Environmental	Major			I don't know			I don't know					
Public safety, including life and property	Major			I don't know			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Manatee County Emergency Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements	Manatee County, Fl	Manatee County, Fl	Manatee County, Fl	

MCA Description	Response
Mission Critical Activity	Emergency Management; providing for the safety of Manatee County residents in times of disaster.
MCA Title	Manatee County Emergency Management
MCA ID	22334
Organization Type	Regional, County, City, or other local government
Organization Name	Manatee County
Sub-Agency or Division	
Organization Mission	We work for the Board of County Commissioners. The Board of County Commissioners, together with Manatee County's five constitutional officers, comprise Manatee County Government. The Board of County Commission establishes policy for County departments and appoints the County Administrator who carries out the day-to-day business of the County.
Program Name	Emergency Management
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 01 - Water Supply and Quality
Tertiary Business Use	BU 27 - Recreation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Buildings

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Not required
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL1B	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	
Acceptable Vertical Error	Up to 10 cm	Up to 20 cm	Up to 20 cm	
How far onshore needed			To the fall line	
How far down the beach profile needed	To MHW		To MHW	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Required	Required		Required	Required
DEM for entire AOI needs to be seamless	Highly desirable	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Required	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Nice to have	
Underwater videography			Required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Not required	Not required	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Nice to have	
Land use/land cover	Highly desirable	Highly desirable	Nice to have	
Wetlands	Highly desirable	Highly desirable	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Nice to have	
Inland surface water features	Highly desirable	Highly desirable	Nice to have	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Nice to have	
Cultural resources	Highly desirable	Highly desirable	Nice to have	
Coastal and riverine structures	Highly desirable	Highly desirable	Nice to have	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	2007 FDEM LiDAR, 2005 SWFWMD LiDAR, 2012 SWFWMD Manatee County 1 meter, 2006 SWFWMD Upper Myakka District	NOAA Nautical Chart Data.	Nautical Charts from NOAA	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI	Yes			
Open Topography				
NOAA nautical charts		Yes	Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know	I don't know	None	
Cost savings/cost reduction	I don't know	I don't know	None	
Cost avoidance	Moderate	I don't know	None	

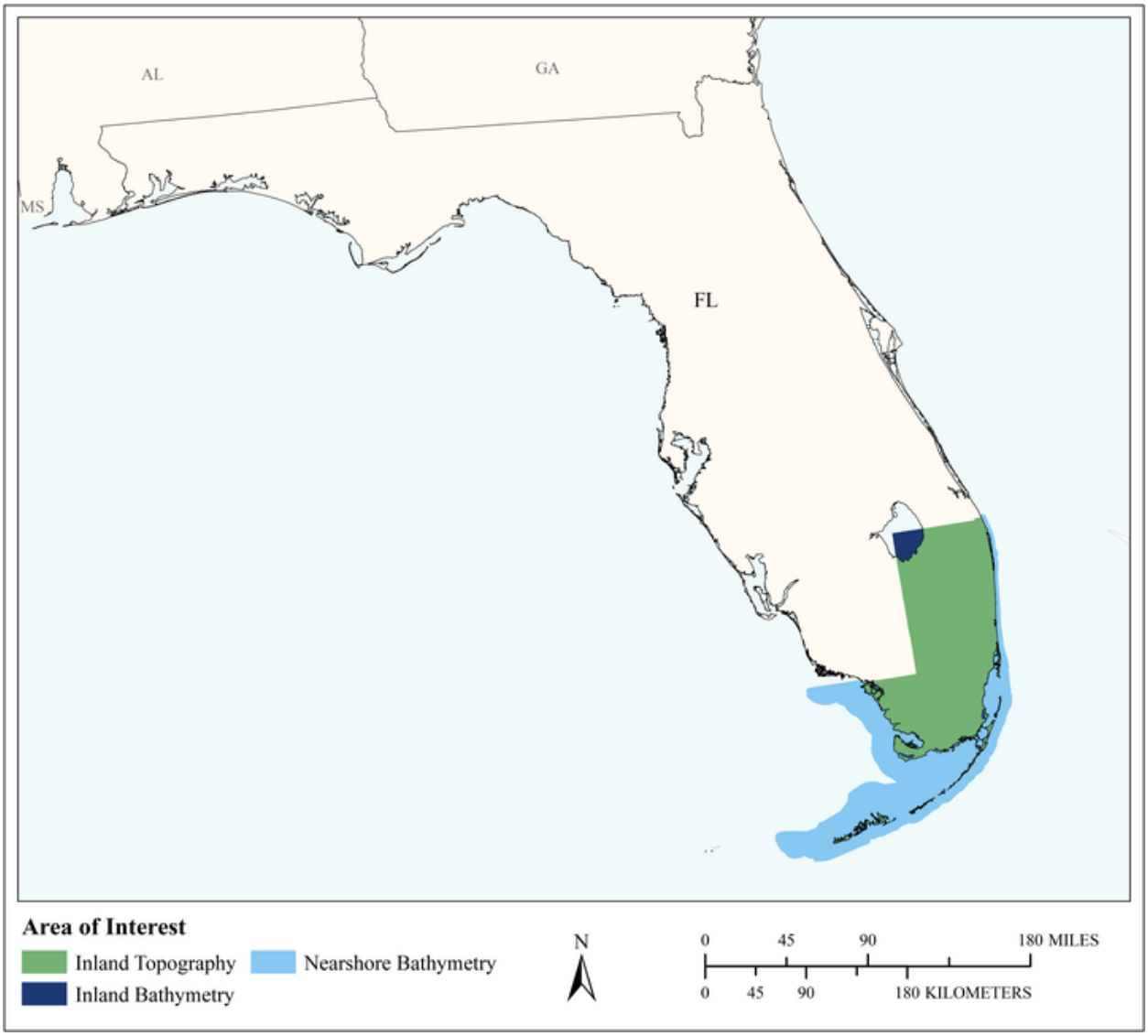
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	I don't know	I don't know	None	
Mission-driven performance improvements	Major	I don't know	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	I don't know	Minor	
Improved response or timeliness	Moderate	I don't know	None	
Improved customer experience	Moderate	I don't know	None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	None	
Environmental	Moderate	Moderate	None	
Public safety, including life and property	Major	Major	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Time savings description	Common source improves consistency. Improved elevation data certainly aids the permitting process. I don't think we do any field visits currently. This would save time in having to combine data from multiple sources. Not sure what is meant by in-office project planning or monitoring.											
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction description	Providing this data to the county would save enormous sums. Not much is used for materials.											
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Minor			Major					
Education or outreach description	Better data to mitigate flood hazards and support flood management programs											
Environmental	Major			Moderate			Major					
Environmental description	Better topographic and vegetative info											
Public safety, including life and property	Major			Major			Major					
Public safety, including life and property description	Better and more accurate evacuation levels can be defined											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps				
Aspect maps				
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes	Yes	
Hydrologic Flow Accumulation Grids		Yes	Yes	
Hydrologic networks (e.g. streams, lakes)		Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: South Florida Adaptation Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Area split by varying quality level or update frequency	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements	Palm Beach, Miami-Dade, and Monroe Counties, FL	Palm Beach, Miami-Dade, and Monroe Counties, FL	Palm Beach, Miami-Dade, and Monroe Counties, FL	

MCA Description	Response
Mission Critical Activity	Development of science-based climate resilience policy and adaptation plans.
MCA Title	South Florida Adaptation Planning
MCA ID	22157
Organization Type	Regional, County, City, or other local government
Organization Name	South Florida County Governments
Sub-Agency or Division	
Organization Mission	Florida's counties' commitment to long-term sustainability includes enhancing community resilience and ensuring a viable future for generations to come. As such, the counties have heavily invested in resources to help assess and plan for climate change effects. These resilience initiatives programs have helped to effectively bridge the gap between scientific research and consequences for decision-makers and the public. The resilience initiatives programs began by building a framework for resiliency supportive policy, progressed by empowering stakeholders with information and encouraging ownership of resilient design decisions across agencies, and is transitioning the counties into the implementation phase through the development of a set of resiliency standards and strategy for investments.
Program Name	Environmental Planning and Community Resilience Division
Total Annual Program Budget	
Primary Business Use	BU 16 - Sea Level Rise and Subsidence
Secondary Business Use	BU 03 - Coastal Zone Management
Tertiary Business Use	BU 12 - Renewable Energy Resources

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Seawall caps, swales, reef edge

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	(a) QL0 (b) QL1	Cross sections and/or transects meet needs	Cross sections and/or transects meet needs	
Update Frequency	4-5 years	6-10 years	Annually	
Event type(s)				
Quality Level and/or update frequency variability across AOI	QL0 for waterfront areas (within 50 feet of MHW), QL1 for remaining area			
Acceptable Horizontal Error	Up to 30 cm	Up to 1 meter	Up to 1 meter	
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm	Up to 30 cm	
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			NAVD88	
Cross sections and/or transects meet needs		Yes	Yes	
Cross section/transect requirement		Sampling every 100 ft, 6 inch vertical	100 ft sampling, 1 ft vertical	

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Required	Required		Highly desirable	Required
Entire AOI under same environmental conditions	Highly desirable	Required	Required		Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Not required	Not required	
DTM	Required	Required	Not required	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Highly desirable	Not required	
Classified point cloud	Required	Not required	Highly desirable	
Edited/cube XYZ		Not required	Not required	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Not required	Not required	
Breaklines required for standard hydro-flattening	Not required	Not required		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Not required	Not required	Highly desirable	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Not required	Not required	Highly desirable	
Water column properties - Physical			Not required	
Water column properties - Chemical			Highly desirable	
Water column properties - Biological			Not required	
Currents			Highly desirable	
Tide/wave heights			Required	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Required	Highly desirable	Not required	
Land use/land cover	Required	Required	Highly desirable	
Wetlands	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Required	Required	Required	
Cultural resources	Not required	Not required	Highly desirable	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	2018 City of Fort Lauderdale LiDAR (From page 3: 0.15 ft vertical and 0.5 ft horizontal); 2018 FDOT (Non Vegetated Ground Surface accuracy at 95% confidence level ≤ 6 centimeters which equates roughly to about 0.20 feet, vegetated Vertical Accuracy (VVA) accuracy at 95th percentile ≤ 14.7 centimeters), 2007 Broward County LIDAR (10 ft DEM)	USACE surveys	Project construction surveys	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes	Yes	Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				

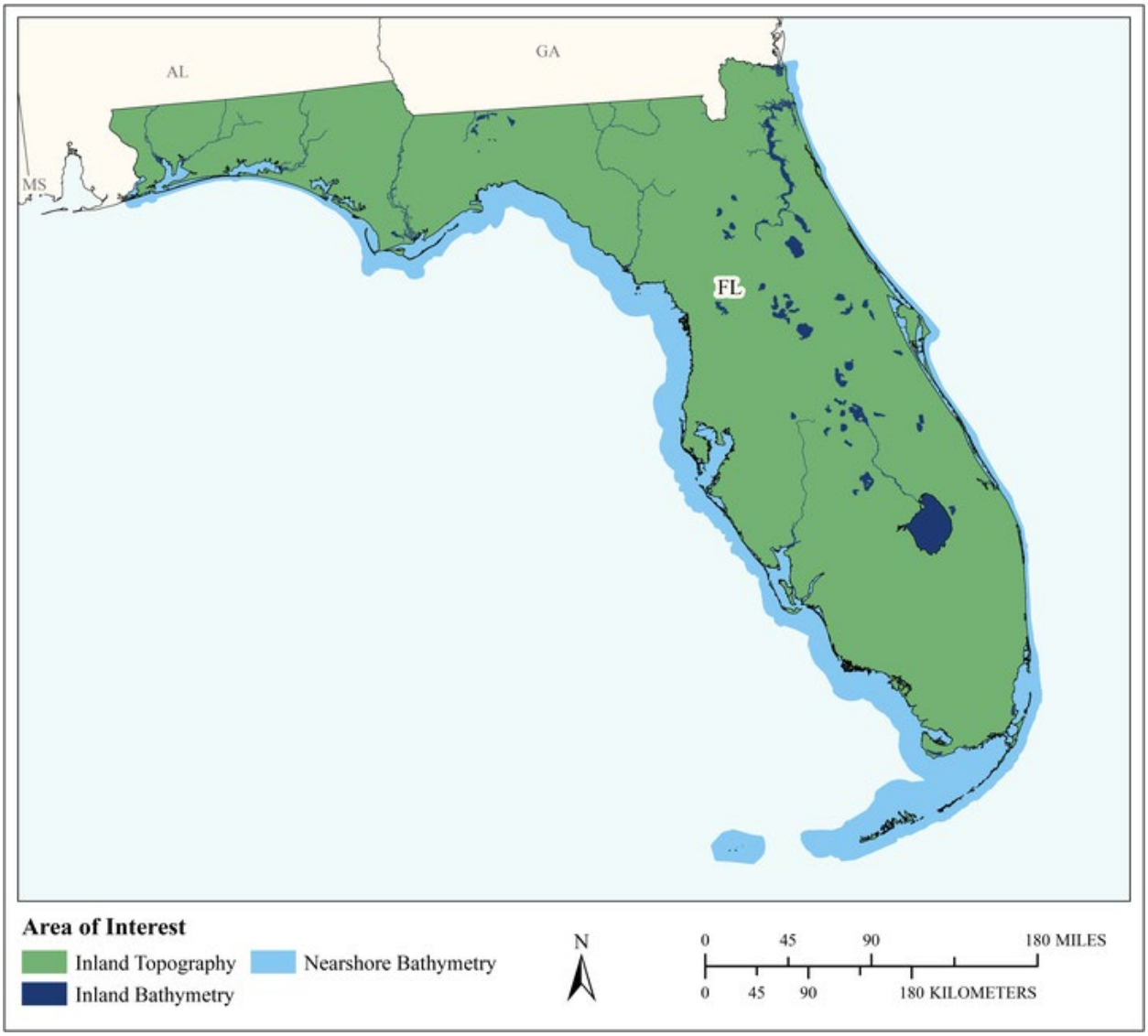
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Major	
Cost savings/cost reduction	Major	Major	Major	
Cost avoidance	Major	Major	Major	
Increased revenues	Minor	Moderate	Major	
Mission-driven performance improvements	Major	Major	Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	
Improved response or timeliness	Major	Moderate	Major	
Improved customer experience	Moderate	Moderate	Major	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major	Major	
Environmental	Moderate	Moderate	Major	
Public safety, including life and property	Major	Moderate	Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	Minor	Unable to provide		None			None					
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Minor	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major					
Environmental	Moderate			Major			Major					
Environmental description				Living shoreline design basis								
Public safety, including life and property	I don't know			I don't know			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections			Yes	
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Sea Level Rise and Subsidence



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Modeling and mapping the effects of sea level rise or subsidence. Population and economic vulnerability assessments. Coastal inundation and infrastructure assessment. The Florida Department of Environmental Protection's Division of State Lands is responsible for the Florida Forever land acquisition program. This year, the portfolio of lands targeted for acquisition includes a significant proportion of properties whose acquisition would directly support stakeholder impacts for sea-level rise. These data will help target future properties for acquisition in response to sea-level rise and subsidence. Elevation data are needed to support these initiatives.
MCA Title	Sea Level Rise and Subsidence
MCA ID	60083
Organization Type	State or U.S. Territorial government
Organization Name	State of Florida
Sub-Agency or Division	Florida Department of Environmental Protection, Division of State Lands
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 16 - Sea Level Rise and Subsidence
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Nice to have

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL1B	QL2B	
Update Frequency	4-5 years	4-5 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Required	Required		Highly desirable	Required
Entire AOI under same environmental conditions	Highly desirable	Required	Required		Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Required		Highly desirable	Required
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have	Highly desirable	
DTM	Required	Required	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Highly desirable	Nice to have	
Classified point cloud	Required	Nice to have	Highly desirable	
Edited/cube XYZ		Not required	Not required	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Not required	Not required	
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Highly desirable	
Ground control/ground truthing	Required	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Required	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Required	Required	Highly desirable	
Wetlands	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Required	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes	Yes	Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Major	
Cost savings/cost reduction	Major	Major	Major	
Cost avoidance	Major	Major	Major	
Increased revenues	None	Minor	Minor	
Mission-driven performance improvements	Major	Major	Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	

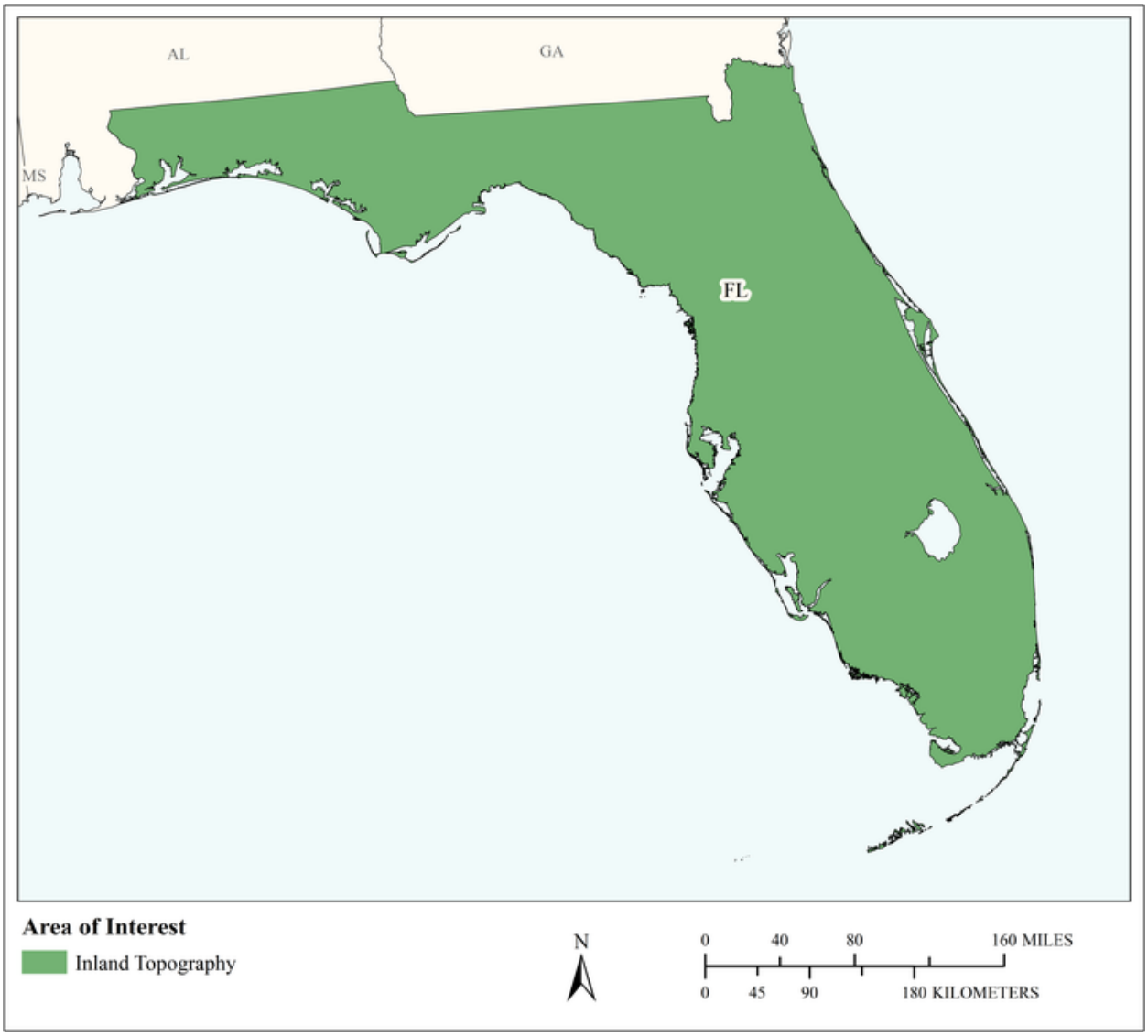
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Minor	Major	
Improved customer experience	Moderate	Moderate	Major	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Major	
Environmental	Moderate	Moderate	Major	
Public safety, including life and property	Major	Moderate	Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Increased revenues	Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,954,336									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Major					
Environmental	Moderate			Major			Major					
Public safety, including life and property	Moderate			Major			Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Wildfire Management, Planning, and Response



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of forest fuel and fire susceptibility. Fire behavior modeling to support wildfire suppression activities. Wildland/urban interface building identification. Post fire analysis to determine landslide prone areas. Fire management is a vital part of Florida's wildlife management planning and response. Elevation data will support fine-tuning models to better understand the local hydrology and habitats in support of this business goal.
MCA Title	Wildfire Management, Planning, and Response
MCA ID	60084
Organization Type	State or U.S. Territorial government
Organization Name	State of Florida
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 17 - Wildfire Management, Planning, and Response
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

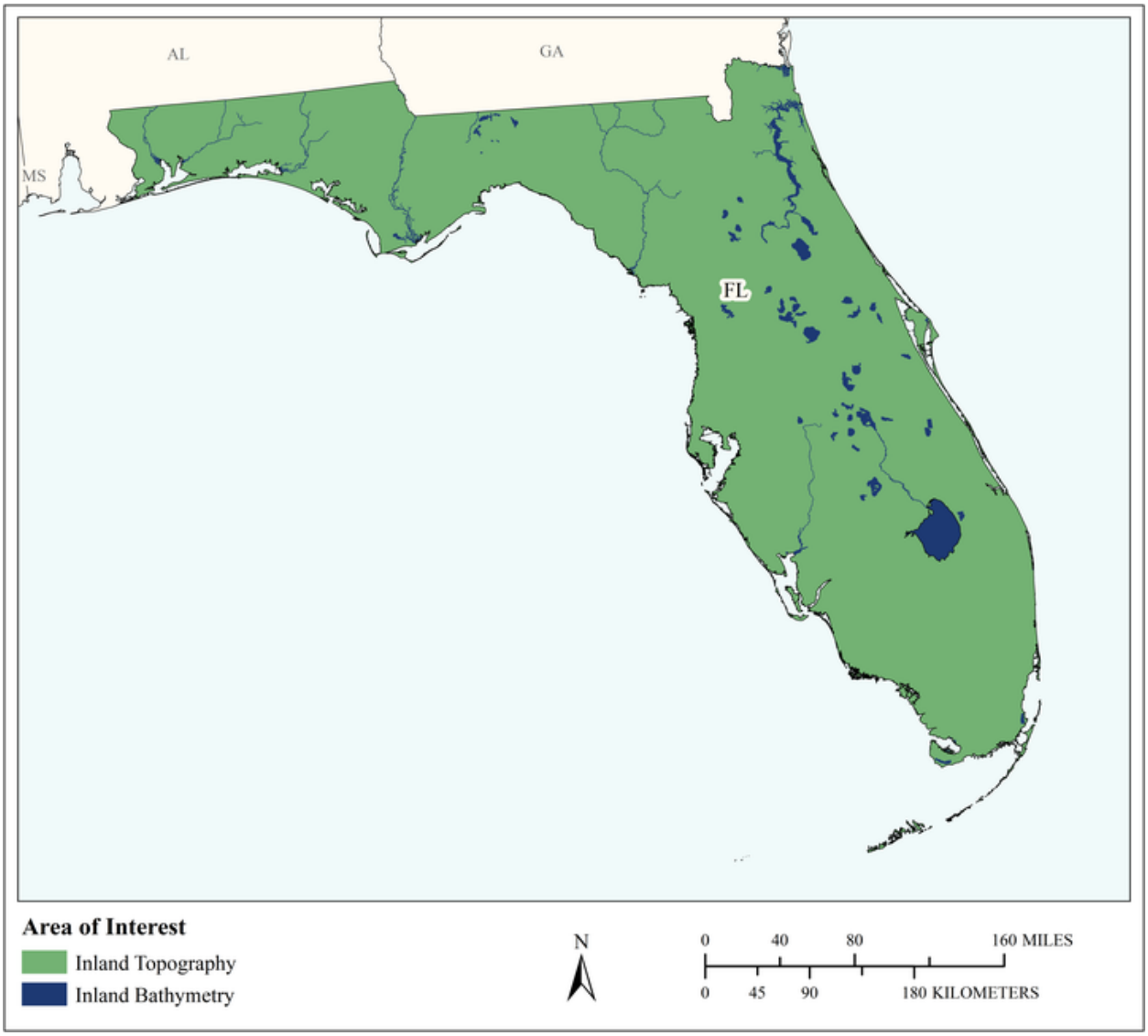
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$301,500									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Homeland Security, Law Enforcement, Disaster Response, and Emergency Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Infrastructure and border protection. Coastal search and rescue. Population dynamics. Emergency fuel supply and movement. Line of sight analysis in urban areas. Disaster response. Flood risk analysis resulting from acts of terrorism. Elevation data are needed to support Florida's security enforcement and emergency response.
MCA Title	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
MCA ID	60085
Organization Type	State or U.S. Territorial government
Organization Name	State of Florida
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable

Inland Bathy Feature Size Requirements	Response
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Highly desirable		
Classified point cloud	Required	Required		
Edited/cube XYZ		Highly desirable		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Required		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Moderate		
Increased revenues	None	None		
Mission-driven performance improvements	Major	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate		

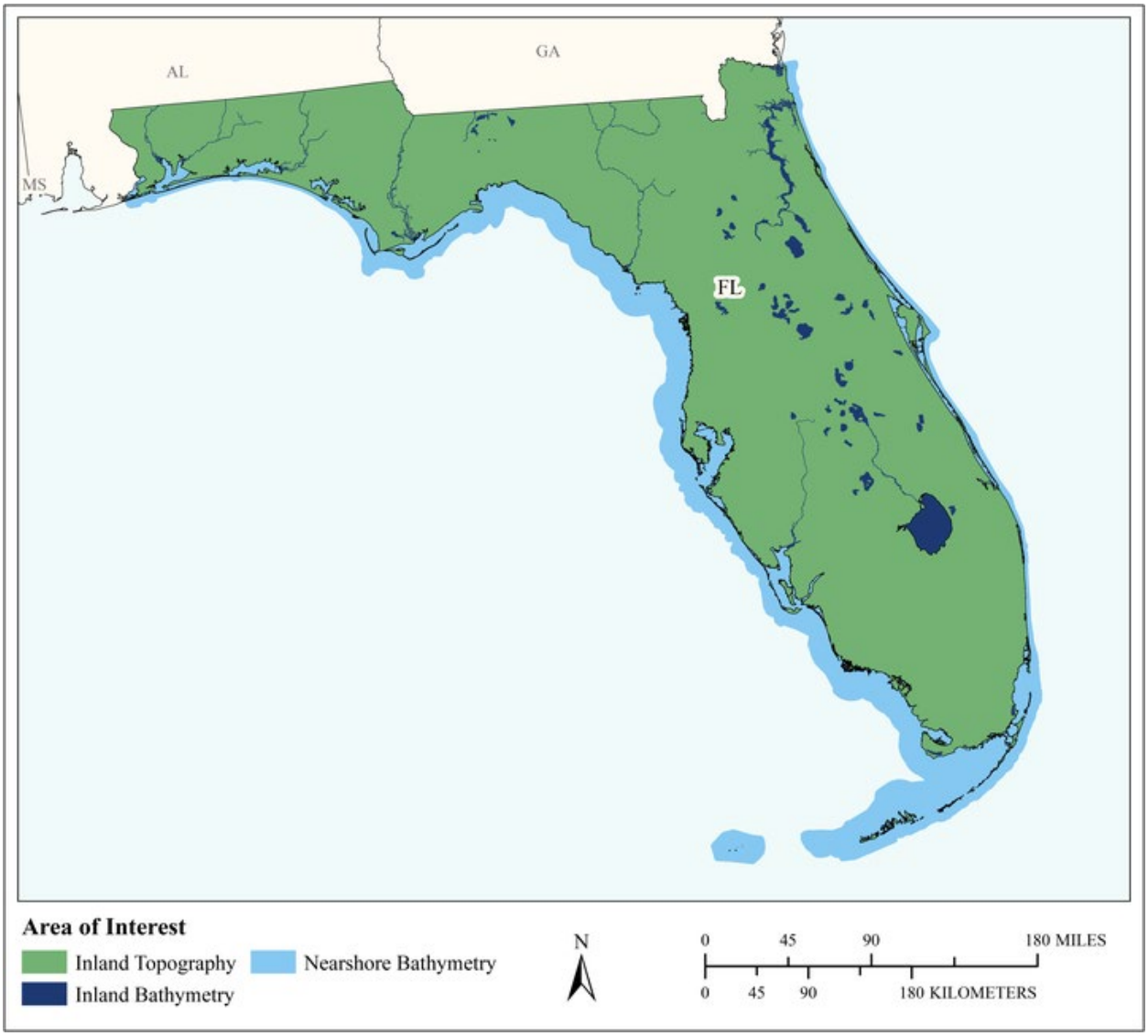
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major		
Improved customer experience	Major	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate		
Environmental	Minor	Moderate		
Public safety, including life and property	Major	Major		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,655,416		Annual dollars saved/ realized	$466,207						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$29,258		Annual dollars saved/ realized	$29,744						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Moderate			Moderate								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Marine and Riverine Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Nautical charting. Bathymetric measurements of nearshore submerged coastal topography. Identification of hazards to navigation. Sediment management at coastal navigation projects. Precision marine navigation. Movement of goods and fishing vessels.
MCA Title	Marine and Riverine Navigation and Safety
MCA ID	60086
Organization Type	State or U.S. Territorial government
Organization Name	State of Florida
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Nice to have
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B	QL0B	
Update Frequency	2-3 years	2-3 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Nice to have	Nice to have		Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required		Required	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Required	
DTM	Required	Highly desirable	Required	
DEM	Required	Required	Required	
Raw point cloud data	Required	Nice to have	Required	
Classified point cloud	Required	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Highly desirable	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	
Breaklines required for standard hydro-flattening	Highly desirable	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Highly desirable	
Ground control/ground truthing	Required	Nice to have	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Required	Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Not required	Not required	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Highly desirable	
Boundaries			Nice to have	
Routes			Required	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Required	
Floating observation/navigation systems			Required	
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Nice to have	Nice to have	Nice to have	
Wetlands	Highly desirable	Required	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Highly desirable	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Required	Nice to have	Nice to have	
Cultural resources	Highly desirable	Highly desirable	Nice to have	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts		Yes	Yes	
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	
Cost savings/cost reduction	Major	I don't know	Minor	
Cost avoidance	Moderate	Major	Minor	
Increased revenues	Moderate	None	Minor	
Mission-driven performance improvements	Moderate	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	None	Minor	

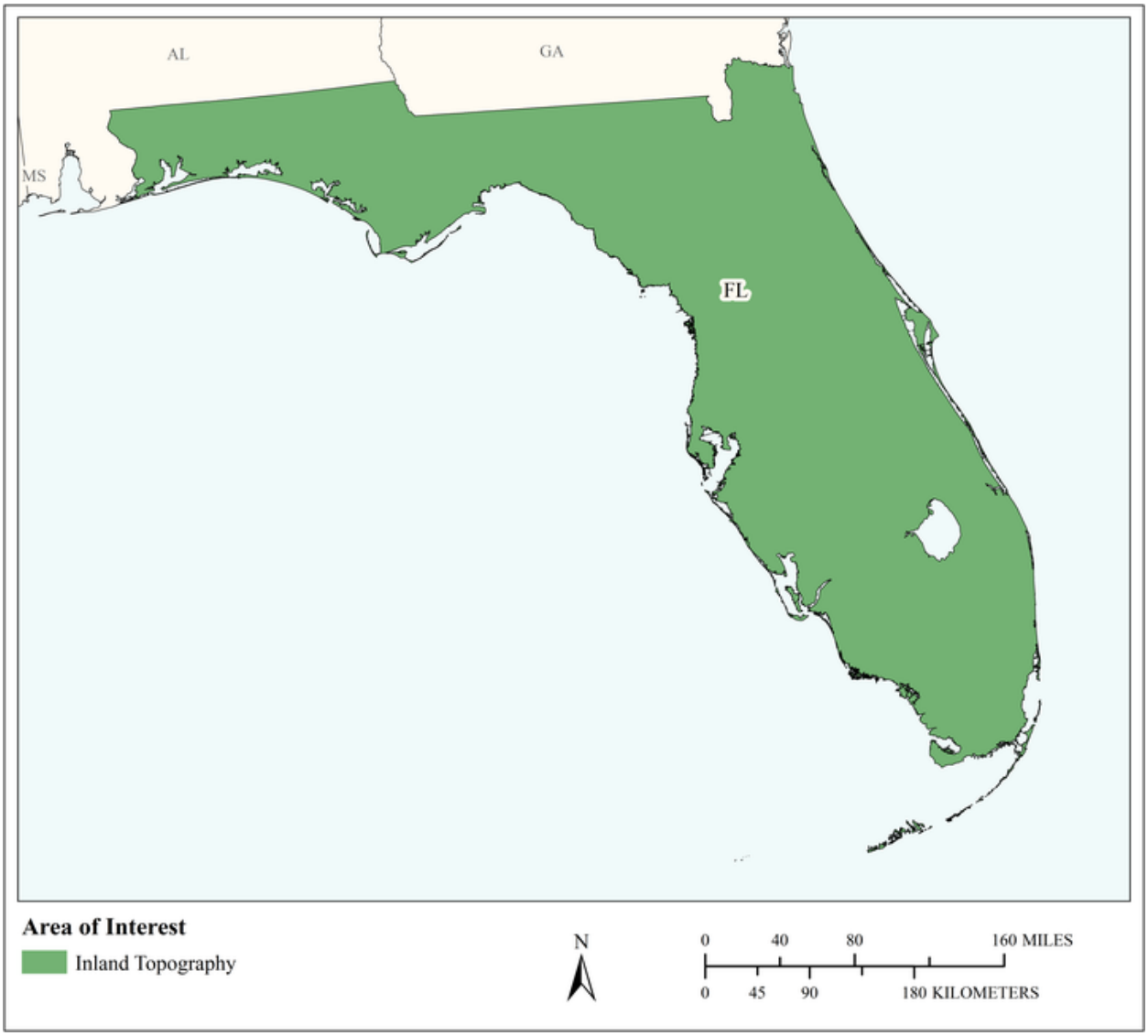
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor	None	Minor	
Improved customer experience	Moderate	None	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	None	Minor	
Environmental	Moderate	None	Minor	
Public safety, including life and property	Major	None	Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Increased revenues	None			Moderate	Unable to provide		Major	Unable to provide				
Mission-driven performance improvements	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,149,688		Annual dollars saved/ realized	$1,023,593		Annual dollars saved/ realized	$9,691,986			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Future annual customer service benefits added during validation					Annual dollars saved/ realized	$134,716		Annual dollars saved/ realized	$328,142			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			Moderate			Minor					
Environmental	None			Moderate			Major					
Public safety, including life and property	Minor			Moderate			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps				
Aspect maps				
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Aviation Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of in-flight hazards and path obstructions. Aeronautical charting. Runway construction and repair. Lidar data supports analysis of tall structures, sight-lines, and vegetation.
MCA Title	Aviation Navigation and Safety
MCA ID	60087
Organization Type	State or U.S. Territorial government
Organization Name	State of Florida
Sub-Agency or Division	Florida Department of Transportation, Aviation
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 21 - Aviation Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes			
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Major			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

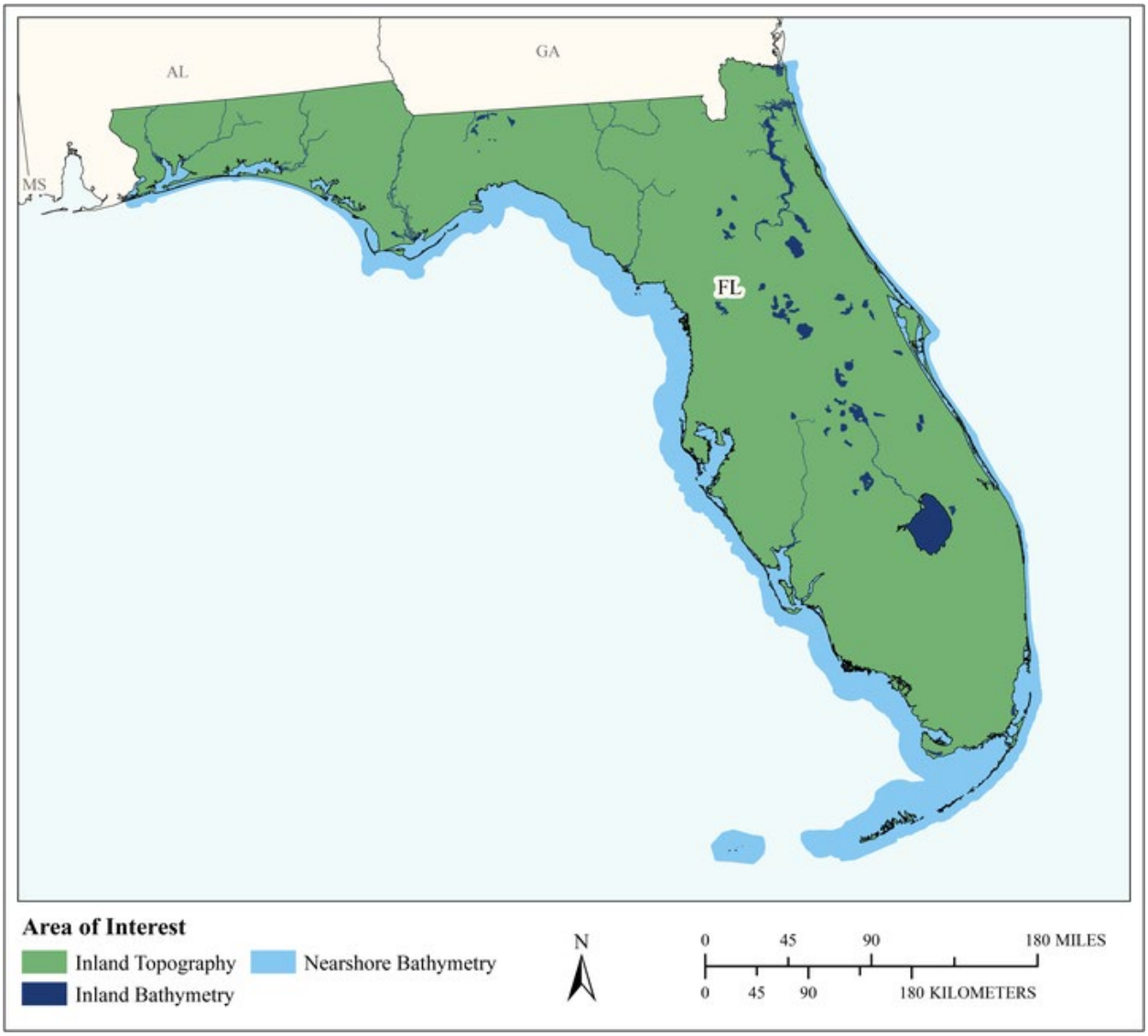
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$189,701									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$236,266									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Moderate											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Planning, Design, Construction, and Maintenance of Transportation Infrastructure



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Area split by varying quality level or update frequency	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements	Florida			

MCA Description	Response
Mission Critical Activity	Planning, design, construction, and maintenance of transportation infrastructure, including roads, seaports, airports, spaceports, and railroads. Operation and monitoring of transportation systems. Statewide elevation data are needed for planning for new and maintenance projects (including 5-, 10-, and 20-year plans). Consistent data is important for planning, Field Survey data are used for construction. FDOT's work includes managing ports, airports, and dredging. River profiles under bridges are needed to analyze flow under bridges. SLOSH modeling is also used. BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management is an additional Business Use.
MCA Title	Planning, Design, Construction, and Maintenance of Transportation Infrastructure
MCA ID	22188
Organization Type	State or U.S. Territorial government
Organization Name	Florida Department of Transportation
Sub-Agency or Division	
Organization Mission	The Department will provide a safe transportation system that ensures the mobility of people and goods, enhances economic prosperity, and preserves the quality of our environment and communities.
Program Name	As one FDOT team, we serve the people of Florida by providing a transportation network that is well planned, supports economic growth, and has the goal of being congestion and fatality free.
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 19 - Land Navigation and Safety
Tertiary Business Use	BU 20 - Marine and Riverine Navigation and Safety

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	We work with everything from large area/large features for transportation planning, all the way down to survey level for engineering design

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable

Inland Bathy Feature Size Requirements	Response
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Nice to have
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	(a) QL0 HD (b) QL1	QL1B	Cross sections and/or transects meet needs	
Update Frequency	2-3 years	4-5 years	6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI	North Florida above Orlando does not need the same vertical accuracy as south Florida. QL1 for areas north of Orlando			
Acceptable Horizontal Error	Up to 30 cm	Up to 1 meter	Up to 1 meter	
Acceptable Vertical Error	Less than 5 cm	Up to 20 cm	Up to 20 cm	
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MSL	
Cross sections and/or transects meet needs		Partial	Yes	
Cross section/transect requirement		Up to WMDs, needed for H&H modeling	500 -1000 ft spacing between transects	

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Nice to have		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Nice to have		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Required	
DTM	Required	Not required	Required	
DEM	Highly desirable	Required	Required	
Raw point cloud data	Highly desirable	Not required	Required	
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Not required	Not required	
Full waveform	Required	Required	Required	
Bathymetric Attributed Grid (BAG)		Not required	Nice to have	
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Required	Highly desirable	Highly desirable	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Required	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Required	Nice to have	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Highly desirable	
Subbottom characteristics			Not required	
Geologic and seismic data	Highly desirable	Highly desirable	Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Highly desirable	
Sea ice conditions			Not required	
Habitat distribution and classification			Not required	
Boundaries			Not required	
Routes			Required	
Offshore cadastral			Required	
Lease areas			Highly desirable	
Fixed obstructions			Required	
Floating observation/navigation systems			Required	
Shorelines – current, historic, change rates	Highly desirable	Required	Nice to have	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Required	Required	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Required	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We use LiDAR QL1 and QL2 to prepare surface models for orthophotography rectification throughout Florida. We also create Stormwater drainage models. In south Florida QL1 and QL2 are not sufficient for drainage modeling due to proximity to sea level and lack of significant terrain relief.	Best available	Best available	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	
NCEI		Yes	Yes	
Open Topography				
NOAA nautical charts		Yes	Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
State repositories used	FDOT Archives FDEP LABINS site			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	I don't know	I don't know	
Cost savings/cost reduction	Major	I don't know	I don't know	
Cost avoidance	Moderate	I don't know	I don't know	
Increased revenues	I don't know	None	I don't know	
Mission-driven performance improvements	Moderate	Moderate	I don't know	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	Moderate	I don't know	
Improved response or timeliness	Minor	Moderate	I don't know	
Improved customer experience	Minor	Minor	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	Minor	I don't know	
Environmental	Moderate	Major	I don't know	
Public safety, including life and property	Moderate	Major	I don't know	

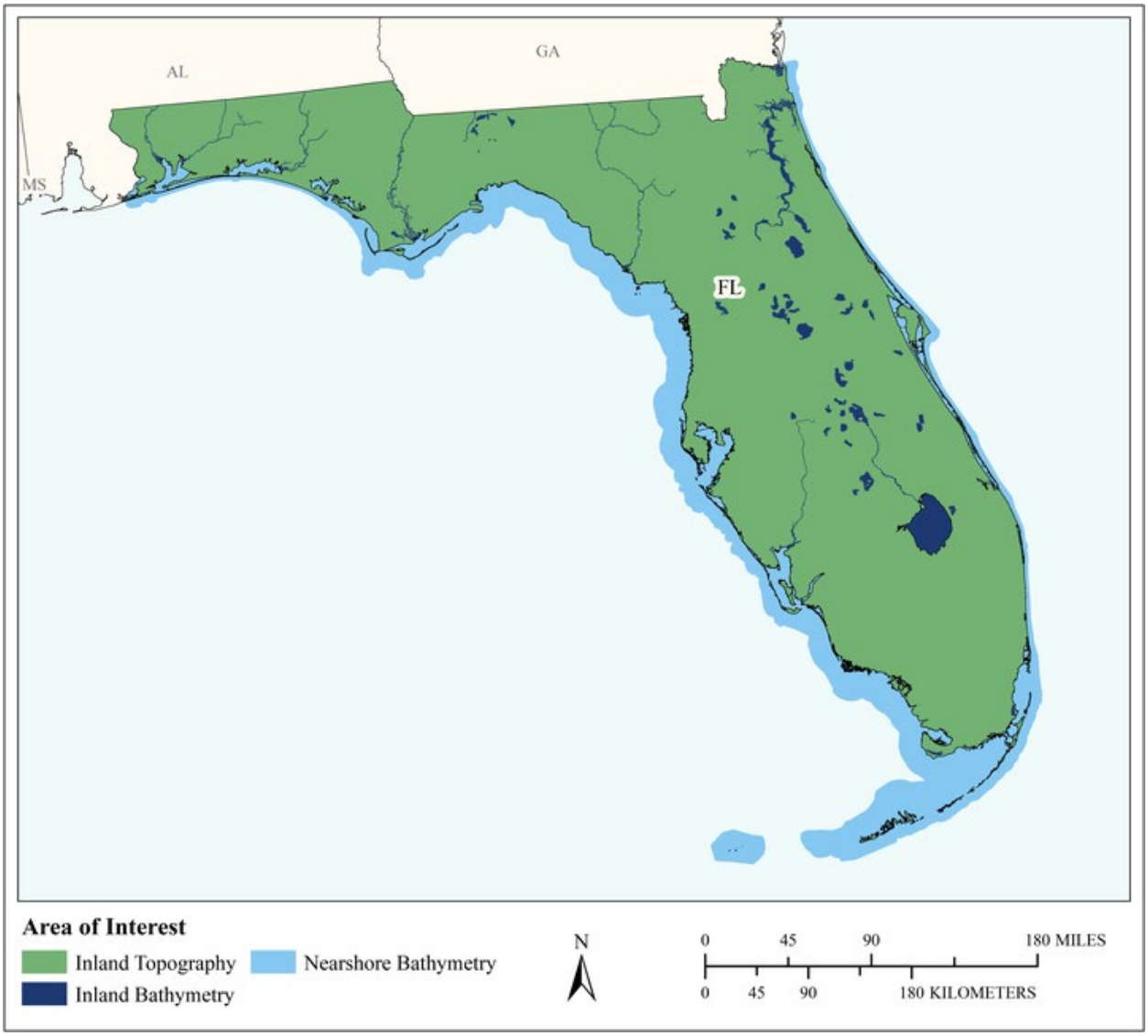
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$105,525	Major	Unable to provide		Major	Unable to provide				
Time savings description	Provide a statewide dataset that can be used to quality assure infrastructure. Transportation planning is a key element of FDOT and having this data would not only streamline the analysis of existing conditions but would also provide more consistent information leading to better planning decisions that result in significant cost savings in design and construction of infrastructure. Reduce labor of ground surface modeling from aerial photography.											
Cost savings/cost reduction	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction description	Transportation planning is a key element of FDOT and having this data would not only streamline the analysis of existing conditions but would also provide more consistent information leading to better planning decisions that result in significant cost savings in design and construction of infrastructure.											
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance description	Improve modeling of infrastructure such as hurricane evacuation routes. Some inhouse GIS processes would be reduced. LiDAR dataset would provide verification of other remotely sensed data.			Better data facilitates better allocation of resources to improved water navigation and increase safety.								
Increased revenues	None			Moderate	Unable to provide		Major	Unable to provide				
Increased revenues description				Increase size of cargo ships to Florida Ports.								
Mission-driven performance improvements	Major	Annual percent improvement	40%	Major	Unable to provide		Major	Unable to provide				
Mission-driven performance improvements description	Part of our survey and mapping mission is to provide statewide topographic mapping.			Improve river, channel, and lake bottom information allows for better allocation of construction materials and resources for bridges, headwall, and other infrastructure.								
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,260,907		Annual dollars saved/ realized	$424,820		Annual dollars saved/ realized	$132,105			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Value added to products or services description	FDOT is responsible for all modes of Transportation within Florida, therefore having an improved model of our infrastructure both coastal and inland is very valuable for maintaining and improving said infrastructure.			Better maps.								
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Improved response or timeliness description	Environmental permitting would be improved. Improve topographic modeling allows us to better allocate resources after a disaster, by knowing what the conditions were before the disaster hit we are better able to assess the impact and cost to repair. Improve topographic modeling allows us to better prepare for the impact of a disaster and to better allocate resources during a disaster.											
Improved customer experience	I don't know	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$3,710,597		Annual dollars saved/ realized	$44,112		Annual dollars saved/ realized	$18,164			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			I don't know			None					
Environmental	Major			Moderate			Moderate					
Environmental description	Improved planning, design, and construction of infrastructure allows for better protection of environment											
Public safety, including life and property	Major			Major			Major					
Public safety, including life and property description	Identify areas and infrastructure most susceptible to storm events											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours		Yes	Yes	
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Infrastructure Planning, Design, and Construction



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Marine construction. Bridge design and construction. Engineering and construction of dams, levees, dikes, reservoirs, and coastal structures. Shipyard and port construction. Water, sewer, or power line planning and vegetation analysis. Pump, drain, and well placement. Stormwater modeling. Cut and fill analysis for earth-moving. Building site analysis. Road infrastructure. Infrastructure hardening or mitigation for climate change effects, e.g. sea level change. Stream channel analysis and mapping. Stream bank erosion analysis. Aquatic and terrestrial species habitat management. Environmental management.
MCA Title	Infrastructure Planning, Design, and Construction
MCA ID	33009
Organization Type	State or U.S. Territorial government
Organization Name	Florida Department of Environmental Protection
Sub-Agency or Division	
Organization Mission	The Department of Environmental Protection protects, conserves and manages Florida's natural resources and enforces the state's environmental laws.
Program Name	Division of Water Resource Management
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 02 - Riverine Ecosystem Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Not required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Bridge, culvert, dam, levee, dike, coastal structure, power line, road, stream channel, etc.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required

Inland Bathy Feature Size Requirements	Response
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL1B	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter	Up to 1 meter	
Acceptable Vertical Error	Up to 10 cm	Up to 40 cm	Up to 40 cm	
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed	To MHW		To MLLW	
Tide correction requirement			MLLW	
Cross sections and/or transects meet needs	Partial	Partial	Partial	
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Nice to have	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Highly desirable	Highly desirable		Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Nice to have	Highly desirable	Highly desirable		Highly desirable	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level		Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	
DTM	Nice to have	Highly desirable	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Highly desirable	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	
Breaklines required for standard hydro-flattening	Not required	Not required		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	
Ground control/ground truthing	Nice to have	Nice to have	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Required	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Not required	
Geologic and seismic data	Nice to have	Highly desirable	Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Highly desirable	
Routes			Highly desirable	
Offshore cadastral			Nice to have	
Lease areas			Highly desirable	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Required	
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Required	Required	Required	
Wetlands	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	State lidar	Best available	Best available	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	
NCEI				
Open Topography				
NOAA nautical charts		Yes		
USACE navigation charts				
USGS Inland Waters server		Yes		
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Florida			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Major	I don't know	
Cost savings/cost reduction	Major	Major	I don't know	
Cost avoidance	Major	Moderate	I don't know	
Increased revenues	None	None	I don't know	
Mission-driven performance improvements	Moderate	Moderate	I don't know	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know	I don't know	I don't know	

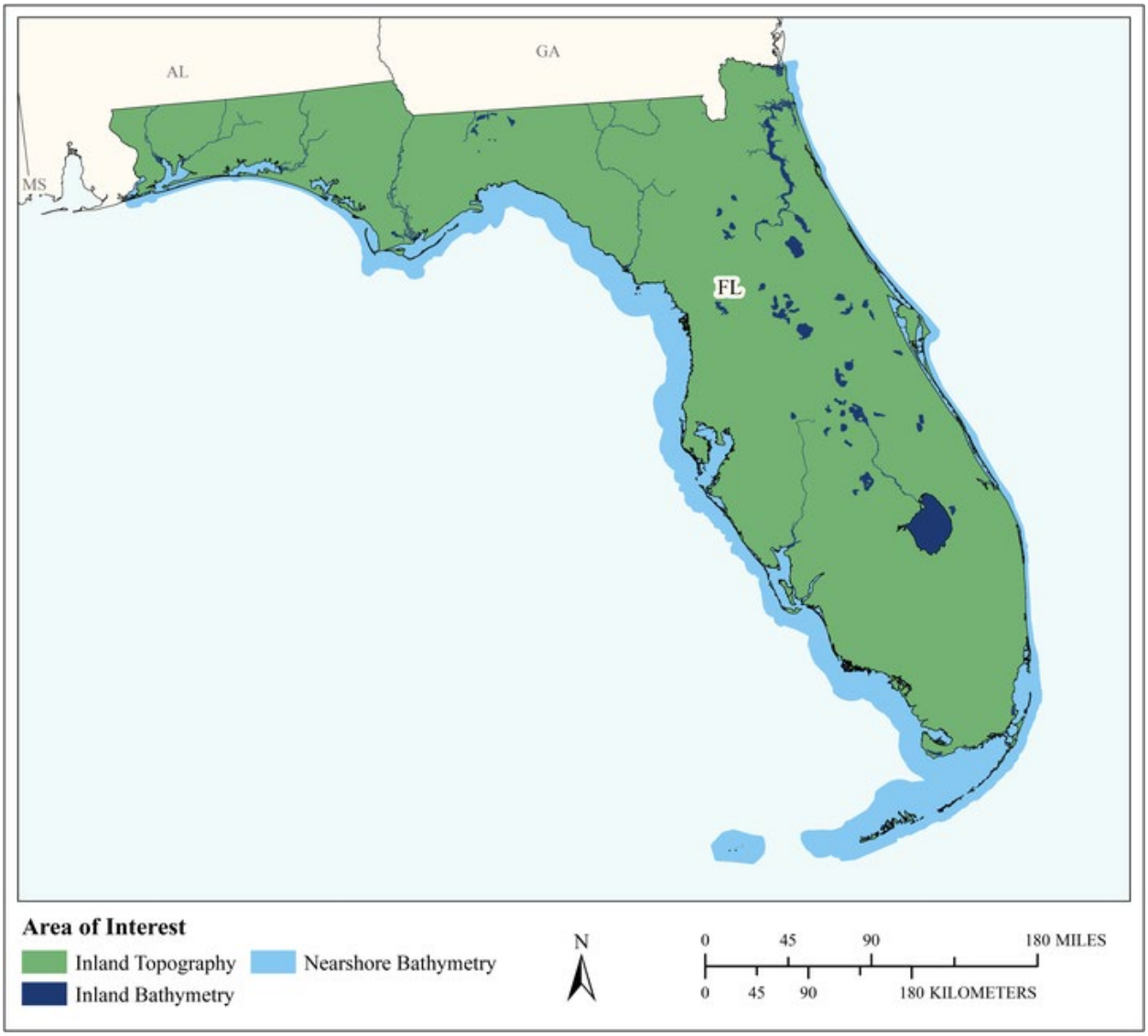
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	I don't know	I don't know	I don't know	
Improved customer experience	I don't know	I don't know	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	I don't know	I don't know	
Environmental	I don't know	I don't know	I don't know	
Public safety, including life and property	I don't know	I don't know	I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,260,907		Annual dollars saved/ realized	$424,820		Annual dollars saved/ realized	$132,105			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$3,710,597		Annual dollars saved/ realized	$44,112		Annual dollars saved/ realized	$18,164			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know			I don't know					
Environmental	I don't know			I don't know			I don't know					
Public safety, including life and property	I don't know			I don't know			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes		
Slope maps				
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps				
Viewshed maps	Yes	Yes		
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Recreation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Planning and development of recreational facilities such as rafting, boating, swimming, diving, and fishing areas; ski slopes; and golf courses. Location- based products and services such as maps and guides. Tourism. Trail and vista site planning. Orienteering. The State of Florida includes 175 state parks in addition to significant, public managed lands for recreation. This resource would help land managers more successfully monitor and tweak projects. The value to Florida from the tourism industry is enormous.
MCA Title	Recreation
MCA ID	60088
Organization Type	State or U.S. Territorial government
Organization Name	State of Florida
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 27 - Recreation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have

Inland Bathy Feature Size Requirements	Response
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required	Highly desirable		Not required	Not required
Entire AOI under same environmental conditions	Required	Not required	Highly desirable		Not required	Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Nice to have		Nice to have	Not required
DEM for entire AOI needs to be seamless	Required	Nice to have	Nice to have		Nice to have	Not required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	
DTM	Nice to have	Highly desirable	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Nice to have	Not required	
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Nice to have	
Full waveform	Not required	Nice to have	Not required	
Bathymetric Attributed Grid (BAG)		Highly desirable	Nice to have	
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Not required	Nice to have	Not required	
Ground control/ground truthing	Nice to have	Nice to have	Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required	Required	Not required	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Not required	Highly desirable	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Not required	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Not required	Highly desirable	Highly desirable	
Land use/land cover	Nice to have	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Not required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Minor	
Cost savings/cost reduction	Moderate	Minor	Minor	
Cost avoidance	Major	Minor	Minor	
Increased revenues	None	Minor	Minor	
Mission-driven performance improvements	Major	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor	Minor	

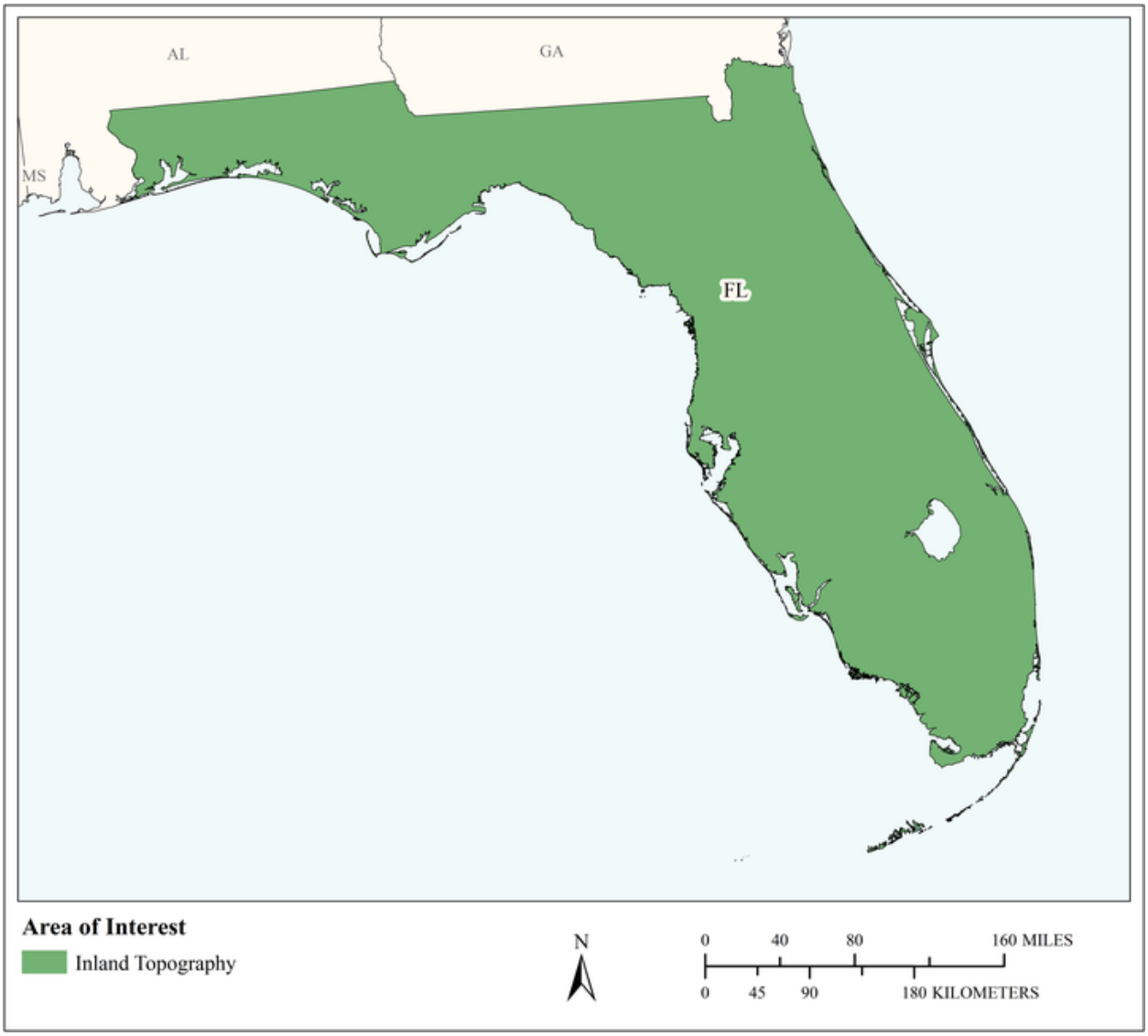
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	Minor	Minor	
Improved customer experience	Moderate	Minor	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	
Environmental	Major	Minor	Minor	
Public safety, including life and property	Major	Minor	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	None			Moderate	Unable to provide		Moderate	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$12,876		Annual dollars saved/ realized	$7,754		Annual dollars saved/ realized	$1,636,274			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Major					
Environmental	Moderate			Major			Major					
Public safety, including life and property	Moderate			Moderate			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes		
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Telecommunications



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Telecommunication tower site selection. Design of radio and radar systems. Interference analysis. Path profiles. Undersea telecommunication route selection and deployment. Telecommunications are vital to the state's emergency response. Lidar can be used for identifying new siting locations as well as areas at risk of flooding or wind-shear risks.
MCA Title	Telecommunications
MCA ID	60089
Organization Type	State or U.S. Territorial government
Organization Name	State of Florida
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 28 - Telecommunications
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Highly desirable			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

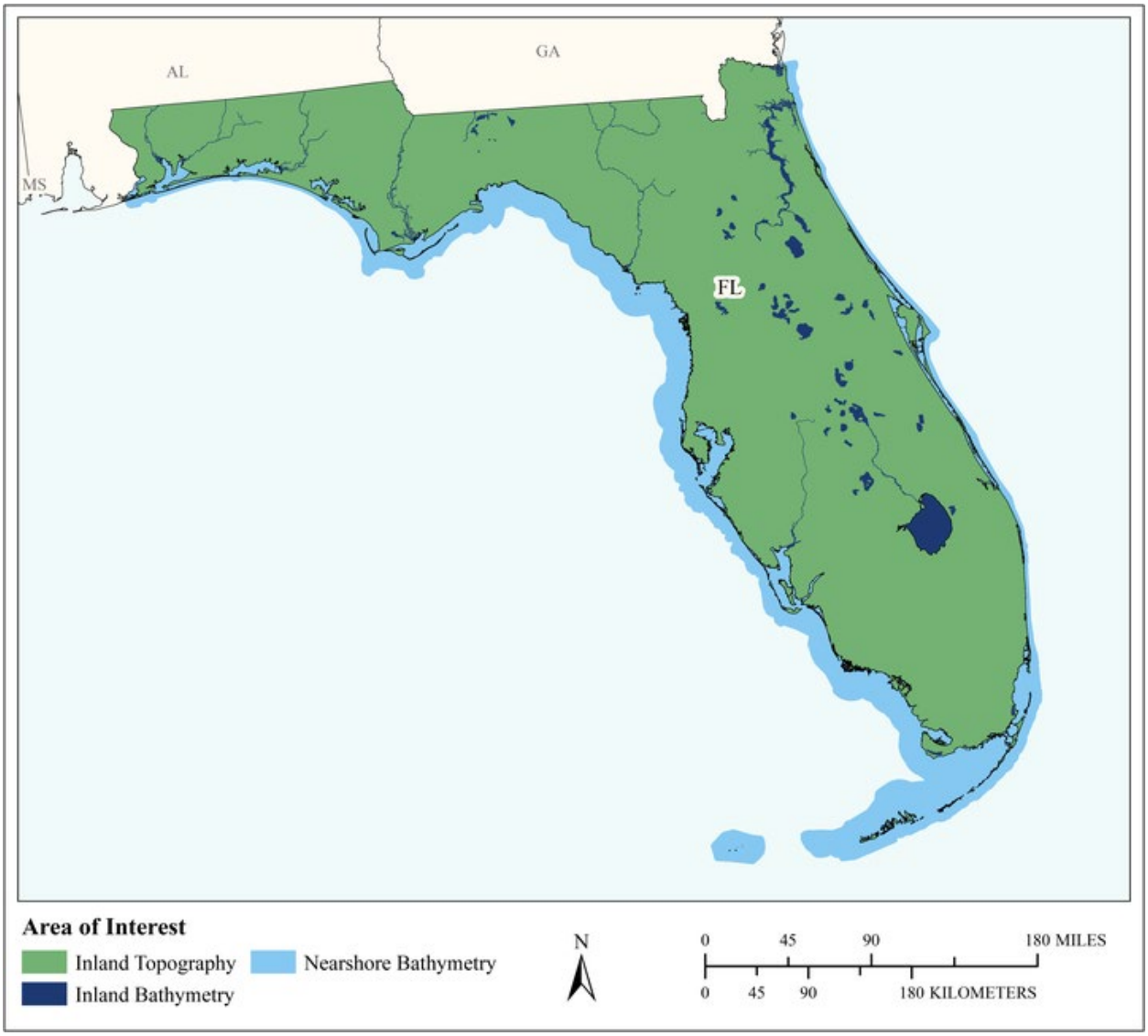
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Maritime and Land Boundary Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Delimitation of legal and other coastal boundaries, inland boundaries, and ordinary high water lines (OHWL). Due to Florida's highly dynamic, physical and political state, real-time ground-truthing is needed more than a one-time snapshot of elevation data.
MCA Title	Maritime and Land Boundary Management
MCA ID	60090
Organization Type	State or U.S. Territorial government
Organization Name	State of Florida
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 30 - Maritime and Land Boundary Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B	QL0B	
Update Frequency	6-10 years	6-10 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have		Highly desirable	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Nice to have		Highly desirable	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable		Required	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	
DTM	Required	Required	Required	
DEM	Highly desirable	Required	Required	
Raw point cloud data	Nice to have	Highly desirable	Required	
Classified point cloud	Highly desirable	Highly desirable	Required	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Nice to have	Not required	
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Nice to have	Required	Not required	
Ground control/ground truthing	Highly desirable	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Required	Highly desirable	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Highly desirable	
Routes			Nice to have	
Offshore cadastral			Highly desirable	
Lease areas			Highly desirable	
Fixed obstructions			Required	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Required	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Highly desirable	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Minor	None	
Cost savings/cost reduction	Moderate	None	Minor	
Cost avoidance	Moderate	None	Minor	
Increased revenues	Minor	None	None	
Mission-driven performance improvements	Major	None	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None	None	

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major	None	Minor	
Improved customer experience	Major	None	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	
Environmental	Major	Minor	Minor	
Public safety, including life and property	Moderate	None	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Increased revenues	Minor	Unable to provide		None			None					
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$63,144		Annual dollars saved/ realized	$47,388		Annual dollars saved/ realized	$2,904,274			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$242,100									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Moderate					
Environmental	Minor			Major			Major					
Public safety, including life and property	None			Moderate			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps		Yes		
Cross sections		Yes		
Height-Above-Ground maps		Yes		
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

Georgia

The State of Georgia has an area of 59,425 square miles (159,909 square kilometers). It embraces parts of varying physiographic regions, including the Appalachian Blue Ridge Mountains in the north, the central Piedmont, and the extensive continental coastal plains. The U.S. Census estimates 10,617,423 residents as of July 2019, making Georgia the ninth most populous state. The Census Bureau ranks it eighth in population projections, growing 46.8 percent from 2000 to 2030, to over 12 million residents.

Georgia's administrative division into 159 counties and 535 cities is a particular challenge to coordination of interagency projects to compile statewide geospatial data. Even so, during recent decades the state has been a particularly active partner in various federal mapping initiatives.

During 1995, Georgia's GIS Coordinating Committee (GISCC), now the state's longest standing interagency technical body on the subject, identified several core base maps for development and set about the work in partnership with the state's university system and several federal agencies. It was one of the first states to acquire complete coverage under the National Digital Orthophoto Program, which immediately supported 1:24,000-scale Digital Line Graph prototype projects for transportation and hydrography. Georgia was one of the first to complete its digital National Wetlands Inventory. These rich framework layers proved indispensable to the state's early participation in U.S. Census Bureau's MAF/TIGER Accuracy Improvement Project, which, in conjunction with its long-standing support of the Census Bureau's annual Boundary and Annexation Survey and near complete local government participation in the decennial Local Update of Census Addresses programs, has provided some of the most accurate census maps in the nation. Georgia has also actively contributed to the National Geospatial-Intelligence Agency's Homeland Security Infrastructure Program maps. Although the GISCC had identified improved elevation data as one of the critically needed core base maps, it remains to date, the single such identified layer with which the state has made the least progress to completion.

During 2010, a legislatively created Georgia Geospatial Advisory Council conducted a statewide survey of assets and needs. In its 2011 report to the state legislature, statewide lidar acquisition to provide enhanced elevation data for detailed flood studies was identified as one the state's principal needs. As of 2012, lidar data were collected in only 55 of Georgia's 159 counties. During 2011, the GISCC formed a new Technical Working Group for Enhanced Elevation which is developing statewide program of education, promotion, and support for a multi-year interagency contracting mechanism to acquire aerial photography and lidar. This is the first statewide effort in Georgia to coordinate the local acquisition and standards for these geospatial products. Hopefully these alignments between local acquisition efforts with similar state and federal requirements and resources will provide mutual value in lower project costs and improved standard products to all partners.

In 2018, The State of Georgia was awarded a USGS 3D Elevation Program grant for the acquisition of elevation data for 67 Georgia counties — over one third of the state. The effort brought together state and federal partners to maximize the data collected. The total commercial value of the award is approximately $5.6 million, of which Georgia partners contributed $1.5 million. The U.S. Department of Agriculture's Natural Resources Conservation Service in Georgia and the Georgia Environmental Protection Division provided the two most significant contributions. As with the inaugural award in 2017 for 22 counties, the grant request was coordinated and prepared by the Georgia Geospatial Information Office. The $4 million in savings in this year's award, results in cost savings of over 70% to the grant partners.

Highly accurate digital elevation data can be used extensively by local and state government to provide critical services to the citizens of Georgia. Up-to-date elevation data support key activities across the state

such as: economic development, infrastructure and construction management, agriculture and precision farming, natural resource conservation, flood risk management, emergency management, urban and regional planning, and coastal zone development and management. In the future, this elevation data will be a critical input to develop a statewide Building Information Model that will enhance public safety and emergency response services, increasing effectiveness and efficiency, and potentially saving lives.

Elevation requirements vary based on the activity. Most respondents indicated that Quality Level 2 (QL2) topographic data would suffice for their needs, however programs involving transportation planning, construction, and engineering require higher-accuracy data. Inland bathymetry is required for transportation and construction across the state at QL0B. Nearshore bathymetry requirements vary from QL0B for transportation and construction planning to cross sections being acceptable for flood risk management and mitigation. Cross sections fulfill offshore bathymetry requirements.

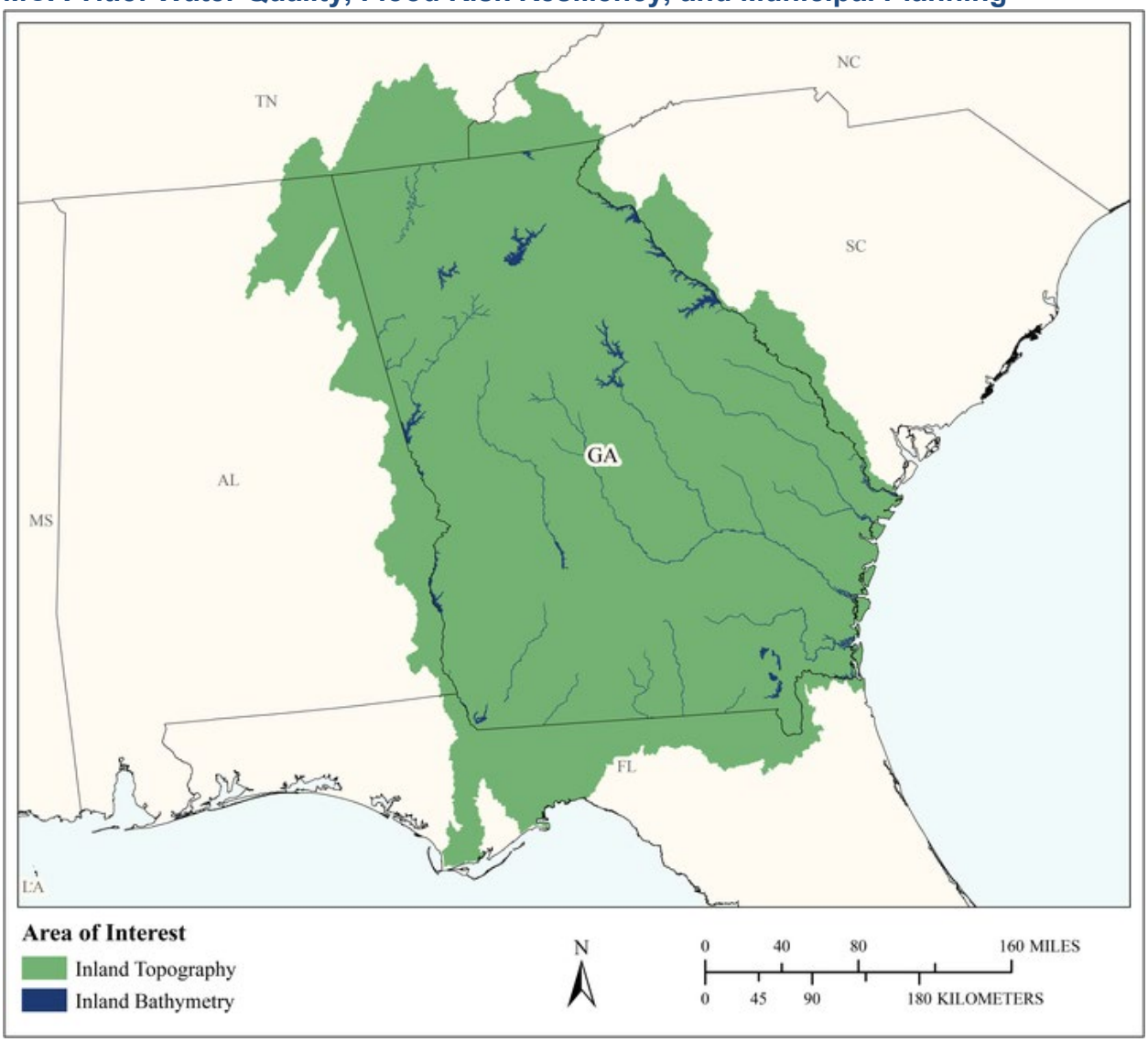
Future benefits from improved elevation data include better inundation modeling; less data manipulation, collection, and processing; reduced field visits; improved in-office project planning; and better maps and visualizations for the public. Programs gain value from higher quality research and results.

The State of Georgia has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	Georgia Regional Commissions	21940	Water Quality, Flood Risk Resiliency, and Municipal Planning	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Inland Bathy	QL2B	6-10 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 03 – Coastal Zone Management	University of Georgia (UGA) - Skidaway Institute of Oceanography	1132	Marine Geologic Assessments	Inland Topo	QL2	4-5 years	$18,301	Unable to quantify	Minor	Minor	Moderate
				Nearshore Bathy	QL2B	4-5 years	$42,537	Unable to quantify	Moderate	Moderate	Major
				Offshore Bathy	Cross sections and/or transects meet needs	6-10 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 15 – Flood Risk Management	Georgia Department of Natural Resources	1392	Flood Risk Management	Inland Topo	QL2	6-10 years	$914,025	Unable to quantify	Minor	Moderate	Major
				Nearshore Bathy	Cross sections and/or transects meet needs	6-10 years	Unable to quantify	Unable to quantify	Moderate	Moderate	I don't know
BU 18 – Homeland Security	Georgia Emergency Management and Homeland Security	22018	Emergency Management	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 19 – Land Navigation	Georgia Department of Transportation (GDOT)	22423	Transportation	Inland Topo	QL1 HD	2-3 years	Unable to quantify	Unable to quantify	Minor	Minor	Major
				Inland Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 22 – Infrastructure Management	Platinum Geomatics, LLC	21495	Topo to Support State and Local Government	Inland Topo	QL1	2-3 years	$36,873	Unable to quantify	I don't know	I don't know	Major
BU 22 – Infrastructure Management	Chatham County Government	22258	County GIS Services	Inland Topo	QL1 HD	6-10 years	Unable to quantify	Unable to quantify	Minor	Moderate	Major
BU 23 – Urban and Regional Planning	Georgia Power Economic Development	22090	Planning and Economic Development	Inland Topo	QL0	Annually	Unable to quantify	Unable to quantify	None	None	None

MCA Title: Water Quality, Flood Risk Resiliency, and Municipal Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more Hydrologic Units (HUC8s)	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	BU 01 Water Supply and Quality - Performing high level H&H studies to influence regionally significant projects which may address stream base flow and water quality issues. BU 15 - Flood Risk Management - Performing risk assessments for critical transportation infrastructure using high level H&H models BU 23 - Urban and Regional Planning - Creating 3d visualizations of transportation project corridors, and to pull out building footprints. Also project site development, impervious surface, slope (runoff, storm water), infrastructure planning.
MCA Title	Water Quality, Flood Risk Resiliency, and Municipal Planning
MCA ID	21940
Organization Type	Regional, County, City, or other local government
Organization Name	Georgia Regional Commissions
Sub-Agency or Division	
Organization Mission	Regional commissions assist local member governments with planning, economic development, GIS, and workforce development. The Atlanta Regional Commission (ARC) engages local government leaders, community partners, and residents to develop a shared approach for improving metro Atlanta's quality of life and addressing our rapidly evolving future. On any given day, ARC works with local jurisdictions and various regional partners to: - Plan new transportation options - Encourage the development of healthy, livable communities - Wisely manage precious water resources - Provide services for the region's older adults and individuals with disabilities - Help businesses recruit and train the workers they need - Provide data to inform leaders and decision-makers - Coordinate with local first responders in preparing for a secure region The agency serves as a regional convener, bringing diverse stakeholders to the table to address the most important issues facing metro Atlanta. And ARC offers leadership development programs to residents who want to make a difference in the Atlanta region.
Program Name	Natural Resources Group - Protecting water supplies and water quality in the metro region Transportation Planning - Development and Implementation of the Regional Transportation Plan (RTP). GIS, Planning and Economic Development
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 23 - Urban and Regional Planning
Tertiary Business Use	BU 15 - Flood Risk Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Buildings, culverts, bridges, roads, parking lots, trees.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Not required
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Not required
5.1 – 10 acres	Not required
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B		
Update Frequency	4-5 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable

Hydrologic Processing Required	Response
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required			Highly desirable	
Entire AOI under same environmental conditions	Required	Highly desirable			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Required	Highly desirable		
Classified point cloud	Required	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required	Highly desirable		
Ground control/ground truthing	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Required	Highly desirable		
Estuaries				
Inland surface water features	Required	Highly desirable		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	USGS National Elevation Dataset (NED) and expect USGS 3DEP delivery for some counties by mid-2019, although gaps exist in overall area of interest. Also contractor lidar.	None available		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				

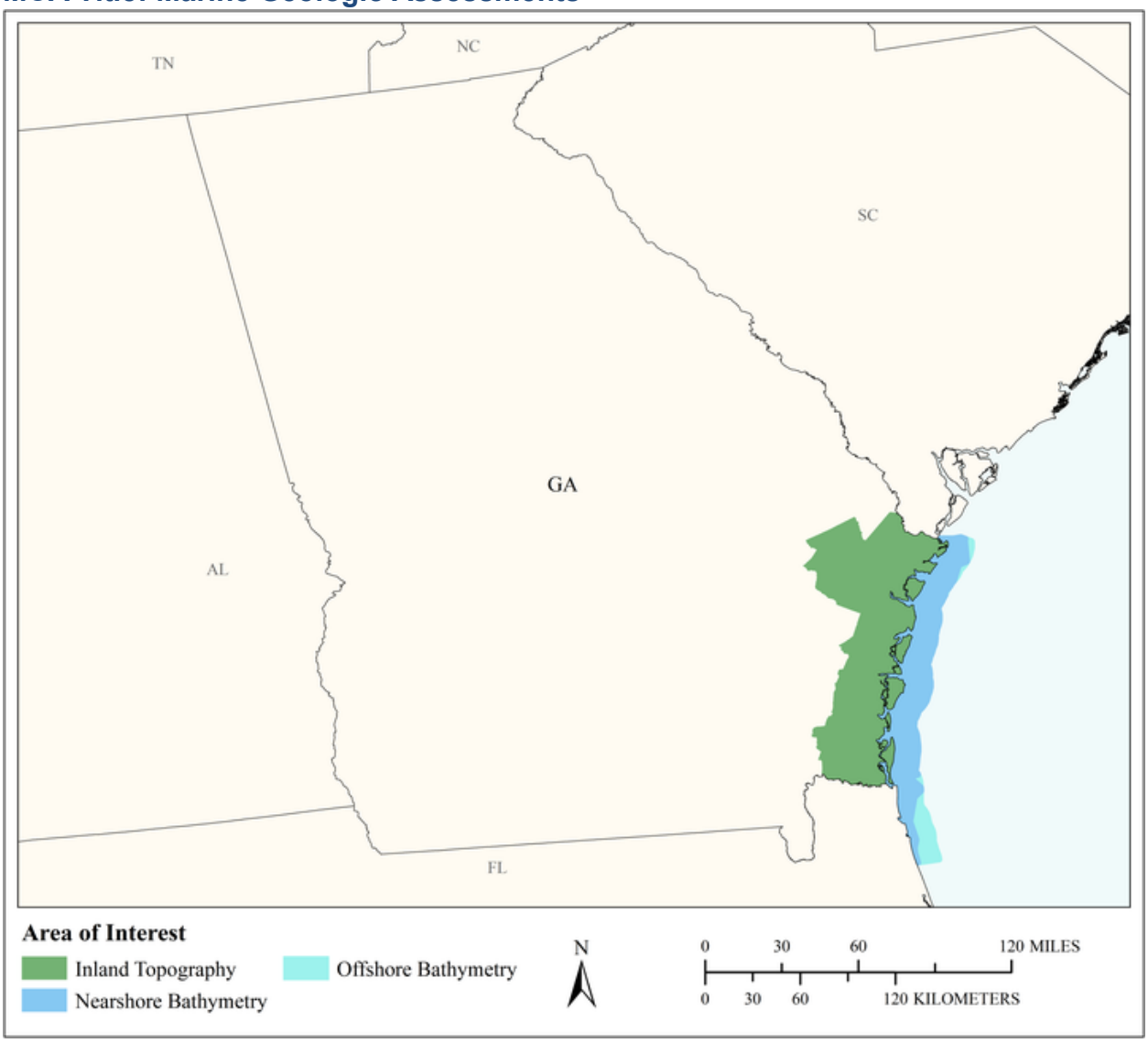
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other	Yes			
Other description	Contractor lidar on local servers			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available		
Cost savings/cost reduction	Major	Inland bathy data not available		
Cost avoidance	Major	Inland bathy data not available		
Increased revenues	Moderate	Inland bathy data not available		
Mission-driven performance improvements	Major	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available		
Improved response or timeliness	Major	Inland bathy data not available		
Improved customer experience	Major	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Inland bathy data not available		
Environmental	Major	Inland bathy data not available		
Public safety, including life and property	Major	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		I don't know	Unable to provide							
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide							
Increased revenues	Major	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	Major	Unable to provide		I don't know	Unable to provide							
Improved customer experience	Major	Unable to provide		I don't know	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			I don't know								
Environmental	Major			I don't know								
Public safety, including life and property	Major			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Marine Geologic Assessments



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	Required
Geographic Area Requirements	One or more states, territories, or counties		Custom description	Custom description
Sub Area Requirements	Barrier islands and coastal counties of Georgia		Georgia and two northern coastal counties of Florida	To 8nm offshore of Georgia and two northern coastal counties of Florida

MCA Description	Response
Mission Critical Activity	The mission critical activity requiring 3D elevation data is assessment of hazards from sea level rise, storm inundation and changing nearshore shallow bathymetry. Also sand resource assessments for harvesting for beach re-nourishment.
MCA Title	Marine Geologic Assessments
MCA ID	1132
Organization Type	Academic or Not-for-Profit
Organization Name	University of Georgia (UGA) - Skidaway Institute of Oceanography
Sub-Agency or Division	
Organization Mission	Coastal zone and marine oceanographic research and graduate education
Program Name	Coastal marine geologic research and graduate education. Support of coastal management needs for coastal elevation data.
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 16 - Sea Level Rise and Subsidence
Tertiary Business Use	BU 20 - Marine and Riverine Navigation and Safety

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	I'm interested in everything from bedforms to crab traps to random outcrops of hard bottom habitat in sounds and estuaries.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2		QL2B	Cross sections and/or transects meet needs
Update Frequency	4-5 years		4-5 years and certain events.	6-10 years
Event type(s)			Episodic after events	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI			Sounds and estuaries need to be surveyed more frequently (2-3 years and after events) whereas shelf bathy can be every 5 years.	
Acceptable Horizontal Error	Up to 1 meter		Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm		Up to 30 cm	Less than 1 meter
How far onshore needed			From the shoreline to the true uplands, west of areas dominated by marsh	
How far down the beach profile needed	To MLLW		Continuous coverage from upland out to the 10 meter isobath	
Tide correction requirement			NAVD88	NAVD88
Cross sections and/or transects meet needs			Partial	Yes

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross section/transect requirement			Vertical accuracy for transects must be <30 cm. Longitudinal sampling density is 50 m spacing on lines, or closer if needed. Water clarity is very poor in the SE US. Therefore topo-bathy lidar does not provide adequate data for much of our region. Thus we need to use multibeam or bathy sonar to collect data. In shallow regions (<3 m MLW), the swatch width is too narrow to justify the tie to collect full data coverage with SWMB systems, so we switch to transects using single beam systems. With extensive regions of coastal areas <3 m water, we collect a lot of single beam data.	Spacing at 1nm, less than 1 meter vertical error

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required		Required	Highly desirable		Not required
Entire AOI under same environmental conditions	Required		Required	Not required		Not required
Other			Required			Required
Other description			Entire EOI needs to be surveyed at low tide			Known tidal stage (low preferred)
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Required	Nice to have		Required
DEM for entire AOI needs to be seamless	Required		Required	Nice to have		Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required		Not required	Not required
DTM	Not required		Not required	Not required
DEM	Required		Required	Required
Raw point cloud data	Nice to have		Required	Required
Classified point cloud	Nice to have		Highly desirable	
Edited/cube XYZ			Highly desirable	Highly desirable
Full waveform	Not required		Highly desirable	Not required
Bathymetric Attributed Grid (BAG)			Highly desirable	Nice to have

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)			Required	Nice to have
Tide Predictions			Not required	Required
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Not required
Intensity imagery/sidescan imagery	Nice to have		Not required	Highly desirable
Ground control/ground truthing	Required		Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Nice to have	Nice to have
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Highly desirable		Highly desirable	Nice to have
Underwater videography			Not required	Not required
Bottom texture			Required	Required
Bottom type			Required	Required
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Highly desirable		Nice to have	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Highly desirable	Nice to have
Tide/wave heights			Highly desirable	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Required	Highly desirable
Routes			Highly desirable	Highly desirable
Offshore cadastral			Nice to have	Highly desirable
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have		Required	
Land use/land cover	Nice to have		Not required	Not required
Wetlands	Nice to have		Nice to have	Not required
Estuaries			Nice to have	Not required
Inland surface water features	Not required		Nice to have	
Bridges/culverts	Not required			
Landmark features	Nice to have		Nice to have	
Cultural resources	Nice to have		Nice to have	
Coastal and riverine structures	Highly desirable		Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	2010 lidar from DNR and USGS		We are using NOAA and USACE bathymetry of whatever age we can get. Much of it for the coast of Georgia is from 1933! Some small additions from the 1970s, and of course the Port of Savannah and Brunswick approaches get done every year. One sound in Georgia was surveyed in the early 1990s just prior to the Olympics sailing event. The AIWW gets surveyed by the USACE frequently, but that data is a very narrow swath and not that useful.	NOAA general bathymetry data. Various ages and methods used to collect.
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			

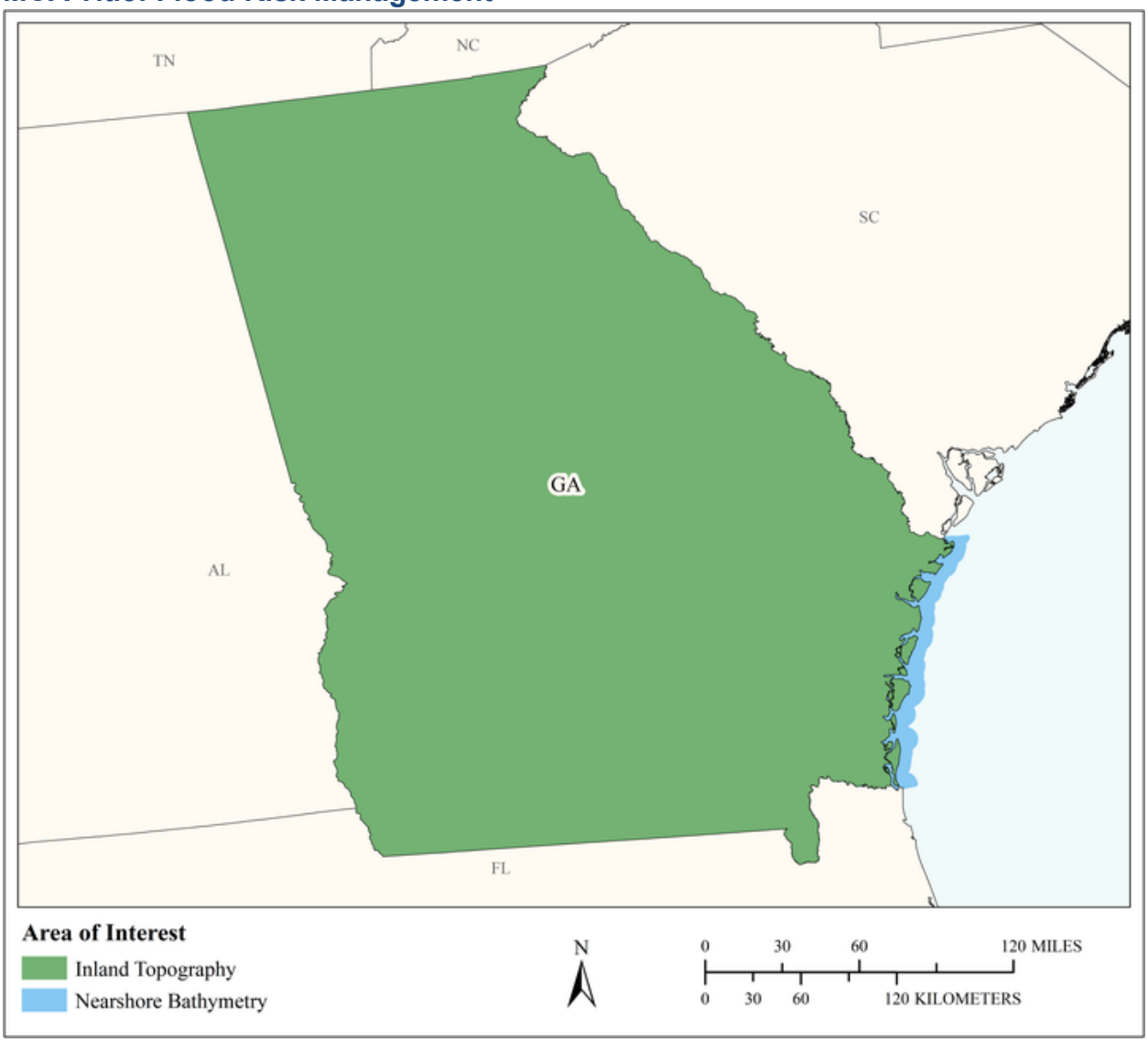
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Digital Coast			Yes	Yes
NCEI			Yes	Yes
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS			Yes	
State Repositories				
State repositories used				
Other	Yes		Yes	
Other description	In-house		I collect my own data where none is available	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know		Moderate	None
Cost savings/cost reduction	I don't know		None	None
Cost avoidance	I don't know		Moderate	None
Increased revenues	I don't know		None	None
Mission-driven performance improvements	I don't know		Moderate	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know		Major	Minor
Improved response or timeliness	I don't know		Minor	None
Improved customer experience	I don't know		None	None
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know		Major	Minor
Environmental	I don't know		Moderate	None
Public safety, including life and property	I don't know		Major	None

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$9,302				Moderate	Annual dollars saved/realized	$7,538	None		
Time savings description	Less planning for field data collection. Better inundation modeling. No need to integrate datasets from one-off mapping projects.						Less planning for surveying in shallow areas if data available. More rapid incorporation of ancillary datasets. Getting all data sources into a compatible format is a large time sink for us.					
Cost savings/cost reduction	Minor	Annual dollars saved/realized	$3,000				Moderate	Annual dollars saved/realized	$25,000	Minor	Unable to provide	
Cost savings/cost reduction description	No need to collect upland data to tie into nearshore bathy.						Staff salary not dedicated to working with/collecting survey data.					
Cost avoidance	Moderate	Annual dollars saved/realized	$6,000				Minor	Annual dollars saved/realized	$10,000	None		
Cost avoidance description	Staff salary saved doing this work.						Staff salary saved doing this work.					
Increased revenues	None						None			Moderate	Unable to provide	
Mission-driven performance improvements	Moderate	Annual percent improvement	10%				Moderate	Annual percent improvement	25%	Minor	Unable to provide	
Mission-driven performance improvements description	Better quality research results and quality of student research adds value to my program.						Better quality research results and quality of student research adds value to my program.					
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide					Moderate	Unable to provide		Minor	Unable to provide	
Value added to products or services description	Better maps of upland areas can be merged more effectively with coastal maps to enhance safety and research.						Better maps of coastal areas enhances the experience for the public. Better maps of coastal areas enhances the safety of the public in boating and in inundation modeling.					
Improved response or timeliness	Moderate	Unable to provide					Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Moderate	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor						Moderate			I don't know		
Education or outreach description	Better visualization tools and displays for students/the public						Better visualization tools and displays for students/the public					
Environmental	Minor						Moderate			I don't know		
Environmental description	Conservation of important habitats						Conservation of important but unknown benthic habitats					
Public safety, including life and property	Moderate						Major			I don't know		
Public safety, including life and property description	Better inundation mapping and surge modeling at upland interface						Better inundation mapping, surge modeling and boater safety information					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	Yes
Contours				
Hillshades	Yes		Yes	Yes
Slope maps	Yes		Yes	Yes
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes		Yes	Yes
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes		Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Flood Risk Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Contribute to mitigating the impacts of riverine and coastal flooding and storm surge by managing the development of flood insurance rate maps and flood risk products/tools, in addition to supporting local jurisdictions participating in the National Flood Insurance Program (NFIP) in administering their flood damage prevention ordinances for compliance with the requirements of the NFIP and conveying flood risk information to their constituents.
MCA Title	Flood Risk Management
MCA ID	1392
Organization Type	State or U.S. Territorial government
Organization Name	Georgia Department of Natural Resources
Sub-Agency or Division	
Organization Mission	The mission of the Department of Natural Resources is to sustain, enhance, protect and conserve Georgia's natural, historic and cultural resources for present and future generations, while recognizing the importance of promoting the development of commerce and industry that utilize sound environmental practices.
Program Name	Georgia Flood Map Program
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Building footprints; Bridges

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2		Cross sections and/or transects meet needs	
Update Frequency	6-10 years		6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Horizontal Error	Less than 20 cm		Up to 1 meter	
Acceptable Vertical Error	Up to 20 cm		Up to 40 cm	
How far onshore needed			500 meters inland	
How far down the beach profile needed	To MHW		To MHW	
Tide correction requirement			No requirement for tide correction	
Cross sections and/or transects meet needs			Yes	
Cross section/transect requirement			18 cm vertical RMSE (36 cm at 95% confidence interval).	

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required		Highly desirable			Highly desirable
Entire AOI under same environmental conditions	Required		Required			Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Required			Required
DEM for entire AOI needs to be seamless	Required		Required			Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required			
DTM	Nice to have			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Highly desirable		Not required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Not required	
Submerged features			Not required	
Subbottom characteristics			Not required	
Geologic and seismic data	Not required		Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Not required	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates	Nice to have		Nice to have	
Land use/land cover	Highly desirable		Highly desirable	
Wetlands	Nice to have		Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required		Required	
Bridges/culverts	Highly desirable			
Landmark features			Not required	
Cultural resources	Not required		Not required	
Coastal and riverine structures	Required		Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Data collected through USGS 3DEP; NOAA: Local Jurisdictions		Bathymetric data collected through partnership with NOAA, Coastal RDC, Georgia DNR & FEMA for the Coastal Risk MAP Project.	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI	Yes		Yes	
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Major	
Cost savings/cost reduction	Major		I don't know	
Cost avoidance	Moderate		Major	

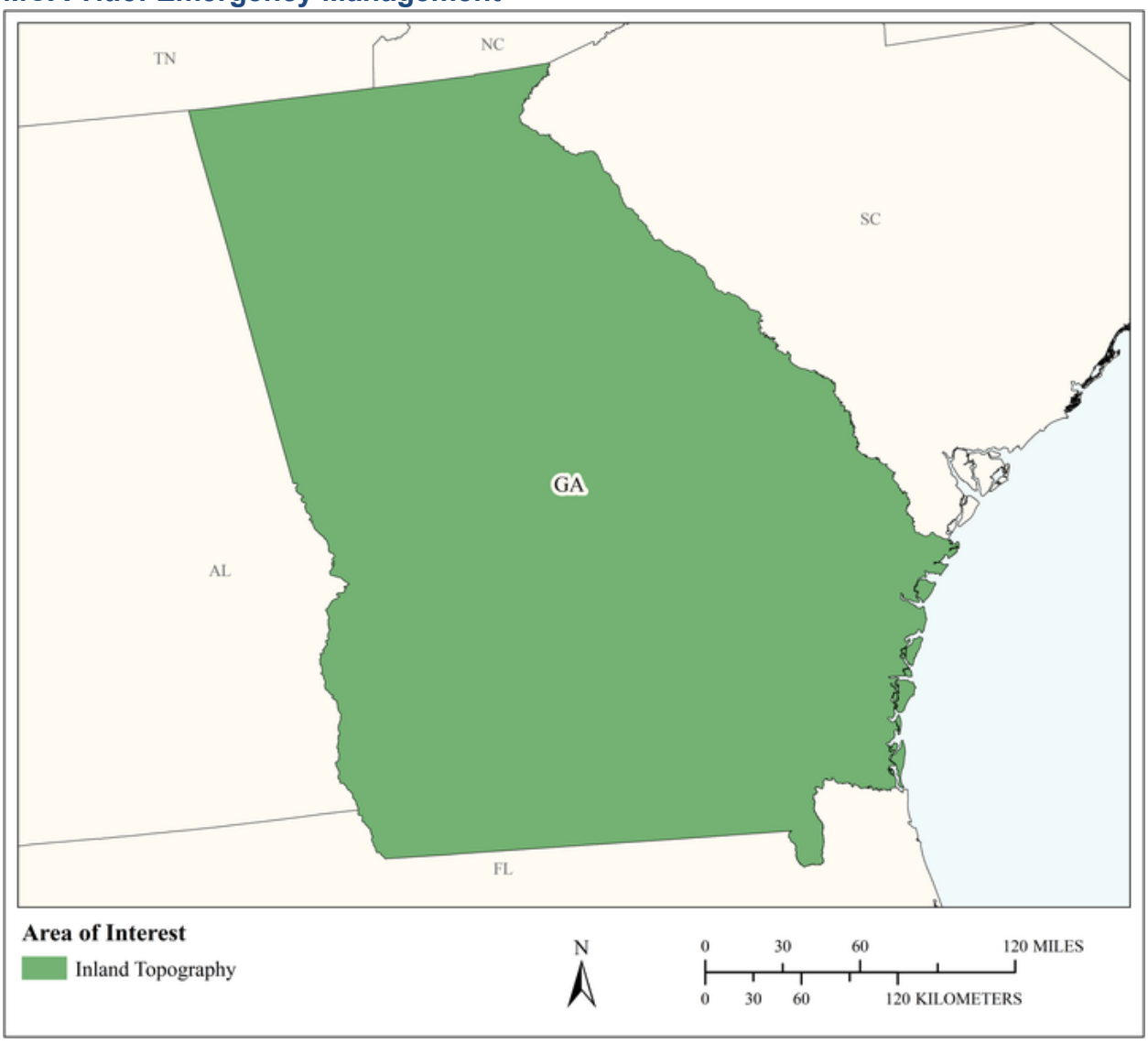
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	None		I don't know	
Mission-driven performance improvements	Major		Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate		Moderate	
Improved response or timeliness	Major		Moderate	
Improved customer experience	Moderate		Moderate	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate		Minor	
Environmental	Minor		Moderate	
Public safety, including life and property	Major		Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					Major	Unable to provide				
Cost savings/cost reduction	Major	Annual dollars saved/realized	$914,025				Major	Unable to provide				
Cost savings/cost reduction description	Using 3DEP Program, saving of at least 50% in acquisition cost per sq. mi. 58,827 sq. mi * $248.60/sq. mi. / 2 spread over 8 years for life of data at 6-10 year update frequency.											
Cost avoidance	Major	Unable to provide					Major	Unable to provide				
Cost avoidance description	Better able to determine water surface elevations for various storm frequencies.											
Increased revenues	None						None					
Mission-driven performance improvements	Major	Unable to provide					Major	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide					Major	Unable to provide				
Improved customer experience	Major	Unable to provide					Major	Unable to provide				
Other customer service benefits	Major	Unable to provide										
Other customer service benefits description	Access to data. Consultants/Engineers could provide better services to stakeholders.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor						Moderate					
Education or outreach description	Public confidence in data											
Environmental	Moderate						Moderate					
Environmental description	Better planning for development within special flood hazard areas											
Public safety, including life and property	Major						I don't know					
Public safety, including life and property description	Determine evacuation routes and better define special flood hazard areas											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections	Yes		Yes	
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes		Yes	
Hydrologic Flow Accumulation Grids	Yes		Yes	
Hydrologic networks (e.g. streams, lakes)	Yes		Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes		Yes	
Building footprints	Yes		Yes	
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Emergency Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Inundation mapping and identifying at risk populations and critical infrastructure.
MCA Title	Emergency Management
MCA ID	22018
Organization Type	State or U.S. Territorial government
Organization Name	Georgia Emergency Management and Homeland Security
Sub-Agency or Division	
Organization Mission	Protect life and property through planning, mitigation, response, and recovery.
Program Name	Hazard Mitigation, Operations Division, Public Assistance and Recovery, Radiological Emergency Preparedness
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Building Footprints, 2 ft Contours, tree canopy

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 60 cm			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed	To MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	3DEP			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes			
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			

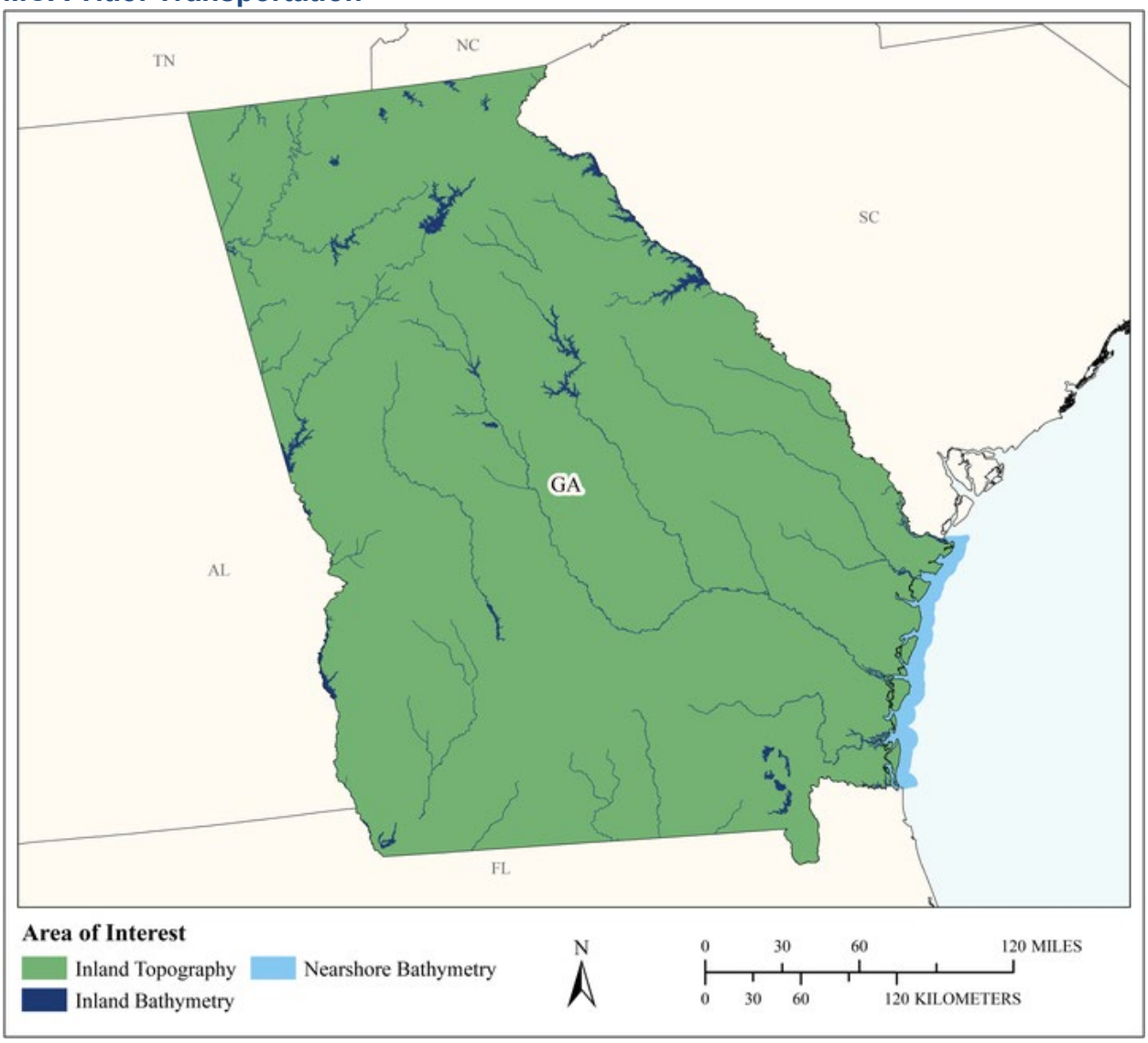
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Minor			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Moderate			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide										
Cost savings/cost reduction	I don't know	Unable to provide										
Cost avoidance	I don't know	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	I don't know	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide										
Improved response or timeliness	I don't know	Unable to provide										
Improved customer experience	I don't know	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Transportation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Road route selection and maintenance. Slope analysis for autonomous cars. GPS navigation visualization. Elevation data are needed for planning for culverts and bridges, design, H&H modeling, etc. BU 21 – Aviation Navigation and Safety is an additional Business Use. All Business Uses could be considered to apply.
MCA Title	Transportation
MCA ID	22423
Organization Type	State or U.S. Territorial government
Organization Name	Georgia Department of Transportation (GDOT)
Sub-Agency or Division	
Organization Mission	Deliver a transportation system focused on innovation, safety, sustainability and mobility
Program Name	Georgia Department of Transportation
Total Annual Program Budget	
Primary Business Use	BU 19 - Land Navigation and Safety
Secondary Business Use	BU 22 - Infrastructure and Construction Management
Tertiary Business Use	BU 23 - Urban and Regional Planning

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Curb, ditch, culvert, and road line, bottom surface underwater

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B	QL0B	
Update Frequency	2-3 years	2-3 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Less than 20 cm	Less than 20 cm	
Acceptable Vertical Error	Less than 5 cm	Less than 5 cm	Less than 5 cm	
How far onshore needed			To Mean Higher High Water (MHHW)	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs		Partial	Partial	
Cross section/transect requirement		I don't know	I don't know	

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	
DTM	Required	Required	Required	
DEM	Highly desirable	Highly desirable	Highly desirable	
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Nice to have	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Nice to have	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Highly desirable	Highly desirable	Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Not required	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Nice to have	
Land use/land cover	Required	Required	Nice to have	
Wetlands	Highly desirable	Highly desirable	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Nice to have	
Inland surface water features	Highly desirable	Highly desirable	Nice to have	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Nice to have	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Best available	Best available – not much	Not much available	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	
NCEI	Yes			
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Georgia			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available	None	
Cost savings/cost reduction	Moderate	Inland bathy data not available	None	
Cost avoidance	Moderate	Inland bathy data not available	None	
Increased revenues	None	Inland bathy data not available	None	

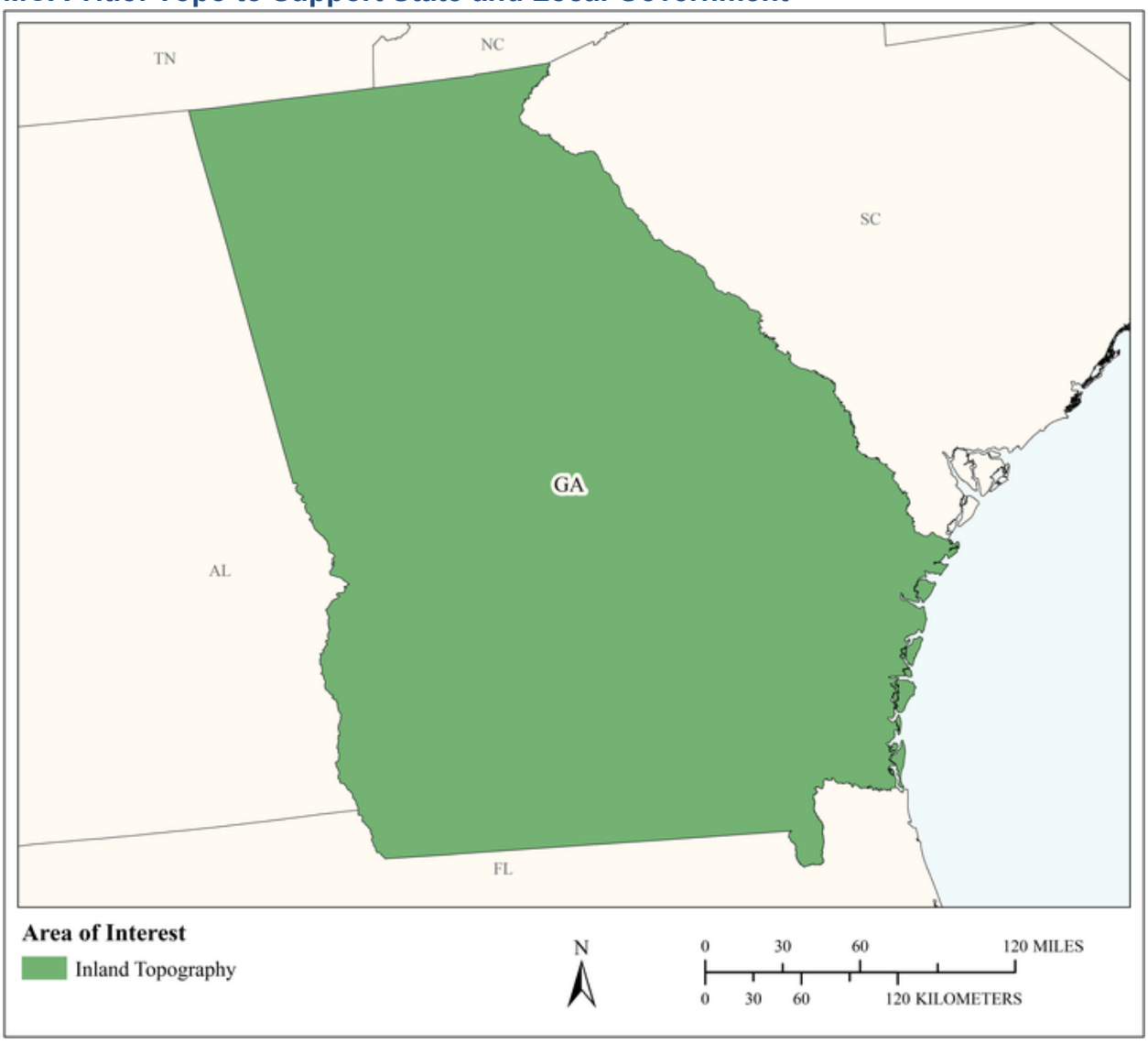
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Mission-driven performance improvements	Major	Inland bathy data not available	None	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available	None	
Improved response or timeliness	Major	Inland bathy data not available	None	
Improved customer experience	Major	Inland bathy data not available	None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Inland bathy data not available	None	
Environmental	Major	Inland bathy data not available	None	
Public safety, including life and property	Major	Inland bathy data not available	None	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost savings/cost reduction	Minor	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost avoidance	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Increased revenues	None			I don't know	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved customer experience	Minor	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			I don't know			I don't know					
Environmental	Minor			I don't know			I don't know					
Public safety, including life and property	Major			I don't know			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades				
Slope maps	Yes	Yes	Yes	
Aspect maps				
Curvature maps	Yes	Yes	Yes	
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Topo to Support State and Local Government



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Transportation Concept Studies, Transportation Design Support, Large Site Civil Design Projects, Residential / Commercial Site Prep and Design Activities
MCA Title	Topo to Support State and Local Government
MCA ID	21495
Organization Type	Private or Commercial
Organization Name	Platinum Geomatics, LLC
Sub-Agency or Division	
Organization Mission	Our mission is to provide quality aerial photogrammetry, LiDAR, digital imagery and land surveying services to a diverse clientele of federal, state, local and private-sector clients.
Program Name	Land Surveying Department, Aerial Mapping Department
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 23 - Urban and Regional Planning
Tertiary Business Use	BU 21 - Aviation Navigation and Safety

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Would love to have curb and gutter, but realize that still requires either mobile or terrestrial LiDAR to do with a high level of confidence / accuracy.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI	Some projects require varying levels of accuracy. Design level versus concept level			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Nice to have
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Required			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Required			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Available lidar via NOAA Digital Coast or in-house collected			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes			
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	Local Government when available			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			

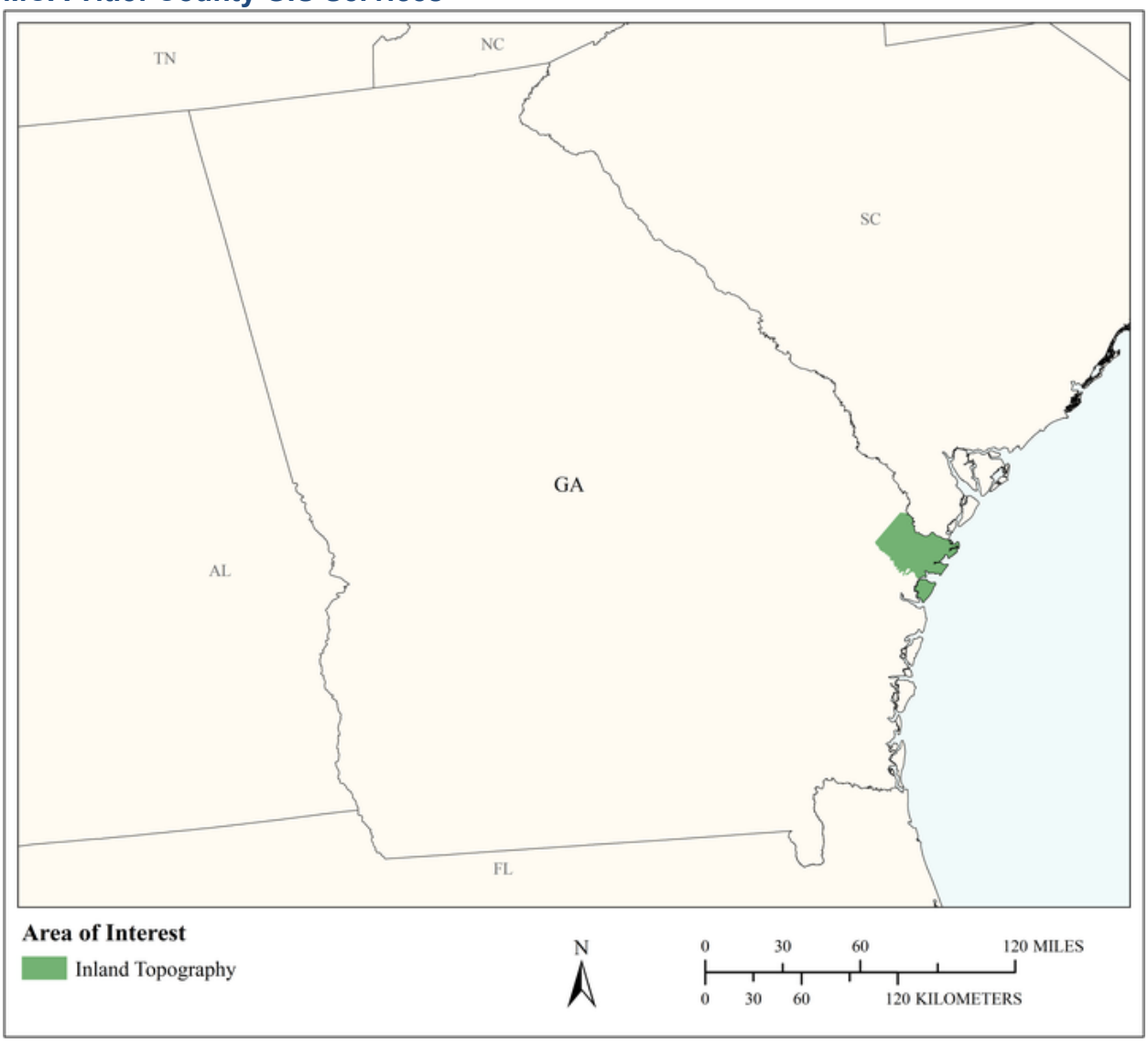
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	Moderate			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$36,873									
Time savings description	Guesstimated number of reduced field time annually. Significant savings in project planning. Another guesstimate.											
Cost savings/cost reduction	Major	Unable to provide										
Cost savings/cost reduction description	We're a data provider, but the benefit to our clients puts less strain on base data and frees up funds for more in depth data collection and modeling.											
Cost avoidance	Moderate	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: County GIS Services



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements	Chatham County, GA			

MCA Description	Response
Mission Critical Activity	Marine construction. Bridge design and construction. Engineering and construction of dams, levees, dikes, reservoirs, and coastal structures. Shipyard and port construction. Water, sewer, or power line planning and vegetation analysis. Pump, drain, and well placement. Stormwater modeling. Cut and fill analysis for earth-moving. Building site analysis. Road infrastructure
MCA Title	County GIS Services
MCA ID	22258
Organization Type	Regional, County, City, or other local government
Organization Name	Chatham County Government
Sub-Agency or Division	
Organization Mission	Provide GIS services to the departments and citizens of Chatham County Georgia
Program Name	Chatham County Government
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 27 - Recreation
Tertiary Business Use	BU 03 - Coastal Zone Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Signs and curbs

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 10 cm			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed				
How far down the beach profile needed	To MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Required			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Data collected through USGS 3DEP			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes			
NCEI	Yes			
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			

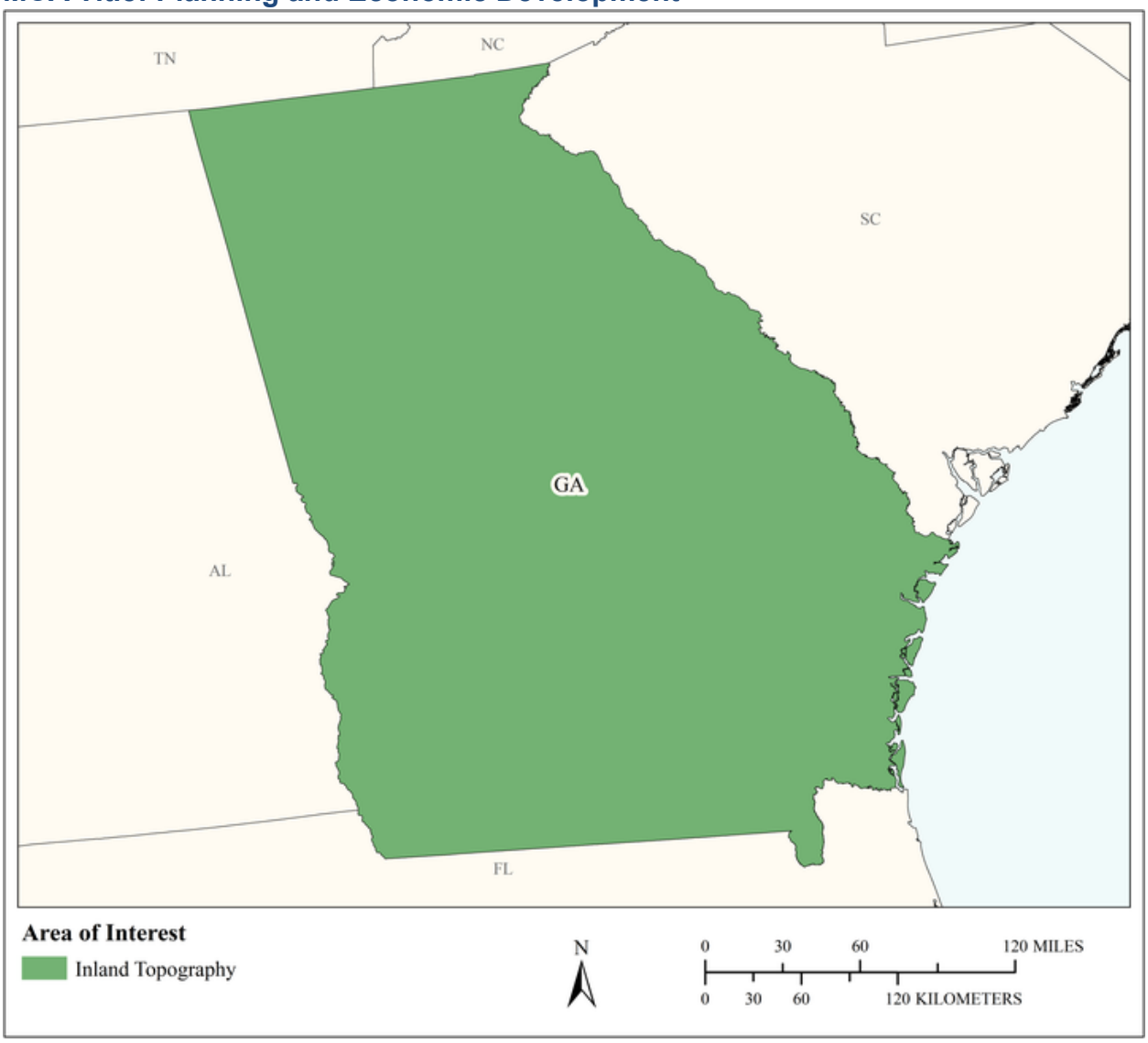
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			
Improved response or timeliness	Moderate			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	Moderate			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	I don't know	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Moderate											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Planning and Economic Development



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Full feature extraction (elevation, contours, 3D features, land use, orthos) from lidar data.
MCA Title	Planning and Economic Development
MCA ID	22090
Organization Type	Private or Commercial
Organization Name	Georgia Power Economic Development
Sub-Agency or Division	
Organization Mission	Economic Development - to help existing business in the state to expand and to bring new companies into Georgia.
Program Name	None
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Vegetation

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI	More frequency in urban areas than rural areas			
Acceptable Horizontal Error	Up to 30 cm			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Not required			
Landmark features	Required			
Cultural resources	Not required			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Digital elevation models			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Minor			
Cost avoidance	Minor			
Increased revenues	Minor			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Minor	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None											
Environmental	None											
Public safety, including life and property	None											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

Guam

Current status of elevation data for Guam

There is existing lidar for Guam and limited bathymetric data, although topobathymetric data at the shoreline is coming soon. Lidar was collected in 2007 and then again in 2012. The 2007 lidar data for the island of Guam was funded and collected for the Department of Public Works (Highway Division) and Guam Homeland Security. The Bureau of Statistics and Plans Land Use Planning Program was the project point of contact for the government of Guam. The collection was conducted by the Joint Airborne Lidar Bathymetry Technical Center of Expertise (JALBTCX) for the U.S. Army Corps of Engineers, Honolulu District who was the project contractor for the government of Guam. The 2012 lidar data were funded by USGS. Both datasets are available though neither meet current 3DEP specifications (considered Quality Level 3 [QL3]). The 2007 lidar included a bathymetric component with a target depth of 40 meters or to laser extinction. Current bathymetric data extend around much of the island to depths of over 25 meters and has a point density of approximately one point per several square meters. Bathymetry for Fena Lake was collected by USGS in February 2014 using a boat-mounted, acoustic Doppler current profiler. New bathymetry for Apra Harbor was collected in 2018 and released in spring 2019. Guam currently has 2019/2020 QL1 topobathy collected under a NGS contract with Woolpert. The island is fully collected (except for a small area around Ritidian Point, a military no-fly-zone). Topo-bathy data for Saipan, Tinian, Rota, Aguijan, FDM, and Pagan were collected by NOAA during April/May 2019 include terrestrial, intertidal, and shallow water zones (up to 50-meter water depth or laser extinction). Topographic data will be QL1 (RMSEz LTE 10 cm; min 8 points per square meter) with a horizontal accuracy of 1.2-meter while bathymetric data will have vertical root mean square error of QL2B.

Importance of elevation data to Guam

Elevation data needs are varied for Guam and include all the elevation datasets in 3D Nation. Guam Waterworks needs topographic lidar and inland bathymetry to support its extensive water-related infrastructure and construction work; it also needs nearshore and offshore bathymetry. Guam EPA also needs topographic lidar and inland bathymetry for water supply protection and coastal zone management. The Comprehensive Long-term Coral Reef Monitoring Program monitors coral reefs as both part of regular surveys and for rapid response. Nearshore and offshore bathymetry are priorities and the program also benefits from the topographic lidar as it provides details on shore process that affect reefs (e.g. runoff). Guam Power Authority needs lidar and inland bathymetry to identify wetlands and help determine ground conditions for infrastructure (utility poles) and underground routing of utility cables. Cultural and archaeological preservation also requires topography and inland, nearshore, and offshore bathymetry. Siting of infrastructure and coastal zone construction and identifying wrecks require both wide data coverage and high resolution. The Pacific Islands Climate Adaptation Science Center supports climate science and adaptation research which requires topographic and all bathymetric coverages. The data help with decision making, instruction, research, collection of biological data, and H&H modeling, especially floodplain delineation. The Department of Land Management covers zoning and land use issues related to public lands. This requires topographic lidar in addition to inland and nearshore bathymetry. Elevation data are also used for riverine ecosystem management, agriculture, geologic assessment and resource mining, fisheries management, forestry management, and recreational purposes.

High-level summary of elevation data requirements

In general Guam requires QL1 inland topography and QL1B inland and nearshore bathymetry updated every 4-5 years, and Order 1b offshore bathymetry updated every 6-10 years. Greater data acquisition costs in the Pacific may decrease the relative expense of higher resolution data, so that higher quality

levels could be considered, at least for topographic lidar. There is limited inland water on Guam, with Fena Valley Reservoir being the largest water body. Although bathymetry was collected in 2014, it would be beneficial to have topobathymetry of the whole area including Fena. Offshore bathymetry to depths of 200 feet and up to 250 meters were noted due to strong coastal zone monitoring requirements and steep underwater drop-offs near the Guam shoreline.

High-level summary of benefits that would come from higher resolution elevation data

Major benefits are found for applications involving utility, construction, and infrastructure planning and execution. There are also major benefits for coastal zone management which affects so much of the territory - for example reefs and fisheries. Significant savings were cited by most everyone all around for field visits and inspections, data review, cost avoidance, reduced accidents and property loss, and in having data readily available without need for collection or further manipulation. Some groups also provide elevation data to other organizations not part of 3D Nation so the effects of having these data are further reaching. Lidar would also help in better characterizing stream, lake, and wetland boundaries.

Additional comments

Refresh rates for Guam should be conducted with consideration to changes in the land and seascapes brought on by the Military Buildup. In other words, a collection should be conducted at the end of military construction projects. Because there are projects outside the DoD fence line this should include the whole island. Also, depending on the duration of the buildup, including any delays, there may be a need to collect data midway through the buildup.

It would be beneficial to have better resolution of offshore banks for possible future management of fishery resources.

Southern and Central Guam landscape is characterized with mountain ranges, valleys, rivers, and the largest river delta on the island. Data collection that captures in better detail the elevation and vegetation cover of the south could be a further benefit to managing their watersheds.

Higher resolution data of nearshore reefs would be highly desirable for future management purposes.

The Territory of Guam has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

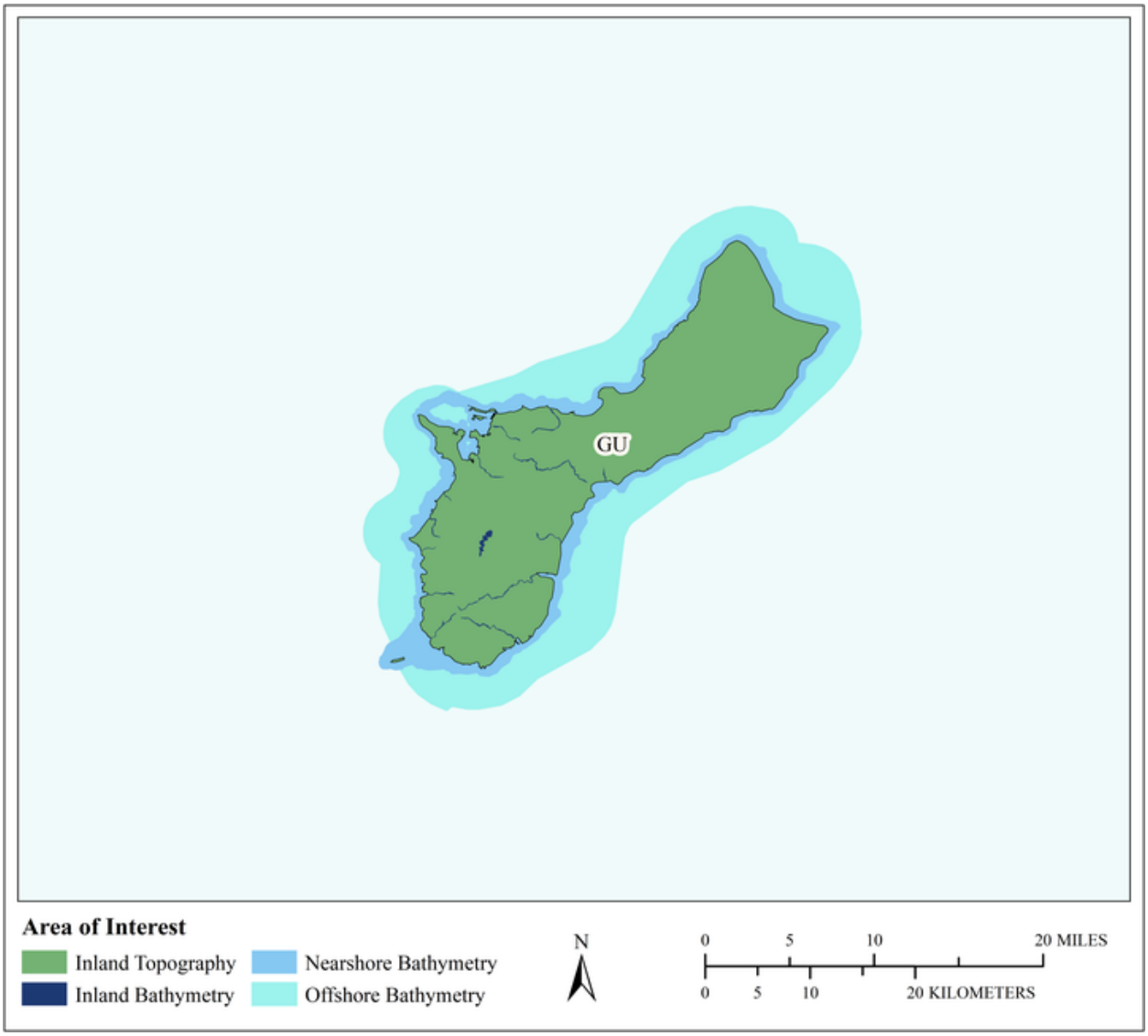
MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	Guam Waterworks Authority (GWA)	21668	Support Water and Wastewater System	Inland Topo	QL2	2-3 years	$2,496	Unable to quantify	Minor	Major	Moderate
				Inland Bathy	QL1B	2-3 years	$77,171	$8,064	I don't know	I don't know	I don't know
				Nearshore Bathy	QL1B	2-3 years	$14,357	$23,652	I don't know	I don't know	I don't know
				Offshore Bathy	Order 2	4-5 years	$1,068	Unable to quantify	I don't know	I don't know	I don't know
BU 01 – Water Supply and Quality	Guam Environmental Protection Agency	21894	Environmental Protection	Inland Topo	Cross sections and/or transects meet needs	4-5 years	$2,496	Unable to quantify	Major	Moderate	Moderate
				Inland Bathy	QL1B	4-5 years	$77,171	$8,064	I don't know	I don't know	I don't know
BU 02 – Riverine Ecosystem Management	Territory of Guam	60091	Riverine Ecosystem Management	Inland Topo	QL1 HD	6-10 years	$9,848	$983	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$5,242	$369	Major	Major	Major
BU 03 – Coastal Zone Management	Territory of Guam	60092	Coastal Zone Management	Inland Topo	QL1	4-5 years	$107,990	$18,870	Major	Major	Major
				Nearshore Bathy	QL0B	4-5 years	$75,130	$127,100	Moderate	Major	Major
BU 04 – Forest Resource Management	Territory of Guam	60093	Forest Resources Management	Inland Topo	QL1	2-3 years	$25,441	$36,879	Major	Major	Major
BU 06 – Natural Resource Management	Territory of Guam	60094	Natural Resources Conservation	Inland Topo	QL1 HD	4-5 years	$82,150	$301,700	Major	Major	Major
				Nearshore Bathy	QL1B	6-10 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate
				Offshore Bathy	Cross sections and/or transects meet needs	4-5 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
BU 07 – Wildlife and Habitat Management	University of Guam	22391	Long-term Coral Reef Monitoring	Inland Topo	QL2	4-5 years	$1,532	$4,427	Moderate	Major	Moderate
				Nearshore Bathy	QL2B	>10 years	$431	$25	I don't know	I don't know	I don't know
				Offshore Bathy	Order 1	>10 years	$2,059	$143	I don't know	I don't know	I don't know
BU 08 – Agriculture	Territory of Guam	60095	Agriculture and Precision Farming	Inland Topo	QL2	2-3 years	$2,420	$1,920	Major	Major	Minor

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 09 – Fisheries Management and Aquaculture	Territory of Guam	60096	Fisheries Management and Aquaculture	Inland Topo	QL2	2-3 years	$214	$465	Moderate	Moderate	Moderate
				Nearshore Bathy	QL0B	6-10 years	$68,390	$5,022	Moderate	Major	Minor
				Offshore Bathy	Special Order	6-10 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Minor
BU 10 – Geologic Assessment	Territory of Guam	60097	Geologic Assessment and Hazard Mitigation	Inland Topo	QL1	4-5 years	$442,150	$23,844	Major	Major	Major
				Nearshore Bathy	QL1B	4-5 years	$33,576	$54,024	Major	Moderate	Major
				Offshore Bathy	Special Order	4-5 years	$466,142	Unable to quantify	Major	Moderate	Major
BU 11 – Geologic Resource Extraction	Territory of Guam	60098	Geologic Resource Mining and Extraction	Inland Topo	QL1 HD	2-3 years	$1,571	$1,042	Minor	Major	Major
BU 14 – Cultural Resource Management	Private Planning and GIS consultant	1382	Preservation of Cultural and Natural Resources	Inland Topo	QL2	6-10 years	$1,179	$1,031	Moderate	Moderate	Major
				Inland Bathy	QL2B	>10 years	Unable to quantify	Unable to quantify	Major	Moderate	Moderate
				Nearshore Bathy	QL1B	4-5 years	$1,245	Unable to quantify	Moderate	Major	Major
				Offshore Bathy	I don't know	6-10 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
BU 14 – Cultural Resource Management	Territory of Guam	60099	Cultural Resources Preservation and Management	Inland Topo	QL1	4-5 years	$1,179	$1,031	Minor	Minor	Minor
				Nearshore Bathy	QL0B	4-5 years	$1,245	Unable to quantify	Minor	Moderate	Minor
BU 15 – Flood Risk Management	Territory of Guam	60100	Flood Risk Management	Inland Topo	QL2	4-5 years	$903,454	$158,076	Major	Moderate	Major
				Nearshore Bathy	QL2B	4-5 years	$82,424	$61,088	Major	Moderate	Major
BU 16 – Sea Level Rise and Subsidence	Territory of Guam	60101	Sea Level Rise and Subsidence	Inland Topo	QL1 HD	4-5 years	$338,764	Unable to quantify	Moderate	Moderate	Moderate
				Nearshore Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Minor
BU 17 – Wildfire Management	Territory of Guam	60102	Wildfire Management, Planning, and Response	Inland Topo	QL1	4-5 years	$34,572	Unable to quantify	Major	Major	Major
BU 18 – Homeland Security	Territory of Guam	60103	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management	Inland Topo	QL2	4-5 years	$189,821	$3,355	Major	Moderate	Major

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 19 – Land Navigation	Territory of Guam	60104	Land Navigation and Safety	Inland Topo	QL0	2-3 years	$2,713	$219	Minor	Major	Major
				Inland Bathy	QL0B	2-3 years	$115	$1	Minor	Moderate	Moderate
				Nearshore Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	None	Moderate	Moderate
BU 20 – Marine and Riverine Navigation	Territory of Guam	60105	Marine and Riverine Navigation and Safety	Nearshore Bathy	QL0B	2-3 years	$333,714	$11,298	Minor	Major	Major
				Offshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 21 – Aviation Navigation	Territory of Guam	60106	Aviation Navigation and Safety	Inland Topo	QL1 HD	Annually	$708	$881	Minor	Moderate	Moderate
BU 22 – Infrastructure Management	Guam Power Authority	21667	Delivering Electric Utility Services to Our Customers	Inland Topo	QL0	4-5 years	$289,168	$850,965	I don't know	I don't know	I don't know
				Inland Bathy	QL1B	Event driven	Unable to quantify	Unable to quantify	I don't know	I don't know	Minor
				Nearshore Bathy	QL1B	4-5 years	$9,097	$1,250	Minor	Moderate	Major
BU 23 – Urban and Regional Planning	Territory of Guam	60107	Urban and Regional Planning	Inland Topo	QL1	4-5 years	$1,731,298	$199,879	Moderate	Major	Major
				Nearshore Bathy	QL2B	4-5 years	$79,677	$84,056	Moderate	Moderate	Moderate
BU 25 – Real Estate, Banking, and Insurance	Territory of Guam	60108	Real Estate, Banking, Mortgage, and Insurance	Inland Topo	QL1 HD	4-5 years	$223,572	Unable to quantify	Minor	Minor	Major
BU 26 – Education and Basic Research	University of Guam	21910	Research and Education	Inland Topo	QL1 HD	4-5 years	$33,814	$80,826	Major	Major	None
				Inland Bathy	QL0B	4-5 years	$8,842	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL1B	4-5 years	$2,855	$112	Major	Major	Major
				Offshore Bathy	Order 3	4-5 years	$7,576	Unable to quantify	Major	Major	Minor
BU 27 – Recreation	Territory of Guam	60109	Recreation	Inland Topo	QL1	4-5 years	$1,476	Unable to quantify	Moderate	Moderate	Moderate
				Nearshore Bathy	QL0B	4-5 years	$56,340	Unable to quantify	Major	Major	Moderate
BU 28 – Telecom-munications	Territory of Guam	60110	Telecommunications	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 29 – Military	Territory of Guam	60111	Military	Inland Topo	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Offshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 30 – Maritime and Land Boundary Management	Department of Land Management	21519	Land Boundary Management and Land Development Zoning	Inland Topo	QL1 HD	4-5 years	$47,034	Unable to quantify	Moderate	Minor	Minor
				Inland Bathy	Cross sections and/or transects meet needs	2-3 years	Unable to quantify	Unable to quantify	Moderate	Minor	Minor
				Nearshore Bathy	QL2B	4-5 years	Unable to quantify	Unable to quantify	Minor	Minor	I don't know

MCA Title: Support Water and Wastewater System



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Custom description
Sub Area Requirements				Guam to about the 200 ft depth

MCA Description	Response
Mission Critical Activity	Mapping Guam Waterworks assets such as Sewer manholes, pipes and inverts. 3D elevation data will also be good for planning where new wells will go. Elevation data are needed for planning and to locate new facilities. Bathymetry is needed for locating outfalls. In addition to the three noted Business Uses, BU 22 Infrastructure and Construction Management would also be applicable.
MCA Title	Support Water and Wastewater System
MCA ID	21668
Organization Type	State or U.S. Territorial government
Organization Name	Guam Waterworks Authority (GWA)
Sub-Agency or Division	
Organization Mission	Guam Waterworks Authority (GWA), a public corporation, provides good drinking water that meets the federal Safe Drinking Water Act (SDWA) to the island of Guam's civilian residents and collects about 60% of wastewater. GWA treats the wastewater and disposes of it in compliance with the federal Clean Water Act (CWA). Currently, 40% of GWA's customers continue to use cesspools and septic tanks that places the ground water that supplies our wells at risk of contamination. GWA provides the facility of water production and distribution system to the community.
Program Name	BU 01 - Water Supply and Quality BU 06 - Natural Resources Conservation BU 23 - Urban and Regional Planning
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 06 - Natural Resources Conservation
Tertiary Business Use	BU 23 - Urban and Regional Planning

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Water pump stations, outfall pipes

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have
Other	Required
Other description	Lake Fena

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL1B	Order 2
Update Frequency	2-3 years	2-3 years	2-3 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI	Cocos and main island. Smaller islands for fisheries.			Offshore QL requirements not as high as nearshore
Acceptable Horizontal Error	Up to 30 cm	Less than 50 cm	Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 10 cm	Less than 10 cm	Up to 30 cm	Up to 2 meters
How far onshore needed			I don't know	
How far down the beach profile needed	To MHW		I don't know	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Nice to have	Nice to have	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Highly desirable	Highly desirable
DTM	Nice to have	Highly desirable	Not required	Not required
DEM	Required	Required	Required	Required
Raw point cloud data	Not required	Nice to have	Required	Required
Classified point cloud	Nice to have	Nice to have	Required	
Edited/cube XYZ		Nice to have	Not required	Not required
Full waveform	Not required	Nice to have	Not required	Not required
Bathymetric Attributed Grid (BAG)		Nice to have	Not required	Not required
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Not required	Not required
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Highly desirable	Required	Highly desirable	Highly desirable
Ground control/ground truthing	Highly desirable	Required	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Not required	Not required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Not required	Not required
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Not required	Not required
Geologic and seismic data	Not required	Highly desirable	Not required	Not required
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Not required	Not required
Tide/wave heights			Not required	Not required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Not required	Not required
Boundaries			Not required	Not required
Routes			Highly desirable	Highly desirable
Offshore cadastral			Not required	Not required
Lease areas			Not required	Not required
Fixed obstructions			Required	Required
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Required	Highly desirable	Highly desirable
Wetlands	Required	Required	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Required	Not required	
Bridges/culverts	Highly desirable	Required		
Landmark features	Required	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	I don't know. I was unable to find the meta data. 2008 lidar	USGS bathy for Lake Fena	Use data from Coastal Resource Management when available	Use data from Coastal Resource management when available
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast		Yes		
NCEI		Yes		
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes	Yes	Yes	
State repositories used	The Guam Coastal Management Program	Guam Coastal Management Program Hydroguam.net	Guam Coastal Management Program Hydroguam.net	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Major	Major
Cost savings/cost reduction	Major	Moderate	Major	Major
Cost avoidance	Minor	Moderate	Moderate	Moderate
Increased revenues	Minor	None	Moderate	Moderate

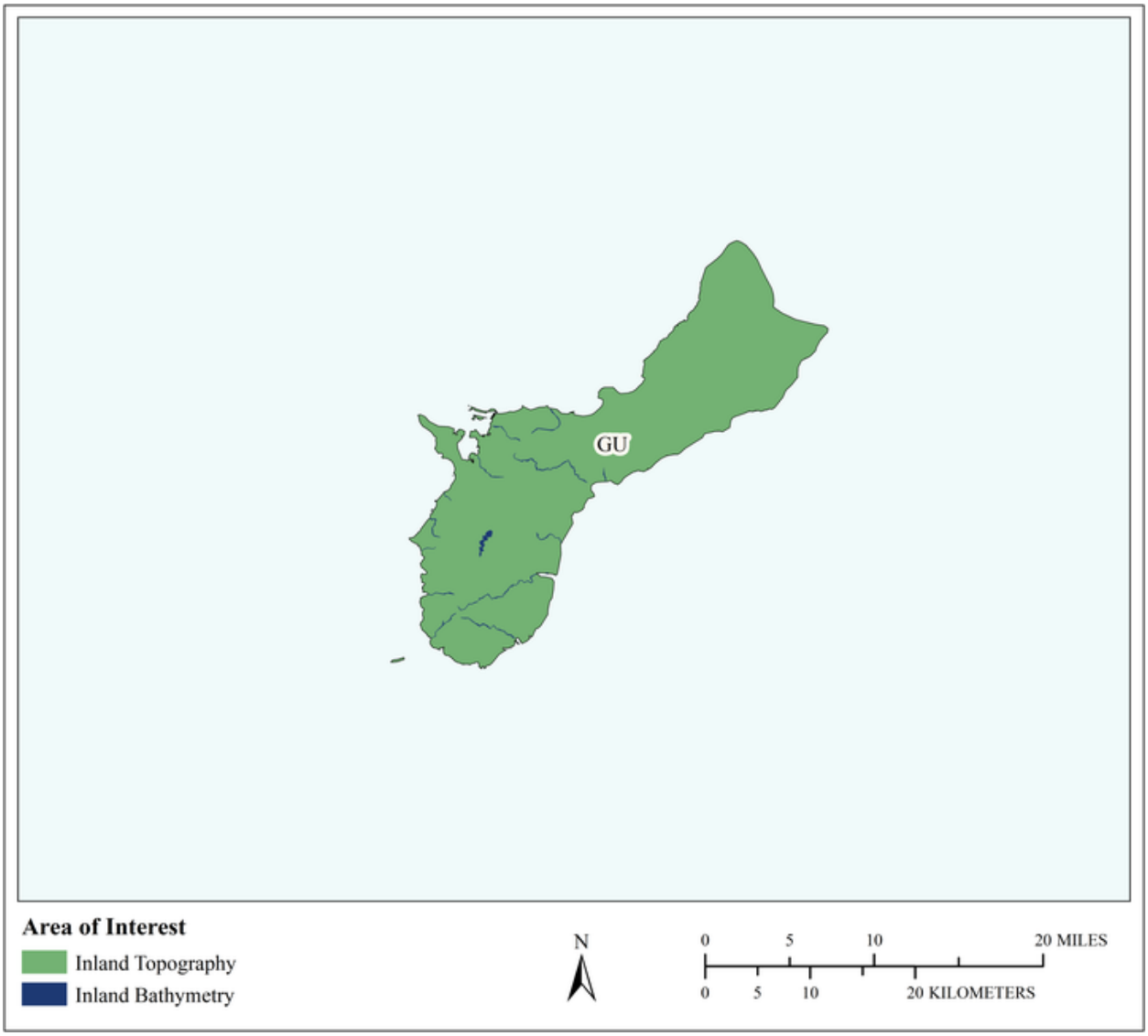
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Mission-driven performance improvements	Moderate	Moderate	Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	Moderate	Major	Major
Improved response or timeliness	Minor	Moderate	Major	Major
Improved customer experience	Moderate	Minor	Major	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Moderate	Major	Major
Environmental	Minor	Major	Major	Major
Public safety, including life and property	Moderate	Major	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Time savings description				Time would be saved by having data on hand. Don't know how to estimate.			Don't know how to estimate. Time would be saved by having data on hand.			Don't know how to estimate.		
Cost savings/cost reduction	Minor	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Minor	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,496		Annual dollars saved/ realized	$77,171		Annual dollars saved/ realized	$14,357		Annual dollars saved/ realized	$1,068
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Other customer service benefits	Major	Unable to provide										
Other customer service benefits description	We will be better able to provide invert elevation data for sewer lines.											
Future annual customer service benefits added during validation					Annual dollars saved/ realized	$8,064		Annual dollars saved/ realized	$23,652			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			I don't know			I don't know			I don't know		
Environmental	Major			I don't know			I don't know			I don't know		
Public safety, including life and property	Moderate			I don't know			I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	Yes
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Environmental Protection



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	To ensure the protection of human health and the environment
MCA Title	Environmental Protection
MCA ID	21894
Organization Type	State or U.S. Territorial government
Organization Name	Guam Environmental Protection Agency
Sub-Agency or Division	
Organization Mission	To ensure Guam that a high quality environment be maintained at all times to guarantee an enjoyable life for all people at present and in the future, and that environmental degradation of the quality of land, water and air by any pollutants, including all physical, chemical and biological agents, should not be allowed. To these ends, it is the purpose of this Act to provide a united, integrated, and comprehensive territory-wide program of environmental protect and to provide a framework to fulfill that task.
Program Name	Guam EPA Safe drinking water program
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 03 - Coastal Zone Management
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Sink hole features and water access to them. Man hole covers and topography.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required

Inland Bathy Feature Size Requirements	Response
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	Cross sections and/or transects meet needs	QL1B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	I don't know		
Acceptable Vertical Error	Up to 80 cm	I don't know		
How far onshore needed				
How far down the beach profile needed	Below MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs	Yes			
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Nice to have	Nice to have			Nice to have	
Other	Required	Required			Required	
Other description	Should be done at least twice a year, rainy and dry season	Twice a year, rainy and dry season			Rainy and dry season	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Highly desirable	Highly desirable		
DEM	Required	Highly desirable		
Raw point cloud data	Highly desirable	Nice to have		
Classified point cloud	Highly desirable	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Highly desirable	Nice to have		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required	Required		
Land use/land cover	Required	Required		
Wetlands	Required	Required		
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Required	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Not known	Not known		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI	Yes			
Open Topography				
NOAA nautical charts		Yes		
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	Moderate	Minor		

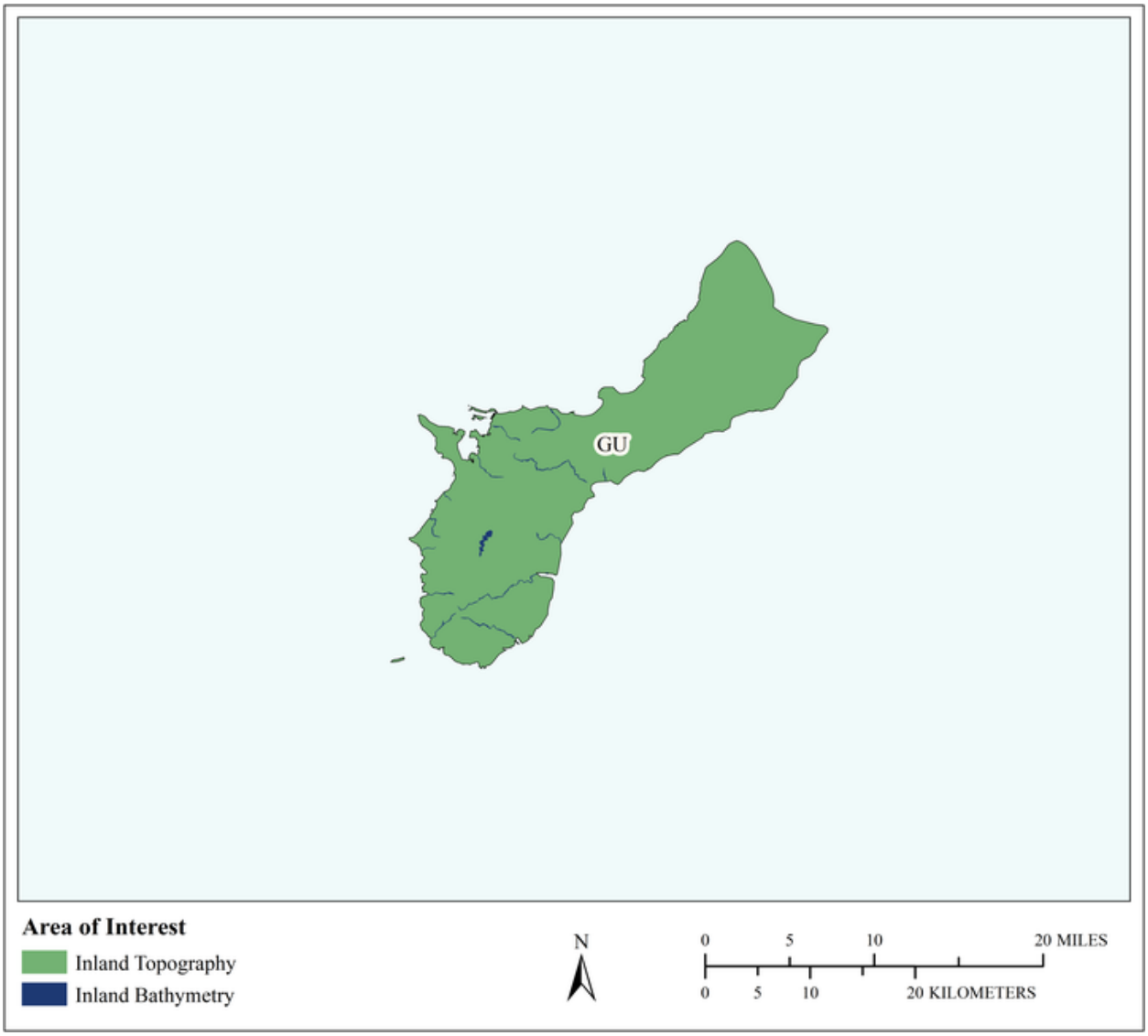
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	Minor	None		
Mission-driven performance improvements	Major	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	I don't know		
Improved response or timeliness	Major	Major		
Improved customer experience	Major	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate		
Environmental	Major	Moderate		
Public safety, including life and property	Major	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide							
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide							
Increased revenues	None			I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,496		Annual dollars saved/ realized	$77,171						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	Moderate	Unable to provide		I don't know	Unable to provide							
Improved customer experience	Moderate	Unable to provide		I don't know	Unable to provide							
Future annual customer service benefits added during validation					Annual dollars saved/ realized	$8,064						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			I don't know								
Environmental	Moderate			I don't know								
Public safety, including life and property	Moderate			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Riverine Ecosystem Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Stream channel analysis and mapping. Stream bank erosion analysis. Aquatic and terrestrial species habitat management. Environmental management. Wetlands and freshwater systems.
MCA Title	Riverine Ecosystem Management
MCA ID	60091
Organization Type	State or U.S. Territorial government
Organization Name	Territory of Guam
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B		
Update Frequency	6-10 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Required			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Required	Highly desirable		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Highly desirable	Nice to have		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Moderate	Minor		
Cost avoidance	Moderate	None		
Increased revenues	None	None		
Mission-driven performance improvements	Major	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		

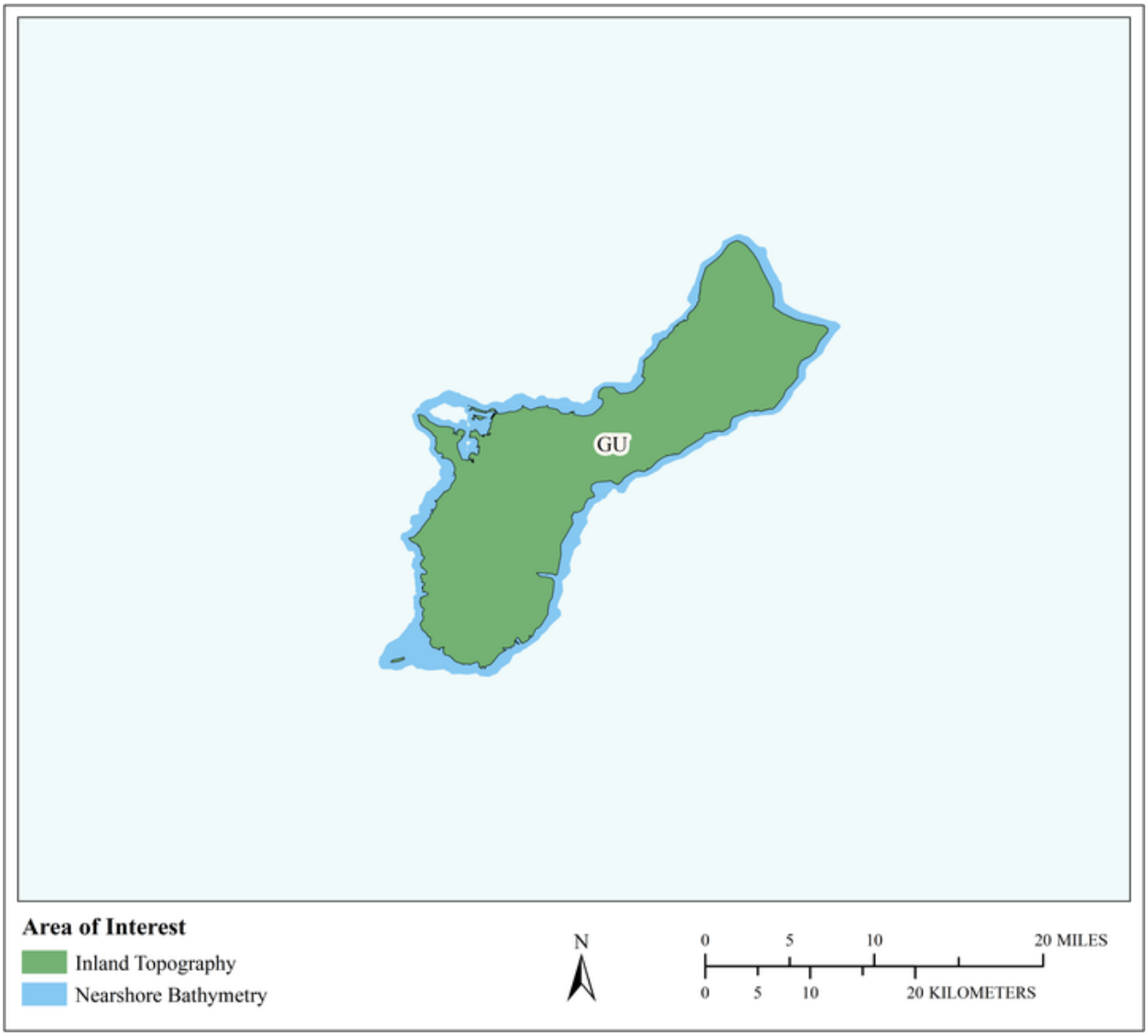
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Moderate		
Improved customer experience	Major	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate		
Environmental	Major	Major		
Public safety, including life and property	Major	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$9,848		Annual dollars saved/ realized	$5,242						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$983		Annual dollars saved/ realized	$369						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Major			Major								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Coastal Zone Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Analysis of coastal erosion and inundation. Hurricane storm surge and wind damage modeling and assessment. Coastal hazard modeling and mapping. Coastal hazard mitigation. Tsunami modeling. Land use and environmental planning. Coastal resiliency. Oil spill modeling. Littoral zone management including dunes and beaches.
MCA Title	Coastal Zone Management
MCA ID	60092
Organization Type	State or U.S. Territorial government
Organization Name	Territory of Guam
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1		QL0B	
Update Frequency	4-5 years		4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter		Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm		Up to 30 cm	
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have		Highly desirable			Highly desirable
Entire AOI under same environmental conditions	Highly desirable		Highly desirable			Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Highly desirable			Nice to have
DEM for entire AOI needs to be seamless	Required		Highly desirable			Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have		Nice to have	
DTM	Required		Highly desirable	
DEM	Required		Required	
Raw point cloud data	Nice to have		Nice to have	
Classified point cloud	Highly desirable		Highly desirable	
Edited/cube XYZ			Nice to have	
Full waveform	Not required		Not required	
Bathymetric Attributed Grid (BAG)			Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have		Highly desirable	
Ground control/ground truthing	Highly desirable		Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required		Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have		Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Required		Required	
Land use/land cover	Highly desirable		Highly desirable	
Wetlands	Required		Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Highly desirable		Highly desirable	
Bridges/culverts	Highly desirable			
Landmark features	Nice to have		Nice to have	
Cultural resources	Nice to have		Nice to have	
Coastal and riverine structures	Required		Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Moderate	
Cost savings/cost reduction	Moderate		Moderate	
Cost avoidance	Major		Moderate	
Increased revenues	None		None	
Mission-driven performance improvements	Major		Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		Moderate	

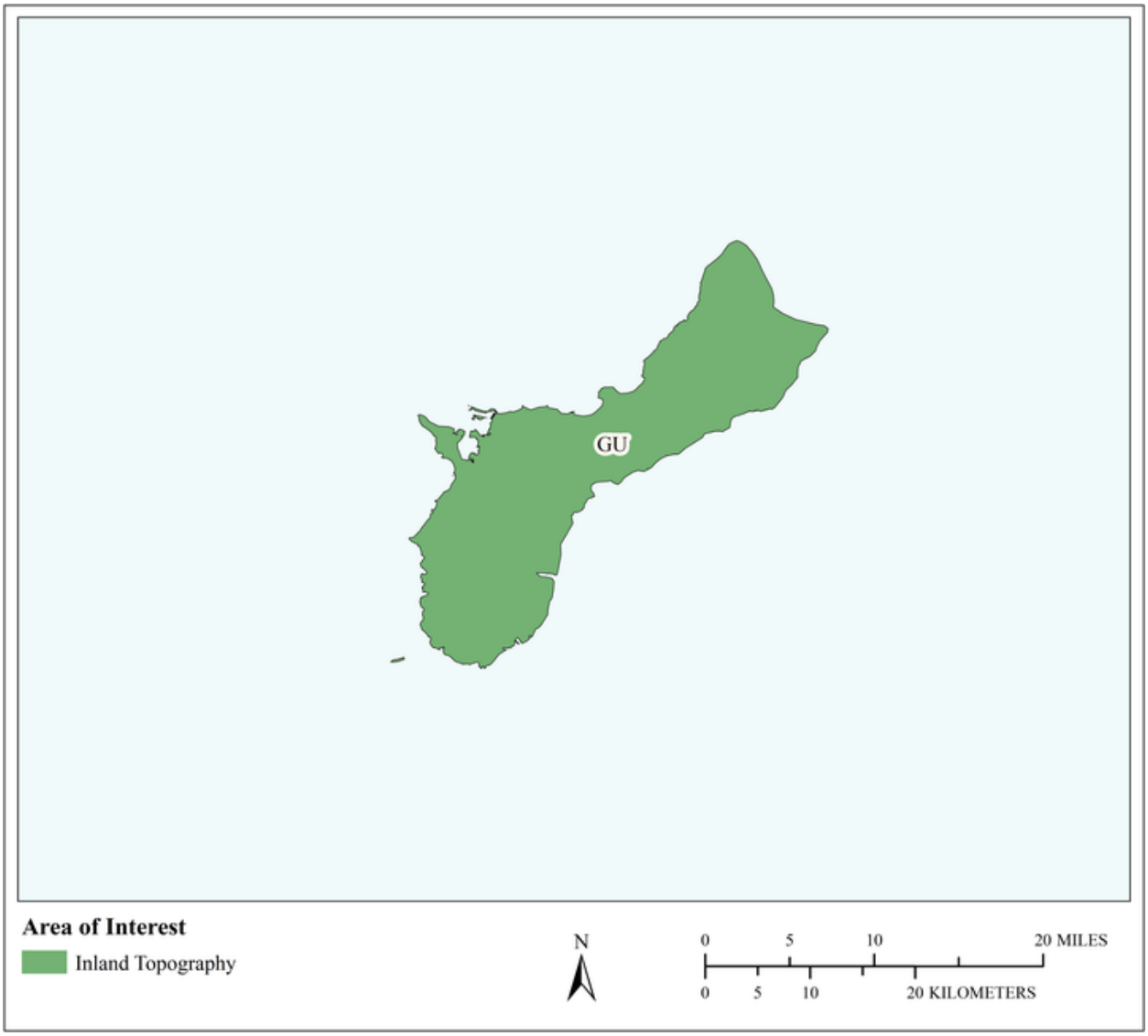
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major		Moderate	
Improved customer experience	Major		Moderate	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major		Moderate	
Environmental	Major		Moderate	
Public safety, including life and property	Major		Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide					Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide					Major	Unable to provide				
Increased revenues	None						Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide					Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$107,990					Annual dollars saved/ realized	$75,130			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide					Moderate	Unable to provide				
Improved customer experience	Moderate	Unable to provide					Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$18,870					Annual dollars saved/ realized	$127,100			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major						Moderate					
Environmental	Major						Major					
Public safety, including life and property	Major						Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes		Yes	
Hillshades	Yes		Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Forest Resources Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Forest health assessment. Determination of standing inventory of forest resources. Prescribed burn planning. Analysis of carbon stocks for trade. Harvest systems planning.
MCA Title	Forest Resources Management
MCA ID	60093
Organization Type	State or U.S. Territorial government
Organization Name	Territory of Guam
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Highly desirable			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

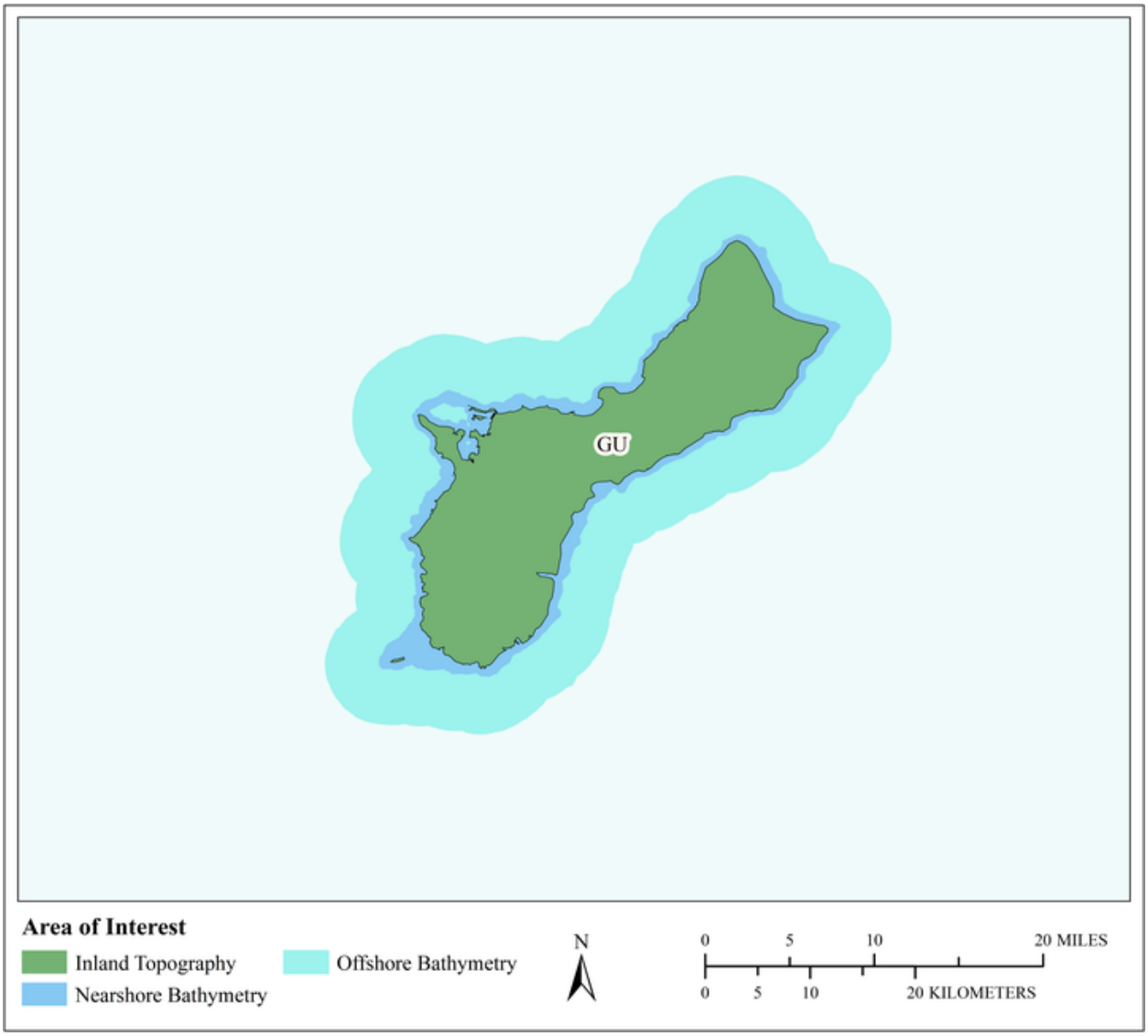
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$25,441									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$36,879									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Natural Resources Conservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	Required
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation engineering. Soils and wetlands mapping and characterization. Modeling of biological and ecological systems. Erosion control. Rainfall penetration studies, impervious surfaces. Assessment of blue carbon stocks.
MCA Title	Natural Resources Conservation
MCA ID	60094
Organization Type	State or U.S. Territorial government
Organization Name	Territory of Guam
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD		QL1B	Cross sections and/or transects meet needs
Update Frequency	4-5 years		6-10 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter		Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 20 cm		Up to 30 cm	I don't know
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				Yes
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required		Required	Required		Required
Entire AOI under same environmental conditions	Required		Required	Required		Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Required	Required		Required
DEM for entire AOI needs to be seamless	Required		Required	Required		Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to double the required TVU at the 95% confidence level	I don't know		Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required		Highly desirable	Highly desirable
DTM	Required		Required	Required
DEM	Required		Required	Required
Raw point cloud data	Required		Required	Required
Classified point cloud	Required		Required	
Edited/cube XYZ			Nice to have	Nice to have
Full waveform	Nice to have		Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)			Required	Highly desirable
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery	Highly desirable		Nice to have	Highly desirable
Ground control/ground truthing	Required		Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Nice to have	Required
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required		Required	Highly desirable
Underwater videography			Nice to have	Highly desirable
Bottom texture			Nice to have	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have		Nice to have	Highly desirable
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Highly desirable	Highly desirable
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Nice to have	Highly desirable
Habitat distribution and classification			Required	Highly desirable
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Highly desirable
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates	Highly desirable		Highly desirable	
Land use/land cover	Required		Highly desirable	Nice to have
Wetlands	Required		Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Highly desirable
Inland surface water features	Required		Required	
Bridges/culverts	Required			
Landmark features	Highly desirable		Highly desirable	
Cultural resources	Nice to have		Nice to have	
Coastal and riverine structures	Highly desirable		Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Moderate	Major
Cost savings/cost reduction	Major		Minor	Major
Cost avoidance	Major		Minor	I don't know
Increased revenues	Minor		None	I don't know
Mission-driven performance improvements	Major		Moderate	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		Moderate	Major

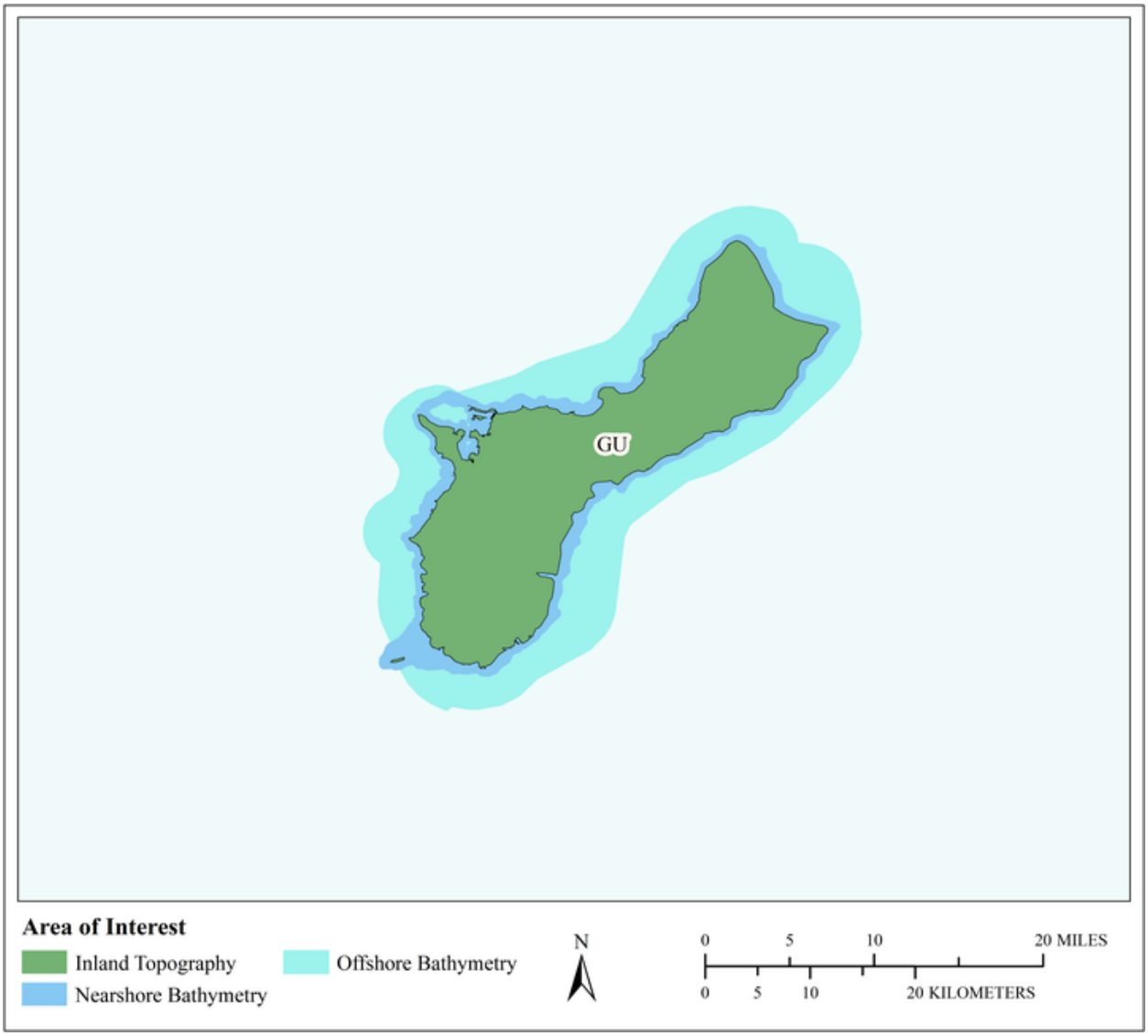
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major		Moderate	Major
Improved customer experience	Major		Minor	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major		Moderate	Major
Environmental	Major		Major	Major
Public safety, including life and property	Major		Moderate	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					Major	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide					Moderate	Unable to provide		Minor	Unable to provide	
Cost avoidance	Major	Unable to provide					Major	Unable to provide		I don't know	Unable to provide	
Increased revenues	Minor	Unable to provide					None			Moderate	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$82,150									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide					Major	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$301,700									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major						Moderate			Moderate		
Environmental	Major						Major			Major		
Public safety, including life and property	Major						Moderate			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	
Contours	Yes		Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes		Yes	Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Long-term Coral Reef Monitoring



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	Required
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Custom description
Sub Area Requirements				Guam out to 250m depth

MCA Description	Response
Mission Critical Activity	Long-term Coral Reef Monitoring: We are responsible for conducting regular ecological data collection at permanent sites located around Guam, as well as for carrying out rapid response surveys during coral bleaching events, crown of thorns sea star outbreaks, and vessel groundings. There are gaps in the currently available nearshore bathymetry that need to be filled. While inland topo is not included as a data requirement, it is nice to have because the land affects the reef system. Topo helps to understand the watersheds that drain to the reefs. The currently available topo is adequate for this need.
MCA Title	Long-term Coral Reef Monitoring
MCA ID	22391
Organization Type	Academic or Not-for-Profit
Organization Name	University of Guam
Sub-Agency or Division	
Organization Mission	From website: The primary mission of the Marine Laboratory faculty is basic and applied research on the biology of tropical marine organisms, with emphasis on the conservation and development of marine resources of the near-shore waters of Guam and Micronesia.
Program Name	Comprehensive Long-term Coral Reef Monitoring at Permanent Sites on Guam
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Coral colonies

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2		QL2B	Order 1
Update Frequency	4-5 years		>10 years	>10 years
Event type(s)				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter		Up to 2 meters	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm		Up to 50 cm	Less than 1 meter
How far onshore needed			None	
How far down the beach profile needed			None	
Tide correction requirement			I don't know	I don't know
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable		Not required	Not required		Not required
Entire AOI under same environmental conditions	Highly desirable		Highly desirable	Highly desirable		Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Highly desirable	Highly desirable		Highly desirable
DEM for entire AOI needs to be seamless	Required		Highly desirable	Highly desirable		Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		I don't know	I don't know		I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable		Not required	Not required
DTM	Highly desirable		Not required	Not required
DEM	Required		Required	Required
Raw point cloud data	Highly desirable		Highly desirable	Highly desirable
Classified point cloud	Highly desirable		Highly desirable	
Edited/cube XYZ			Not required	Not required
Full waveform	Not required		Not required	Not required
Bathymetric Attributed Grid (BAG)			Not required	Not required
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Not required	Not required
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Nice to have		Nice to have	Nice to have
Ground control/ground truthing	Highly desirable		Nice to have	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Not required	Not required
Nautical and/or navigation charts			Not required	Not required
Acoustic imagery of the seafloor			Not required	Not required
Aerial and/or satellite imagery	Required		Required	Required
Underwater videography			Not required	Not required
Bottom texture			Not required	Not required
Bottom type			Highly desirable	Highly desirable
Submerged features			Nice to have	Nice to have
Subbottom characteristics			Not required	Not required
Geologic and seismic data	Nice to have		Not required	Not required
Water column properties - Physical			Highly desirable	Highly desirable
Water column properties - Chemical			Highly desirable	Highly desirable
Water column properties - Biological			Highly desirable	Highly desirable
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Highly desirable	Highly desirable
Routes			Not required	Not required
Offshore cadastral			Not required	Not required
Lease areas			Not required	Not required
Fixed obstructions			Not required	Not required
Floating observation/navigation systems			Not required	Not required
Shorelines – current, historic, change rates	Highly desirable		Required	
Land use/land cover	Highly desirable		Highly desirable	Highly desirable
Wetlands	Highly desirable		Not required	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Not required	Not required
Inland surface water features	Required		Not required	
Bridges/culverts	Nice to have			
Landmark features	Nice to have		Not required	
Cultural resources	Nice to have		Not required	
Coastal and riverine structures	Nice to have		Not required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used			2001-2008 SHOALS lidar data and multibeam sonar bathymetry data collected by NOAA PIFSC	2001-2008 SHOALS lidar data and multibeam sonar bathymetry data collected by NOAA PIFSC
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other			Yes	Yes
Other description			From Guam Bureau of Statistics and Plans (lidar) and NOAA PIFSC website (multibeam)	From Guam Bureau of Statistics and Plans (lidar) and NOAA PIFSC website (multibeam)
Data that meet my needs are not available				

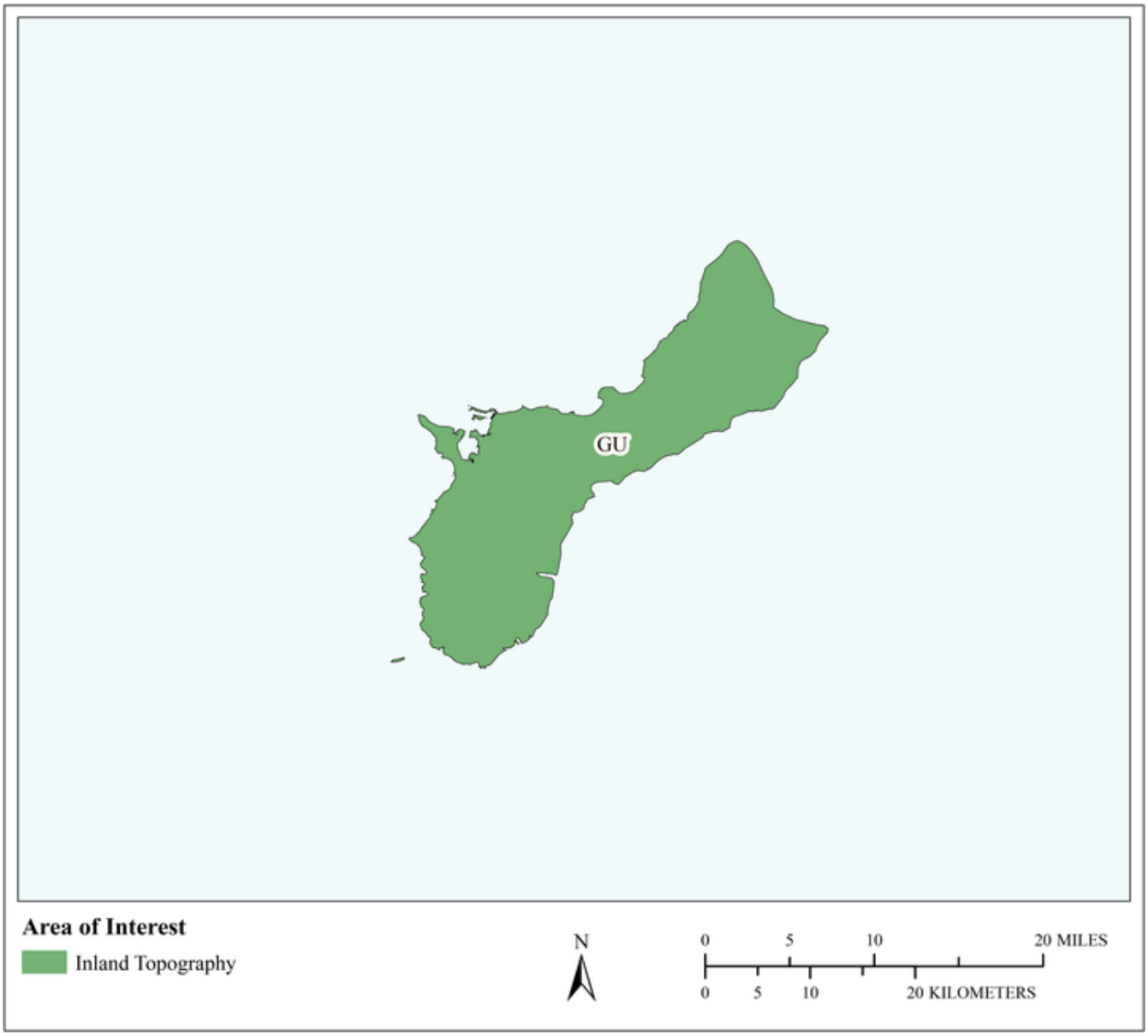
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Major	Major
Cost savings/cost reduction	Major		Minor	Minor
Cost avoidance	Major		I don't know	I don't know
Increased revenues	None		None	None
Mission-driven performance improvements	Moderate		Moderate	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate		None	None
Improved response or timeliness	Minor		None	None
Improved customer experience	Minor		None	None
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor		Moderate	Moderate
Environmental	Moderate		Moderate	Moderate
Public safety, including life and property	Minor		Minor	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Minor	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues	Minor	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues description							Fisheries could benefit from filling data gaps.			Fisheries could benefit from filling data gaps.		
Mission-driven performance improvements	Major	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements description							Fisheries could benefit from filling data gaps.			Fisheries could benefit from filling data gaps.		
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,532					Annual dollars saved/ realized	$431		Annual dollars saved/ realized	$2,059
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Major	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness description							Fisheries could benefit from filling data gaps.			Fisheries could benefit from filling data gaps.		
Improved customer experience	Moderate	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$4,427					Annual dollars saved/ realized	$25		Annual dollars saved/ realized	$143
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate						I don't know			I don't know		
Environmental	Major						I don't know			I don't know		
Public safety, including life and property	Moderate						I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes		Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Agriculture and Precision Farming



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Elevation data are needed for agroforestry research. Elevation data in conjunction with multi-spectral imagery can be used to identify pockets of past agroforest systems and perhaps help site future agroforests. Farm pond design. Irrigation system design. Detailed site analysis. Analysis of farm sedimentation and runoff. Calibration of fertilizer application, fertilizer management, and irrigation planning. Optimized terraforming.
MCA Title	Agriculture and Precision Farming
MCA ID	60095
Organization Type	State or U.S. Territorial government
Organization Name	Territory of Guam
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 08 - Agriculture and Precision Farming
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

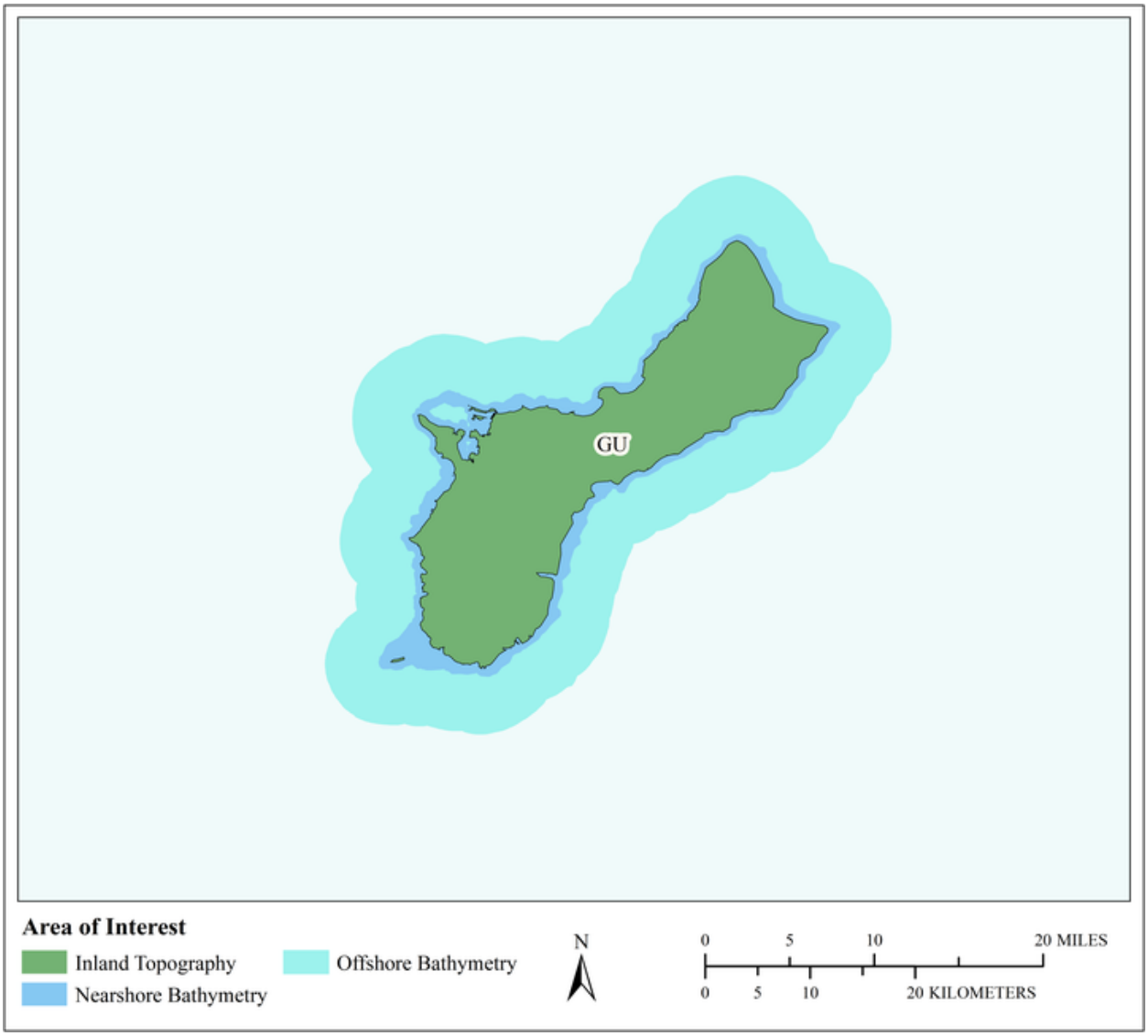
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Moderate	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,420									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,920									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Minor											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Fisheries Management and Aquaculture



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	Required
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Management of fisheries. Sustainable aquaculture.
MCA Title	Fisheries Management and Aquaculture
MCA ID	60096
Organization Type	State or U.S. Territorial government
Organization Name	Territory of Guam
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2		QL0B	Special Order
Update Frequency	2-3 years		6-10 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter		Up to 2 meters	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm		Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable		Nice to have	Nice to have		Nice to have
Entire AOI under same environmental conditions	Required		Highly desirable	Highly desirable		Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Highly desirable	Highly desirable		Highly desirable
DEM for entire AOI needs to be seamless	Required		Highly desirable	Highly desirable		Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable		Highly desirable	Required
DTM	Required		Highly desirable	Nice to have
DEM	Required		Required	Required
Raw point cloud data	Highly desirable		Highly desirable	Nice to have
Classified point cloud	Highly desirable		Highly desirable	
Edited/cube XYZ			Nice to have	Nice to have
Full waveform	Nice to have		Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)			Highly desirable	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Nice to have
Tide Predictions			Not required	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Highly desirable		Highly desirable	Required
Ground control/ground truthing	Required		Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Nice to have	Required
Acoustic imagery of the seafloor			Highly desirable	Required
Aerial and/or satellite imagery	Required		Highly desirable	Required
Underwater videography			Nice to have	Highly desirable
Bottom texture			Nice to have	Required
Bottom type			Highly desirable	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Highly desirable		Nice to have	Nice to have
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Required
Floating observation/navigation systems			Nice to have	Required
Shorelines – current, historic, change rates	Required		Highly desirable	
Land use/land cover	Required		Nice to have	Nice to have
Wetlands	Required		Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Highly desirable
Inland surface water features	Required		Nice to have	
Bridges/culverts	Required			
Landmark features	Highly desirable		Nice to have	
Cultural resources	Nice to have		Not required	
Coastal and riverine structures	Required		Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Moderate	Moderate
Cost savings/cost reduction	Major		Major	Minor
Cost avoidance	Moderate		Minor	Minor
Increased revenues	Moderate		Minor	None
Mission-driven performance improvements	Major		Moderate	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		Minor	Moderate

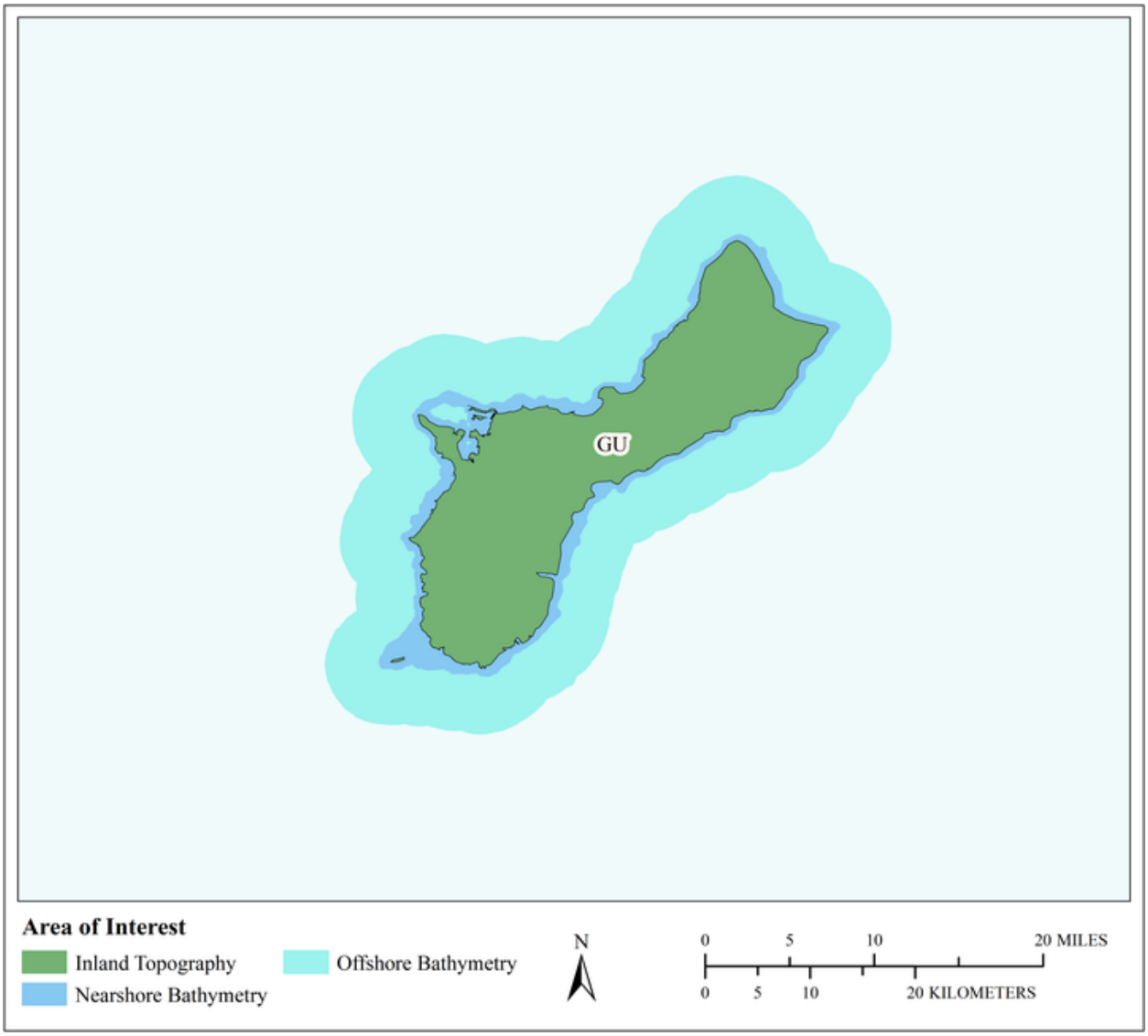
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate		Moderate	Minor
Improved customer experience	Moderate		Minor	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate		Moderate	Moderate
Environmental	Major		Moderate	Minor
Public safety, including life and property	Moderate		Minor	None

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide					Major	Unable to provide		Minor	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide					Moderate	Unable to provide		None		
Cost avoidance	Moderate	Unable to provide					Moderate	Unable to provide		None		
Increased revenues	Minor	Unable to provide					Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Moderate	Unable to provide					Major	Unable to provide		Minor	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$214					Annual dollars saved/ realized	$68,390			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide					Minor	Unable to provide		Minor	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide					Major	Unable to provide		Minor	Unable to provide	
Improved customer experience	Moderate	Unable to provide					Moderate	Unable to provide		Minor	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$465					Annual dollars saved/ realized	$5,022			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate						Moderate			Moderate		
Environmental	Moderate						Major			Moderate		
Public safety, including life and property	Moderate						Minor			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes		Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes		Yes	Yes
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic Assessment and Hazard Mitigation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	Required
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Geologic mapping and analysis. Sinkhole and steephead mapping, monitoring, and analysis. Identification of geomorphologic units. Landslide hazard mapping and assessment. Karst mapping, including springs and caves. Aquifer recharge.
MCA Title	Geologic Assessment and Hazard Mitigation
MCA ID	60097
Organization Type	State or U.S. Territorial government
Organization Name	Territory of Guam
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1		QL1B	Special Order
Update Frequency	4-5 years		4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter		Up to 2 meters	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm		Up to 30 cm	Less than 1 meter
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have		Highly desirable	Nice to have		Highly desirable
Entire AOI under same environmental conditions	Required		Highly desirable	Highly desirable		Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Required	Highly desirable		Highly desirable
DEM for entire AOI needs to be seamless	Required		Required	Required		Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable		Highly desirable	Highly desirable
DTM	Required		Highly desirable	Required
DEM	Required		Required	Required
Raw point cloud data	Highly desirable		Nice to have	Highly desirable
Classified point cloud	Required		Highly desirable	
Edited/cube XYZ			Nice to have	Nice to have
Full waveform	Nice to have		Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)			Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Highly desirable		Highly desirable	Highly desirable
Ground control/ground truthing	Required		Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required		Highly desirable	Required
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Required		Required	Required
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Highly desirable
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Nice to have	Highly desirable
Shorelines – current, historic, change rates	Required		Required	
Land use/land cover	Highly desirable		Highly desirable	Highly desirable
Wetlands	Highly desirable		Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required		Highly desirable	
Bridges/culverts	Highly desirable			
Landmark features	Nice to have		Highly desirable	
Cultural resources	Nice to have		Nice to have	
Coastal and riverine structures	Highly desirable		Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Minor	Moderate
Cost savings/cost reduction	Major		Minor	Minor
Cost avoidance	Major		Minor	Minor
Increased revenues	None		None	None
Mission-driven performance improvements	Major		Moderate	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		Moderate	Major

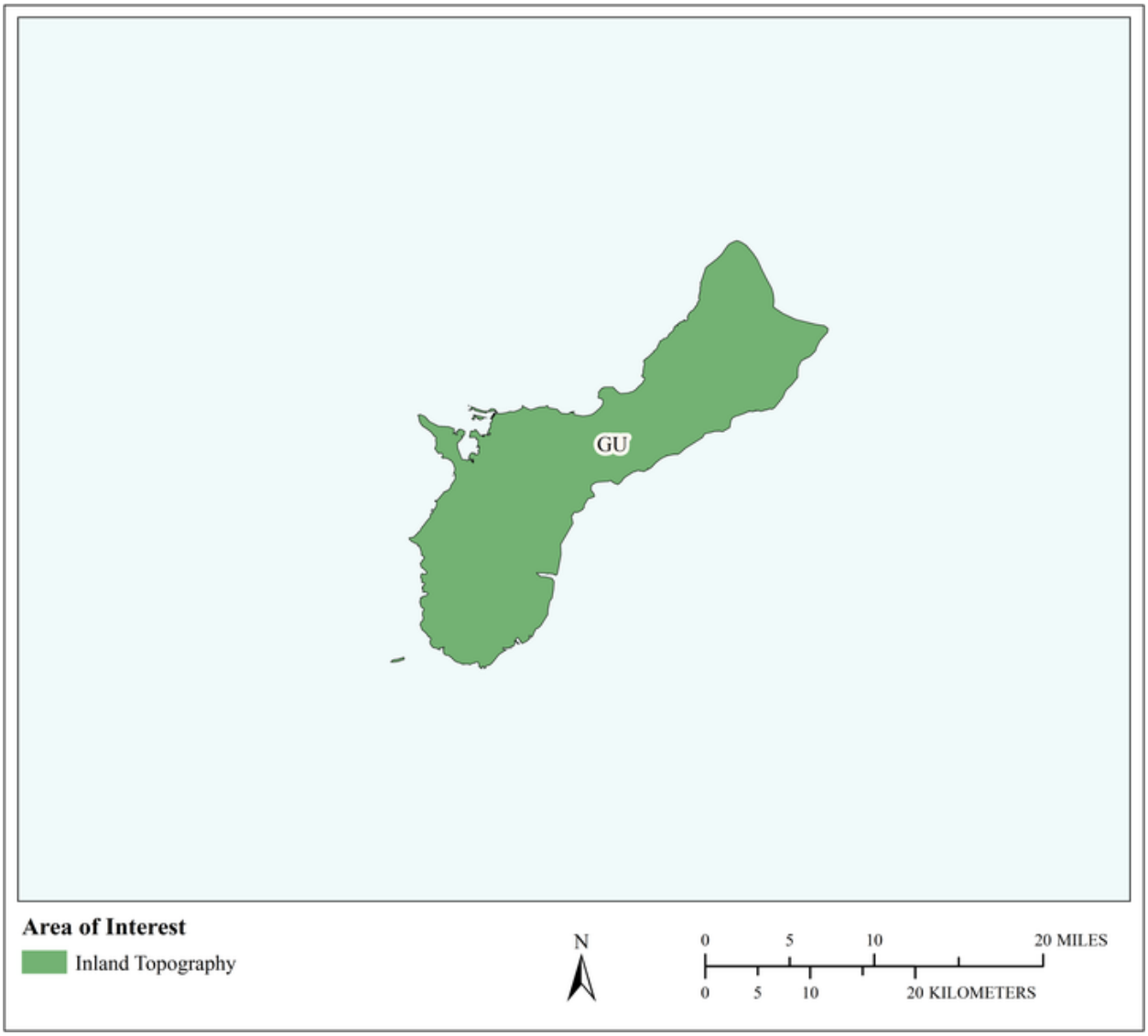
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major		Moderate	Moderate
Improved customer experience	Major		Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major		Moderate	Major
Environmental	Major		Minor	Moderate
Public safety, including life and property	Major		Major	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide					Moderate	Unable to provide		Minor	Unable to provide	
Cost avoidance	Major	Unable to provide					Moderate	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide					None			Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$442,150					Annual dollars saved/ realized	$33,576		Annual dollars saved/ realized	$466,142
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide					Major	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$23,844					Annual dollars saved/ realized	$54,024			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major						Major			Major		
Environmental	Major						Moderate			Moderate		
Public safety, including life and property	Major						Major			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	Yes
Contours	Yes		Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes		Yes	Yes
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes		Yes	Yes
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic Resource Mining and Extraction



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Elevation data are needed to update fault maps, identify how much limestone extraction is occurring, and identify new quarries. Onshore or offshore mineral extraction. Monitoring sand as a local resource. Seabed resources. Open mine volume computations. Stockpile analysis. Environmental impact assessment and site restoration.
MCA Title	Geologic Resource Mining and Extraction
MCA ID	60098
Organization Type	State or U.S. Territorial government
Organization Name	Territory of Guam
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 11 - Geologic Resource Mining and Extraction
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			

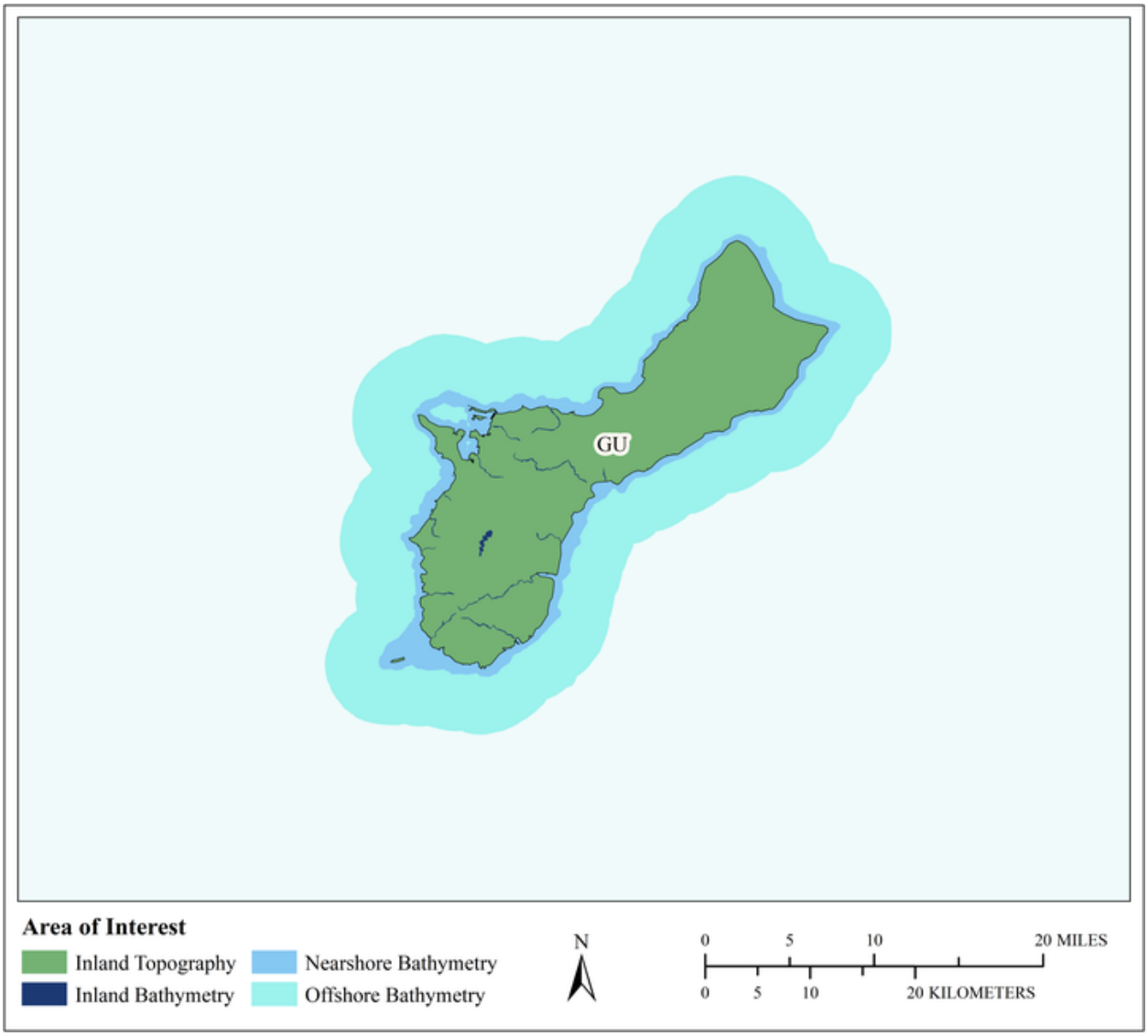
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Minor	Unable to provide										
Cost avoidance	Minor	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,571									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,042									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Preservation of Cultural and Natural Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Preservation of cultural and natural resources. Elevation data are needed for future siting of wind energy projects. Bathymetry is needed for fisheries management.
MCA Title	Preservation of Cultural and Natural Resources
MCA ID	1382
Organization Type	Private or Commercial
Organization Name	Private Planning and GIS consultant
Sub-Agency or Division	
Organization Mission	Providing archaeological, Land Use and/or Coastal Management Planning and GIS services to clients that include private individuals or firms and public sector agencies. Many jobs are conducted for compliance with the applicable laws.
Program Name	Background research program to determine what exists on the land or underwater.
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	BU 06 - Natural Resources Conservation
Tertiary Business Use	BU 03 - Coastal Zone Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Many times we are interested in manmade land alterations and other archaeological features like house posts, hidden mounds, water wells, etc. Also submerged wrecks, cultural resources.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B	QL1B	I don't know
Update Frequency	6-10 years	>10 years	4-5 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI			Frequency of update should be more frequent (4-5 years) for erosion prone nearshore areas, elsewhere 6-10 yrs or more is sufficient	
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter	Up to 1 meter	I don't know
Acceptable Vertical Error	Up to 30 cm	Up to 30 cm	Up to 20 cm	I don't know
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed	To MLLW		To 10 meter depth	
Tide correction requirement			MHW	MHW
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Required	Nice to have	Highly desirable	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Not required	Highly desirable	Highly desirable	Not required	Nice to have
DEM for entire AOI needs to be seamless	Nice to have	Not required	Highly desirable	Highly desirable	Not required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Highly desirable	Required	Required
DEM	Required	Highly desirable	Required	Required
Raw point cloud data	Not required	Not required	Nice to have	Nice to have
Classified point cloud	Nice to have	Nice to have	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Not required	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Nice to have

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Nice to have	Highly desirable	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Highly desirable	Nice to have	Nice to have
Underwater videography			Nice to have	Nice to have
Bottom texture			Nice to have	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Required	Required
Subbottom characteristics			Not required	Not required
Geologic and seismic data	Nice to have	Highly desirable	Highly desirable	Highly desirable
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Required	Required
Routes			Highly desirable	Highly desirable
Offshore cadastral			Highly desirable	Highly desirable
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Required	Required
Floating observation/navigation systems			Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Required	Required
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Highly desirable	Highly desirable	Highly desirable	
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Required	Highly desirable	Highly desirable	
Cultural resources	Required	Highly desirable	Required	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	2012 USGS Lidar derived products. Nominal Pulse spacing of 1 meter	I don't believe we have inland bathy data for Fena Lake or other rivers like Talofofo River.	USACE Shoals CAD data circa 2000 and NOAA Bathymetric data 2007	USACE Shoals CAD data circa 2000 and NOAA Bathymetric data 2007
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes		Yes	Yes
NCEI				
Open Topography				
NOAA nautical charts		Yes		Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Guam State			
Data that meet my needs are not available		Yes		

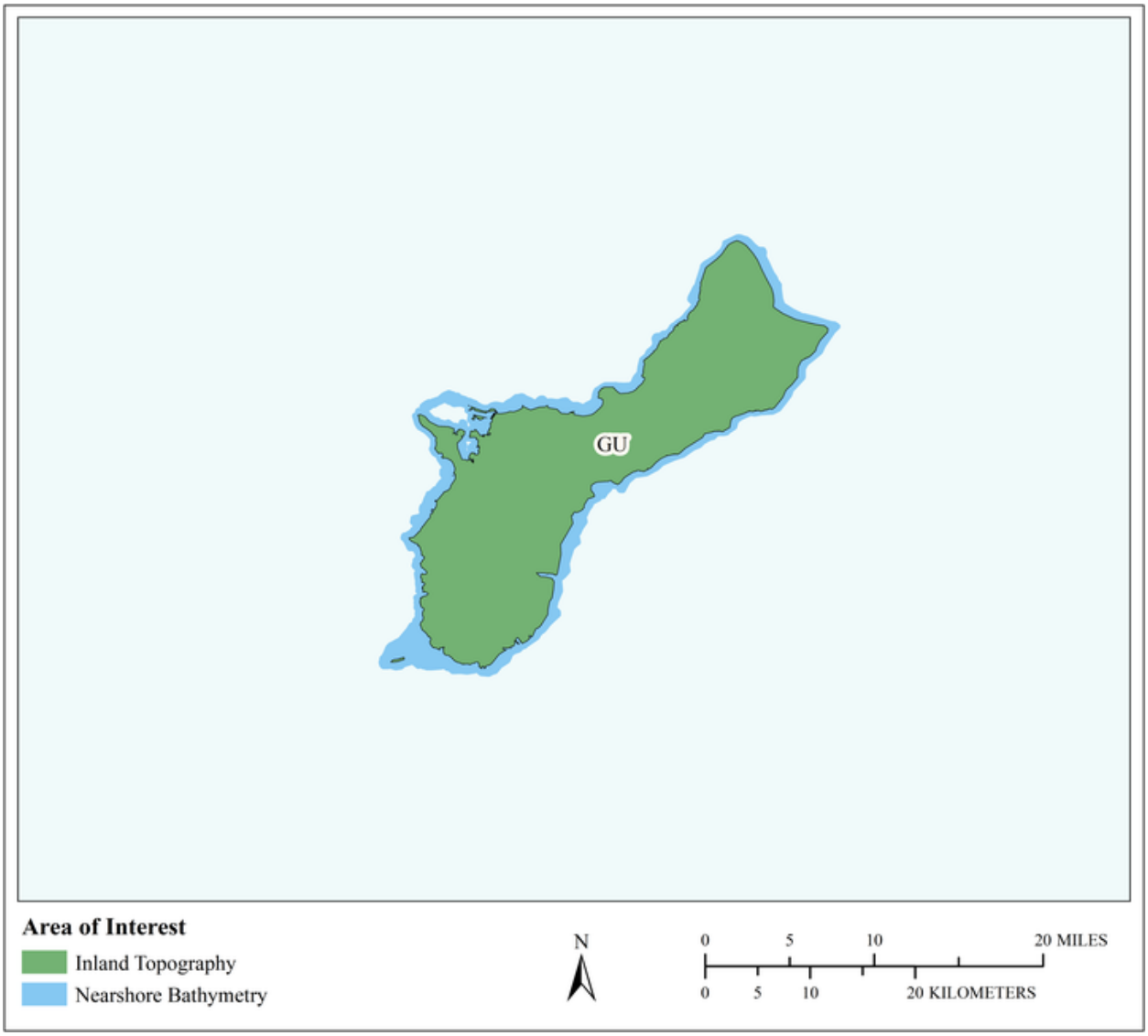
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available	Major	Major
Cost savings/cost reduction	Major	Inland bathy data not available	Major	Major
Cost avoidance	Major	Inland bathy data not available	Major	Major
Increased revenues	Minor	Inland bathy data not available	Minor	Minor
Mission-driven performance improvements	Moderate	Inland bathy data not available	Moderate	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available	Major	Major
Improved response or timeliness	Moderate	Inland bathy data not available	Major	Major
Improved customer experience	Moderate	Inland bathy data not available	Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Inland bathy data not available	Minor	Minor
Environmental	Moderate	Inland bathy data not available	Moderate	Moderate
Public safety, including life and property	Major	Inland bathy data not available	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Other operational benefits	Major	Unable to provide										
Other operational benefits description	Better data to carry out various analyses in differing fields of operations.											
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,179					Annual dollars saved/ realized	$1,245			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Other customer service benefits	Major	Unable to provide										
Other customer service benefits description	Better data to conduct analyses in our varying fields of work.											
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,031									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Moderate			Moderate		
Education or outreach description	Education of University students and government professionals											
Environmental	Moderate			Moderate			Major			Major		
Environmental description	Showing various landforms, vegetation and bottom contours towards environmental benefits											
Public safety, including life and property	Major			Moderate			Major			Major		
Public safety, including life and property description	Using products to support project planning and completion including for Guam Homeland Security functions											
Other	Better data to conduct analyses in our varying fields of work.											
Other benefits	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Cultural Resources Preservation and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Discovery and analysis of underwater archaeological and historical cultural sites. Site protection and preservation planning. Discovery and analysis of Native American and other historical cultural sites and subsistence activities.
MCA Title	Cultural Resources Preservation and Management
MCA ID	60099
Organization Type	State or U.S. Territorial government
Organization Name	Territory of Guam
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1		QL0B	
Update Frequency	4-5 years		4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter		Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm		Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have		Nice to have			Nice to have
Entire AOI under same environmental conditions	Nice to have		Nice to have			Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have		Nice to have			Nice to have
DEM for entire AOI needs to be seamless	Nice to have		Nice to have			Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable		Required	
DTM	Required		Nice to have	
DEM	Required		Required	
Raw point cloud data	Not required		Not required	
Classified point cloud	Nice to have		Nice to have	
Edited/cube XYZ			Not required	
Full waveform	Not required		Not required	
Bathymetric Attributed Grid (BAG)			Nice to have	
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have		Highly desirable	
Ground control/ground truthing	Nice to have		Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required		Highly desirable	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Required	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have		Highly desirable	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Highly desirable	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Highly desirable	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Required	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Nice to have		Required	
Land use/land cover	Nice to have		Nice to have	
Wetlands	Nice to have		Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Nice to have		Nice to have	
Bridges/culverts	Nice to have			
Landmark features	Nice to have		Highly desirable	
Cultural resources	Required		Required	
Coastal and riverine structures	Nice to have		Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Minor	
Cost savings/cost reduction	Moderate		Minor	
Cost avoidance	Minor		Minor	
Increased revenues	None		None	
Mission-driven performance improvements	Moderate		Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate		None	

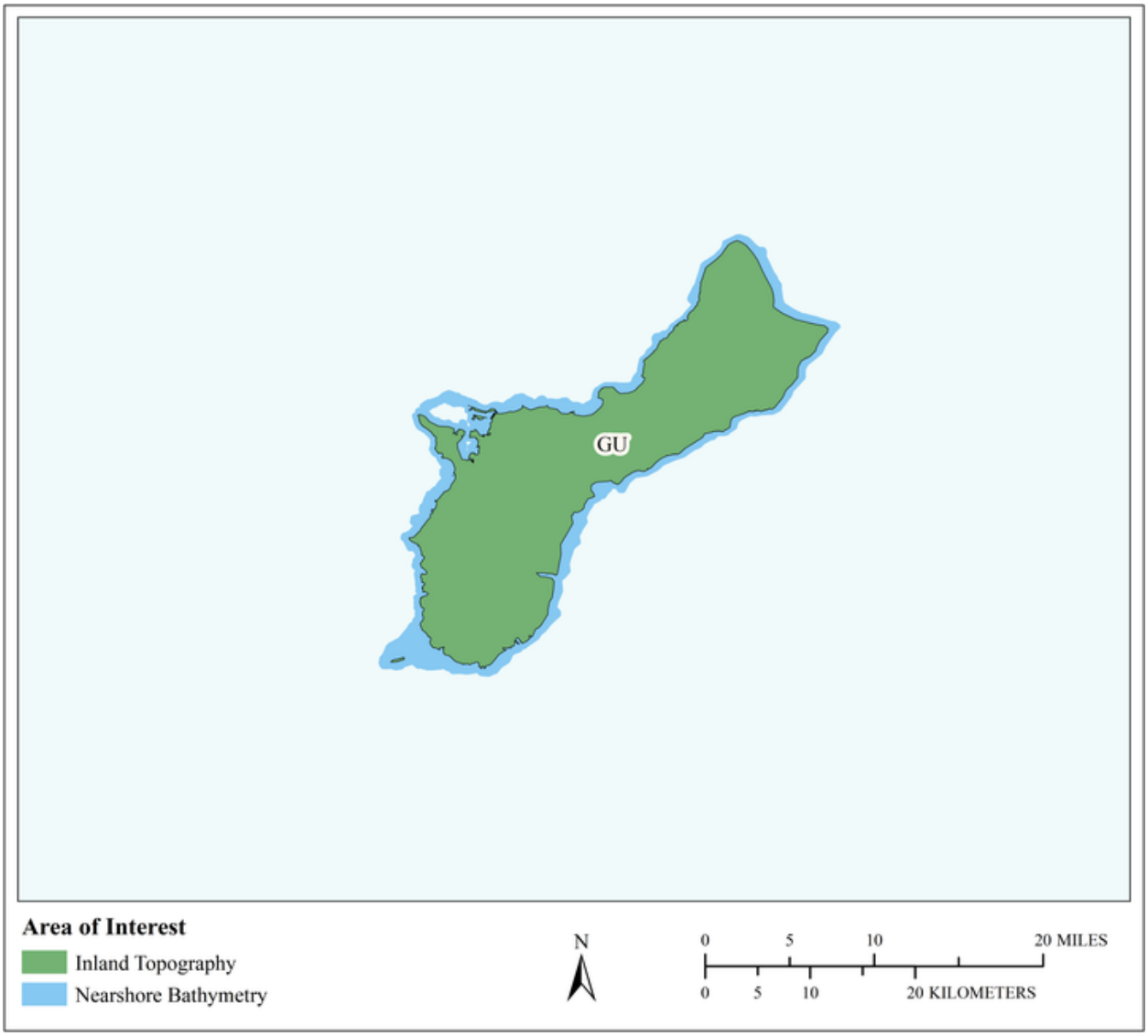
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate		Minor	
Improved customer experience	Moderate		Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor		Minor	
Environmental	Minor		Minor	
Public safety, including life and property	Minor		None	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide					Major	Unable to provide				
Cost savings/cost reduction	Minor	Unable to provide					Moderate	Unable to provide				
Cost avoidance	Moderate	Unable to provide					Moderate	Unable to provide				
Increased revenues	None						None					
Mission-driven performance improvements	Moderate	Unable to provide					Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,179					Annual dollars saved/ realized	$1,245			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide					Moderate	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide					Moderate	Unable to provide				
Improved customer experience	Moderate	Unable to provide					Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,031									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor						Minor					
Environmental	Minor						Moderate					
Public safety, including life and property	Minor						Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes		Yes	
Hillshades	Yes		Yes	
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Flood Risk Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Flood risk modeling and mapping of riverine and coastal areas. Dam/dike/levee safety analysis. Emergency management. Flood forecasts.
MCA Title	Flood Risk Management
MCA ID	60100
Organization Type	State or U.S. Territorial government
Organization Name	Territory of Guam
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2		QL2B	
Update Frequency	4-5 years		4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter		Up to 5 meters	
Acceptable Vertical Error	Up to 20 cm		Up to 40 cm	
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable		Highly desirable			Highly desirable
Entire AOI under same environmental conditions	Required		Highly desirable			Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Highly desirable			Highly desirable
DEM for entire AOI needs to be seamless	Required		Required			Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have		Highly desirable	
DTM	Required		Highly desirable	
DEM	Required		Required	
Raw point cloud data	Highly desirable		Highly desirable	
Classified point cloud	Required		Highly desirable	
Edited/cube XYZ			Nice to have	
Full waveform	Nice to have		Nice to have	
Bathymetric Attributed Grid (BAG)			Nice to have	
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have		Nice to have	
Ground control/ground truthing	Required		Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required		Required	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Not required	
Geologic and seismic data	Nice to have		Not required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Highly desirable	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Not required	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Nice to have		Highly desirable	
Land use/land cover	Highly desirable		Highly desirable	
Wetlands	Highly desirable		Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required		Required	
Bridges/culverts	Required			
Landmark features	Highly desirable		Nice to have	
Cultural resources	Nice to have		Nice to have	
Coastal and riverine structures	Required		Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Minor	
Cost savings/cost reduction	Major		Minor	
Cost avoidance	Major		Minor	
Increased revenues	Minor		None	
Mission-driven performance improvements	Major		Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		Minor	

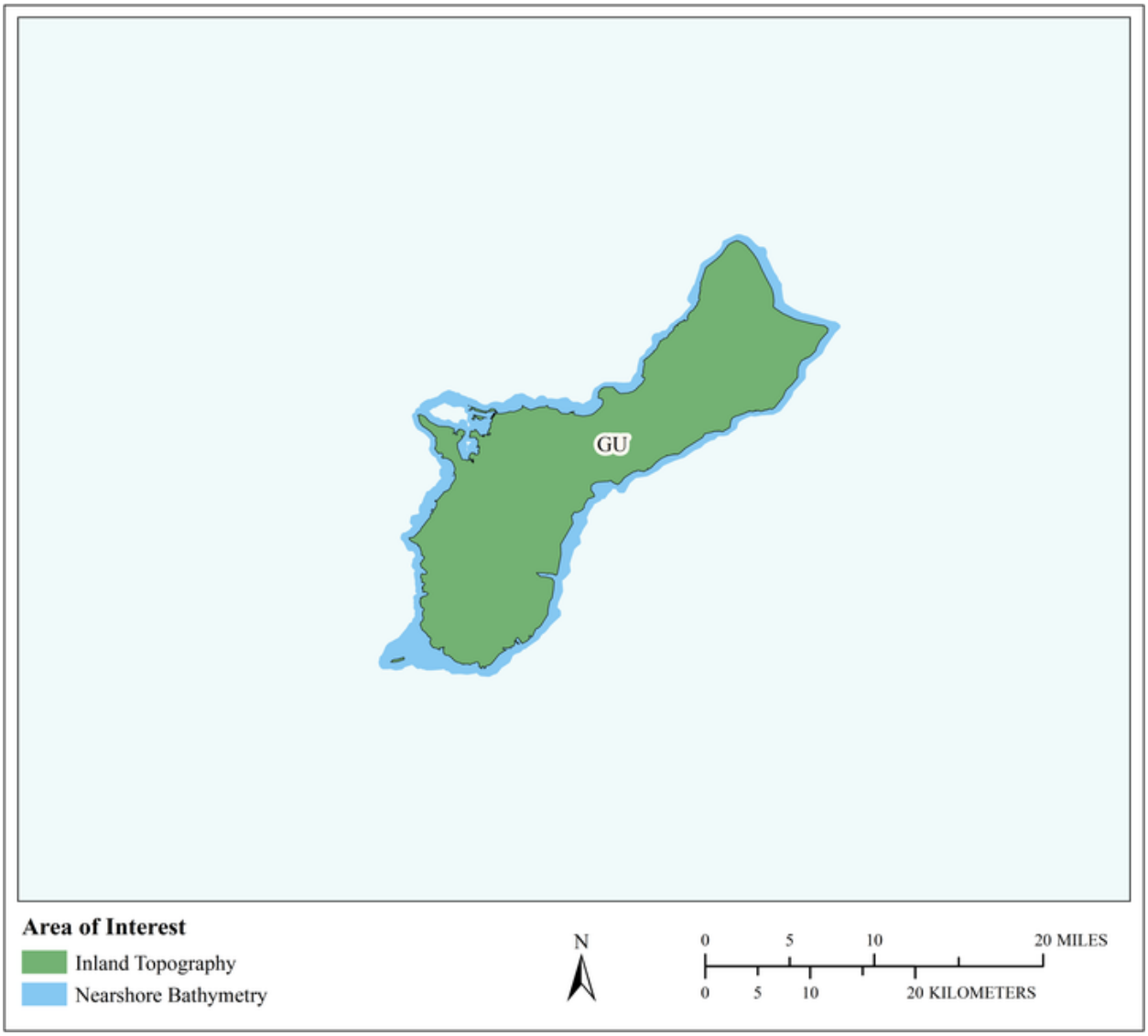
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major		Minor	
Improved customer experience	Major		Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major		Minor	
Environmental	Major		Moderate	
Public safety, including life and property	Major		Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide					Major	Unable to provide				
Cost avoidance	Major	Unable to provide					Major	Unable to provide				
Increased revenues	Minor	Unable to provide					Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide					Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$903,454					Annual dollars saved/ realized	$82,424			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide					Major	Unable to provide				
Improved customer experience	Major	Unable to provide					Major	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$158,076					Annual dollars saved/ realized	$61,088			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major						Major					
Environmental	Moderate						Moderate					
Public safety, including life and property	Major						Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	
Contours	Yes		Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Sea Level Rise and Subsidence



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Modeling and mapping the effects of sea level rise or subsidence. Population and economic vulnerability assessments. Coastal inundation and infrastructure assessment.
MCA Title	Sea Level Rise and Subsidence
MCA ID	60101
Organization Type	State or U.S. Territorial government
Organization Name	Territory of Guam
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 16 - Sea Level Rise and Subsidence
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD		QL2B	
Update Frequency	4-5 years		2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter		Up to 5 meters	
Acceptable Vertical Error	Up to 20 cm		Up to 40 cm	
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have		Required			Required
Entire AOI under same environmental conditions	Highly desirable		Required			Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Required			Required
DEM for entire AOI needs to be seamless	Required		Required			Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable		Highly desirable	
DTM	Required		Highly desirable	
DEM	Required		Required	
Raw point cloud data	Highly desirable		Nice to have	
Classified point cloud	Required		Highly desirable	
Edited/cube XYZ			Not required	
Full waveform	Not required		Not required	
Bathymetric Attributed Grid (BAG)			Not required	
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable		Highly desirable	
Ground control/ground truthing	Required		Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required		Required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have		Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Required	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Required		Highly desirable	
Land use/land cover	Required		Highly desirable	
Wetlands	Required		Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required		Required	
Bridges/culverts	Required			
Landmark features	Highly desirable		Nice to have	
Cultural resources	Nice to have		Nice to have	
Coastal and riverine structures	Required		Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes		Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Major	
Cost savings/cost reduction	Major		Major	
Cost avoidance	Major		Major	
Increased revenues	None		Minor	
Mission-driven performance improvements	Major		Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		Major	

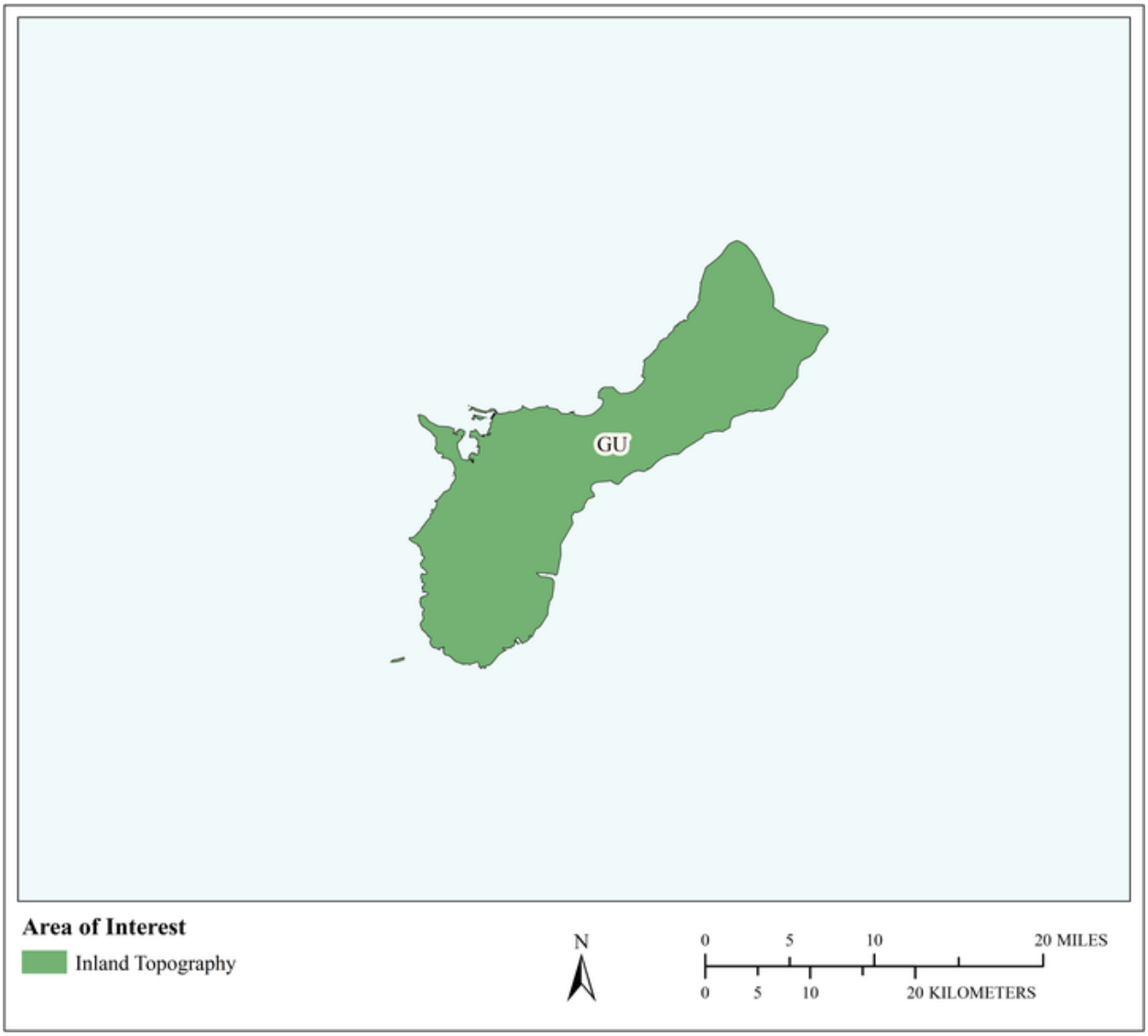
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate		Major	
Improved customer experience	Moderate		Major	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major		Major	
Environmental	Moderate		Major	
Public safety, including life and property	Major		Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide					Major	Unable to provide				
Cost avoidance	Major	Unable to provide					Moderate	Unable to provide				
Increased revenues	Moderate	Unable to provide					Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide					Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$338,764									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide					Major	Unable to provide				
Improved customer experience	Major	Unable to provide					Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate						Major					
Environmental	Moderate						Major					
Public safety, including life and property	Moderate						Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	
Contours	Yes		Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections			Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Wildfire Management, Planning, and Response



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of forest fuel and fire susceptibility. Fire behavior modeling to support wildfire suppression activities. Wildland/urban interface building identification. Post fire analysis to determine landslide prone areas.
MCA Title	Wildfire Management, Planning, and Response
MCA ID	60102
Organization Type	State or U.S. Territorial government
Organization Name	Territory of Guam
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 17 - Wildfire Management, Planning, and Response
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

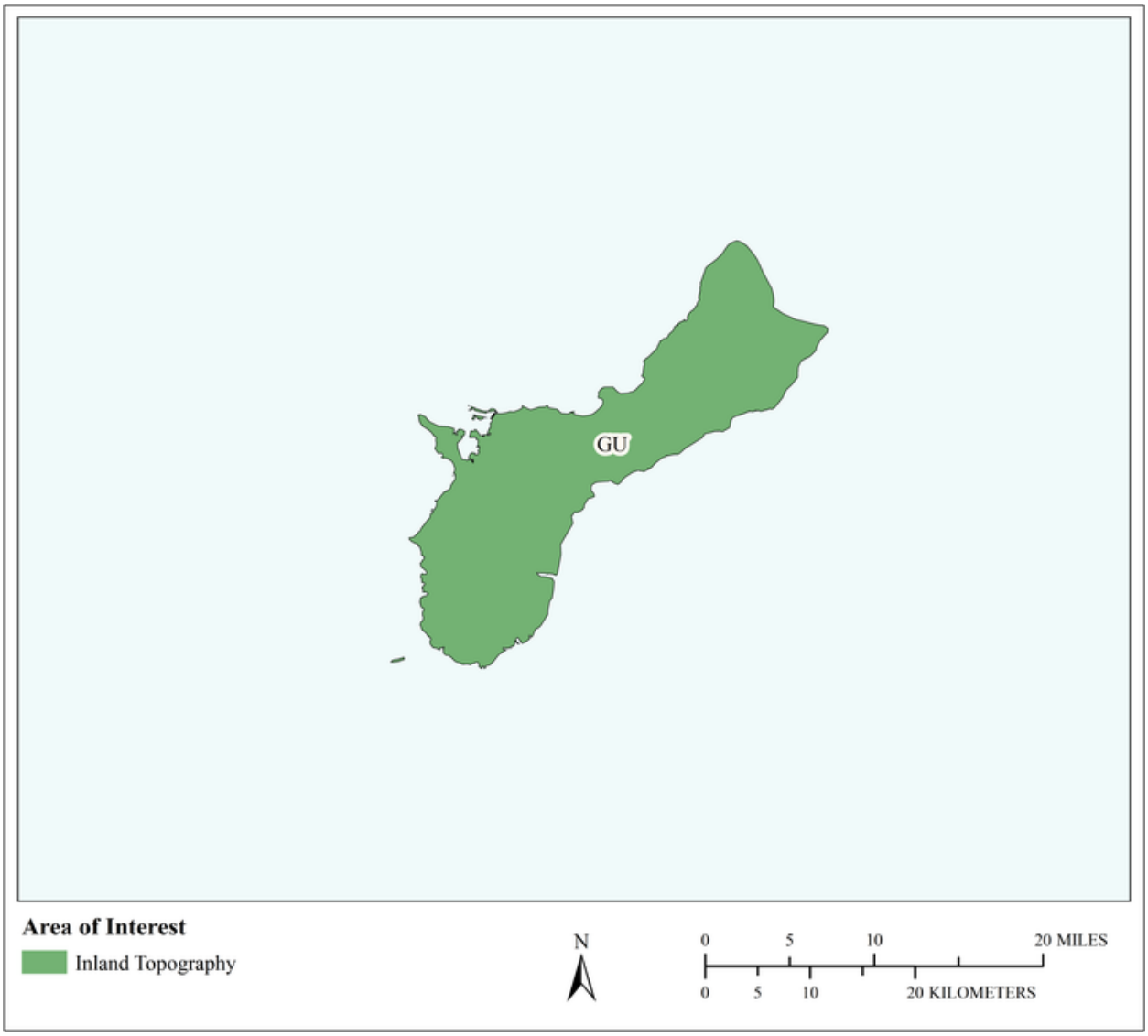
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$34,572									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Homeland Security, Law Enforcement, Disaster Response, and Emergency Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Infrastructure and border protection. Coastal search and rescue. Population dynamics. Emergency fuel supply and movement. Line of sight analysis in urban areas. Disaster response. Flood risk analysis resulting from acts of terrorism.
MCA Title	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
MCA ID	60103
Organization Type	State or U.S. Territorial government
Organization Name	Territory of Guam
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

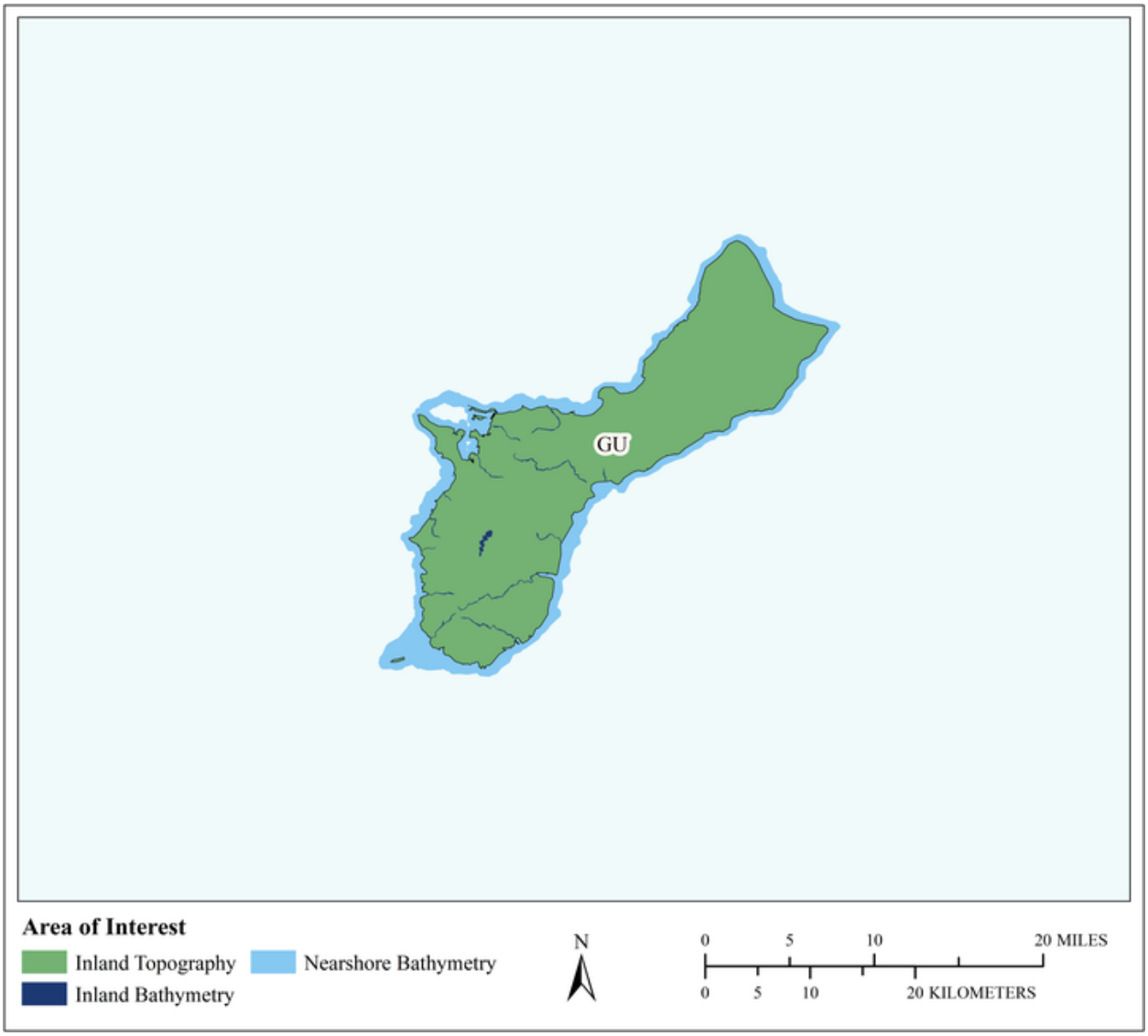
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Minor			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$189,821									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$3,355									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Moderate											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Land Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Road and railroad route selection and maintenance. Slope analysis for autonomous cars. GPS navigation visualization.
MCA Title	Land Navigation and Safety
MCA ID	60104
Organization Type	State or U.S. Territorial government
Organization Name	Territory of Guam
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 19 - Land Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL0B	QL0B	
Update Frequency	2-3 years	2-3 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable		Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Highly desirable	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	
Classified point cloud	Highly desirable	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Highly desirable	
Full waveform	Nice to have	Nice to have	Highly desirable	
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	
Ground control/ground truthing	Required	Required	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Highly desirable	Highly desirable	Highly desirable	
Water column properties - Physical			Highly desirable	
Water column properties - Chemical			Highly desirable	
Water column properties - Biological			Highly desirable	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Highly desirable	
Boundaries			Highly desirable	
Routes			Highly desirable	
Offshore cadastral			Highly desirable	
Lease areas			Highly desirable	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Nice to have	Required	Highly desirable	
Land use/land cover	Highly desirable	Required	Highly desirable	
Wetlands	Required	Required	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Highly desirable	Highly desirable	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Minor	
Cost savings/cost reduction	Major	Minor	Minor	
Cost avoidance	Moderate	Minor	Minor	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	None	

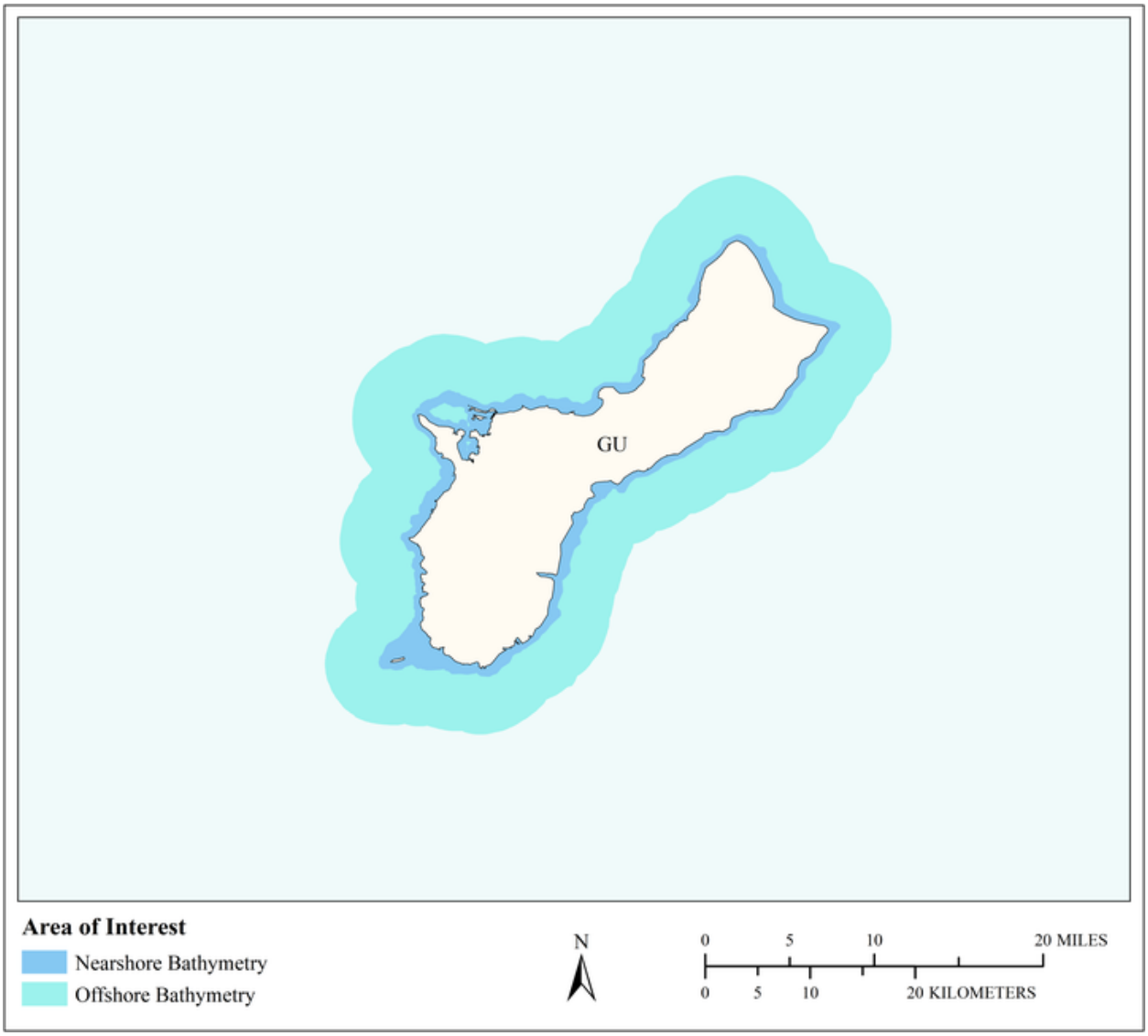
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	None	
Improved customer experience	Major	Minor	None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	None	
Environmental	Moderate	Moderate	Moderate	
Public safety, including life and property	Major	Minor	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		None					
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,713		Annual dollars saved/ realized	$115						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$219		Annual dollars saved/ realized	$1						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			None					
Environmental	Major			Moderate			Moderate					
Public safety, including life and property	Major			Moderate			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps	Yes		Yes	
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes		Yes	
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Marine and Riverine Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type			Required	Required
Geographic Area Requirements			Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Nautical charting. Bathymetric measurements of nearshore submerged coastal topography. Identification of hazards to navigation. Sediment management at coastal navigation projects. Precision marine navigation. Movement of goods and fishing vessels.
MCA Title	Marine and Riverine Navigation and Safety
MCA ID	60105
Organization Type	State or U.S. Territorial government
Organization Name	Territory of Guam
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order			QL0B	I don't know
Update Frequency			2-3 years	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error			Up to 2 meters	I don't know
Acceptable Vertical Error			Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season			Nice to have	I don't know		Nice to have
Entire AOI under same environmental conditions			Nice to have	I don't know		Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless			Required	I don't know		Highly desirable
DEM for entire AOI needs to be seamless			Required	I don't know		Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM			Required	I don't know
DTM			Required	I don't know
DEM			Required	I don't know
Raw point cloud data			Required	I don't know
Classified point cloud			Nice to have	
Edited/cube XYZ			Highly desirable	I don't know
Full waveform			Not required	I don't know
Bathymetric Attributed Grid (BAG)			Highly desirable	I don't know
Breaklines required for standard hydro-flattening				
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	I don't know
Tide Predictions			Required	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	I don't know
Intensity imagery/sidescan imagery			Highly desirable	I don't know
Ground control/ground truthing			Highly desirable	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	I don't know
Nautical and/or navigation charts			Highly desirable	I don't know
Acoustic imagery of the seafloor			Highly desirable	I don't know
Aerial and/or satellite imagery			Highly desirable	I don't know
Underwater videography			Nice to have	I don't know
Bottom texture			Highly desirable	I don't know
Bottom type			Highly desirable	I don't know
Submerged features			Highly desirable	I don't know
Subbottom characteristics			Nice to have	I don't know
Geologic and seismic data			Nice to have	I don't know
Water column properties - Physical			Nice to have	I don't know
Water column properties - Chemical			Nice to have	I don't know
Water column properties - Biological			Nice to have	I don't know
Currents			Highly desirable	I don't know
Tide/wave heights			Highly desirable	I don't know
Sea ice conditions			Nice to have	I don't know
Habitat distribution and classification			Highly desirable	I don't know
Boundaries			Nice to have	I don't know
Routes			Required	I don't know
Offshore cadastral			Nice to have	I don't know
Lease areas			Nice to have	I don't know
Fixed obstructions			Required	I don't know
Floating observation/navigation systems			Required	I don't know
Shorelines – current, historic, change rates			Required	
Land use/land cover			Nice to have	I don't know
Wetlands			Highly desirable	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	I don't know
Inland surface water features			Highly desirable	
Bridges/culverts				
Landmark features			Nice to have	
Cultural resources			Nice to have	
Coastal and riverine structures			Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings			Minor	I don't know
Cost savings/cost reduction			Minor	I don't know
Cost avoidance			Minor	I don't know
Increased revenues			Minor	I don't know
Mission-driven performance improvements			Minor	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services			Minor	I don't know

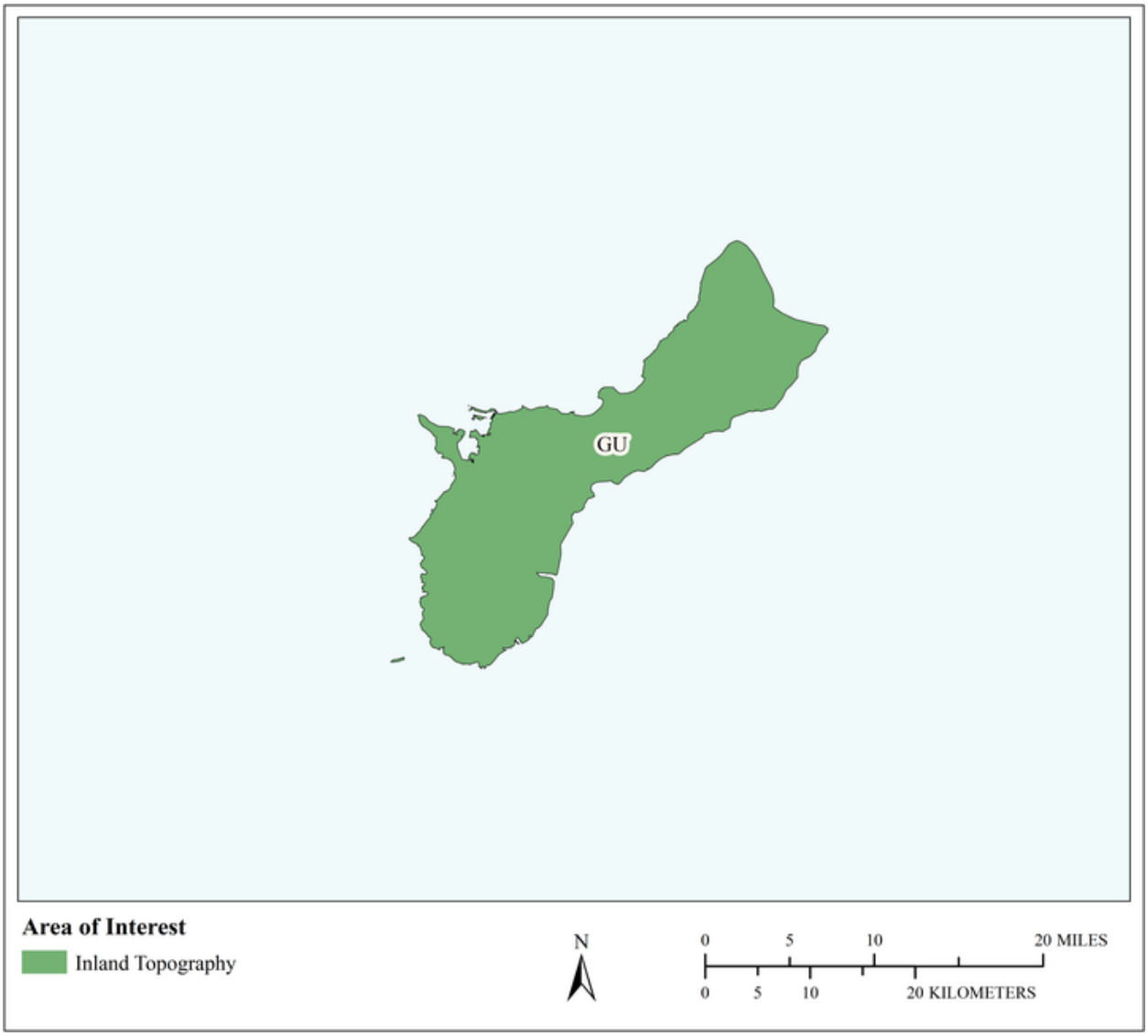
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness			Minor	I don't know
Improved customer experience			Minor	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach			Minor	I don't know
Environmental			Minor	I don't know
Public safety, including life and property			Major	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings							Moderate	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction							Moderate	Unable to provide		I don't know	Unable to provide	
Cost avoidance							Major	Unable to provide		I don't know	Unable to provide	
Increased revenues							Major	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements							Major	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation								Annual dollars saved/ realized	$333,714			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services							Moderate	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness							Major	Unable to provide		I don't know	Unable to provide	
Improved customer experience							Major	Unable to provide		I don't know	Unable to provide	
Future annual customer service benefits added during validation								Annual dollars saved/ realized	$11,298			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach							Minor			I don't know		
Environmental							Major			I don't know		
Public safety, including life and property							Major			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	
Contours			Yes	Yes
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections			Yes	
Height-Above-Ground maps				Yes
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)			Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				Yes

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Aviation Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	UAV flight planning. Determination of in-flight hazards and path obstructions. Aeronautical charting. Runway construction and repair.
MCA Title	Aviation Navigation and Safety
MCA ID	60106
Organization Type	State or U.S. Territorial government
Organization Name	Territory of Guam
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 21 - Aviation Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes			
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Major			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

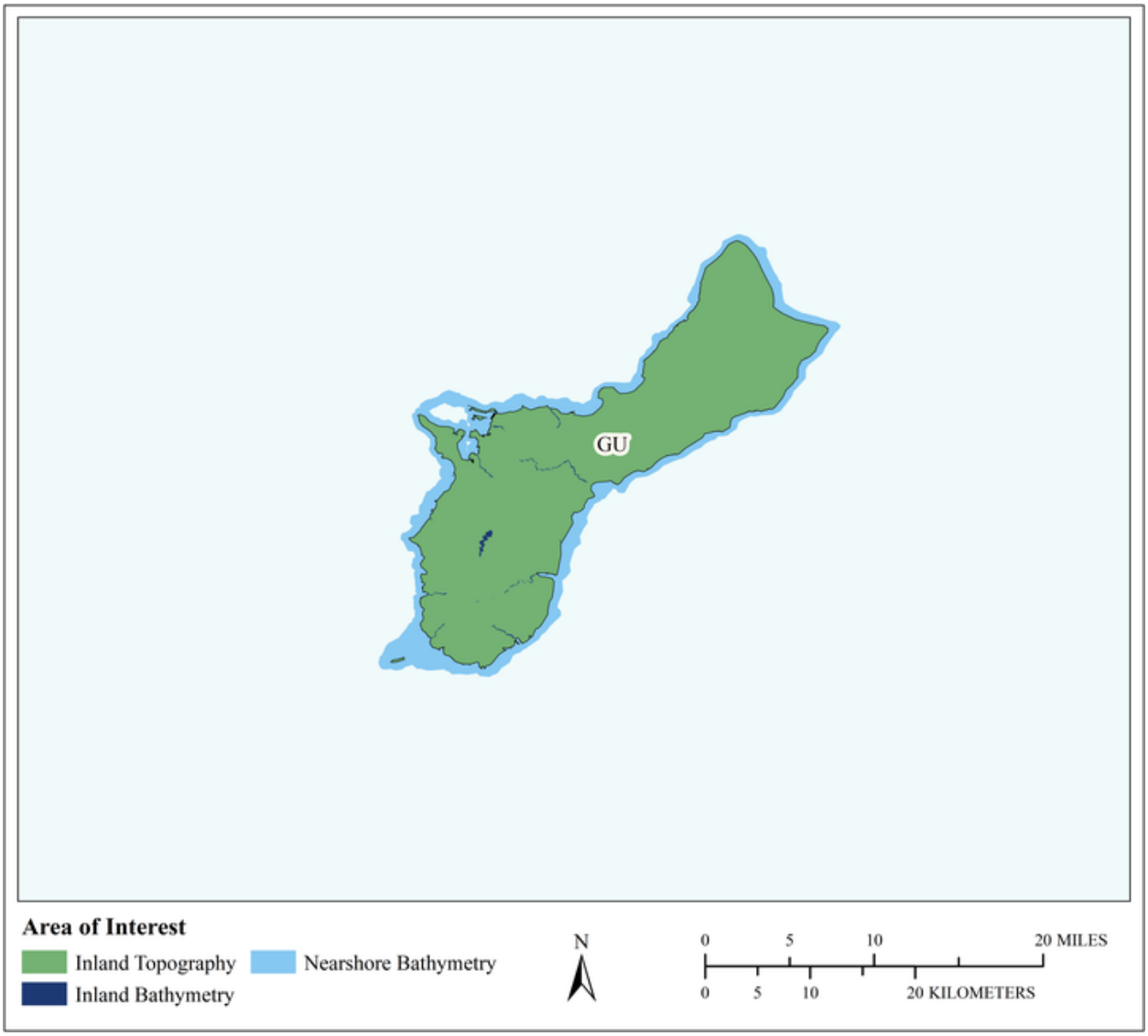
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$708									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$881									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Moderate											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Delivering Electric Utility Services to Our Customers



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	Respondent provided own shapefile, KML, or geodatabase	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements		Wetland areas and areas near shoreline on west of island		

MCA Description	Response
Mission Critical Activity	Electric utility: Activities support high system reliability, mobile workforce development, effective use of technology, and product affordability. Elevation data are needed to help identify wetlands, and to identify the depth to the water table. This is needed in order to understand where water would seep into the coral if the land was drilled into. Elevation data and water table depth are also needed for placing power poles, underground cable placement (electric cables cannot be placed below the water table), possible siting of renewable energy infrastructure in the future, and for vegetation management.
MCA Title	Delivering Electric Utility Services to Our Customers
MCA ID	21667
Organization Type	State or U.S. Territorial government
Organization Name	Guam Power Authority
Sub-Agency or Division	
Organization Mission	Electrical Utility, Provide reliable, efficient, effective, environmentally sound affordable, accountable leading energy solutions.
Program Name	Guam Power Authority
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 12 - Renewable Energy Resources
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Nice to have
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required
Other	Required
Other description	Wetlands

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Surface structures like manholes and handholes

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Not required
51 - 100 ft	Not required
101 - 500 ft	Not required

Inland Bathy Feature Size Requirements	Response
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Other	Required
Other description	Wetlands
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Not required
5.1 – 10 acres	Not required
Greater than 10 acres	Not required
Other	Required
Other description	Wetlands

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL1B	QL1B	
Update Frequency	4-5 years	Event driven only – Data need to coincide with a specific event.	4-5 years	
Event type(s)		A new project,		
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	I don't know	Up to 2 meters	
Acceptable Vertical Error	Less than 5 cm	I don't know	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed	To MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial			
Cross section/transect requirement	Centimeter accuracy			

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Not required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Not required	Highly desirable		Not required	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Not required	Highly desirable		Not required	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Not required	Highly desirable		Nice to have	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	Up to double the required TVU at the 95% confidence level		I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Nice to have	Highly desirable	
DTM	Highly desirable	Nice to have	Required	
DEM	Required	Nice to have	Required	
Raw point cloud data	Highly desirable	Not required	Nice to have	
Classified point cloud	Highly desirable	Not required	Highly desirable	
Edited/cube XYZ		Not required	Nice to have	
Full waveform	Highly desirable	Not required	Nice to have	
Bathymetric Attributed Grid (BAG)		Not required	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Not required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Nice to have	
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Highly desirable	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Nice to have	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Highly desirable	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Nice to have	Nice to have	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Highly desirable	Nice to have	Required	
Bridges/culverts	Highly desirable	Nice to have		
Landmark features	Highly desirable	Required	Highly desirable	
Cultural resources	Required	Required	Nice to have	
Coastal and riverine structures	Highly desirable	Nice to have	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	None at this time	None available		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Guam Bureau of Statistics and Plans			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available	Minor	
Cost savings/cost reduction	Major	Inland bathy data not available	Minor	
Cost avoidance	Moderate	Inland bathy data not available	Minor	

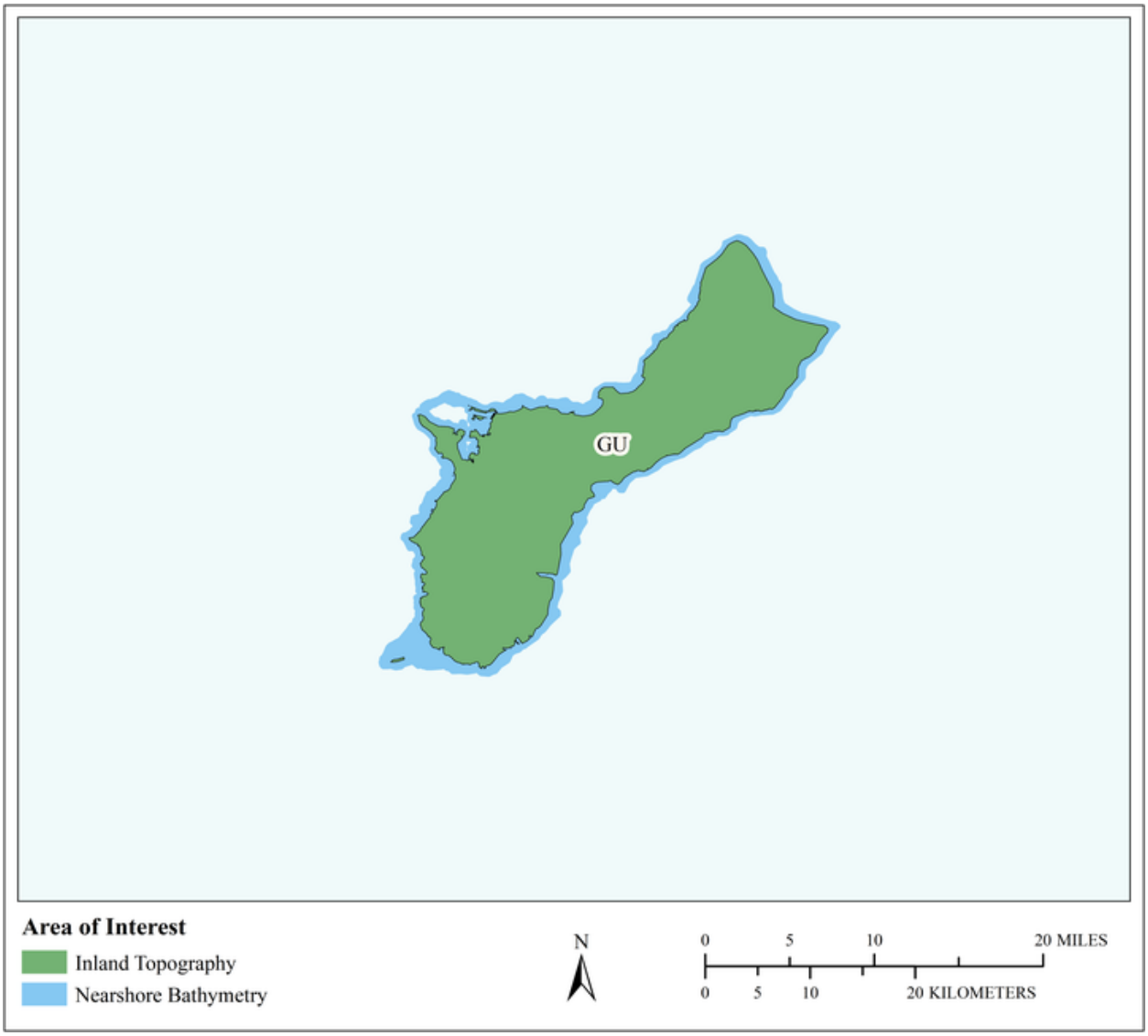
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	Moderate	Inland bathy data not available	None	
Mission-driven performance improvements	Major	Inland bathy data not available	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available	Minor	
Improved response or timeliness	Moderate	Inland bathy data not available	Minor	
Improved customer experience	Moderate	Inland bathy data not available	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Inland bathy data not available	Minor	
Environmental	Moderate	Inland bathy data not available	Minor	
Public safety, including life and property	Moderate	Inland bathy data not available	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide				
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide				
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	I don't know	Unable to provide		I don't know	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$289,168					Annual dollars saved/ realized	$9,097			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	I don't know	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved customer experience	I don't know	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$850,965					Annual dollars saved/ realized	$1,250			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know			Minor					
Environmental	I don't know			I don't know			Moderate					
Public safety, including life and property	I don't know			Minor			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Urban and Regional Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Land development and zoning. Municipal mapping of building footprints and elevations. Port resilience planning. Parks and transportation planning. Virtual city creation. Urban ecology planning.
MCA Title	Urban and Regional Planning
MCA ID	60107
Organization Type	State or U.S. Territorial government
Organization Name	Territory of Guam
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1		QL2B	
Update Frequency	4-5 years		4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter		Up to 5 meters	
Acceptable Vertical Error	Up to 20 cm		Up to 40 cm	
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable		Highly desirable			Highly desirable
Entire AOI under same environmental conditions	Required		Highly desirable			Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Highly desirable			Highly desirable
DEM for entire AOI needs to be seamless	Required		Highly desirable			Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable		Required	
DTM	Required		Required	
DEM	Required		Required	
Raw point cloud data	Required		Highly desirable	
Classified point cloud	Required		Highly desirable	
Edited/cube XYZ			Nice to have	
Full waveform	Nice to have		Nice to have	
Bathymetric Attributed Grid (BAG)			Nice to have	
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Nice to have		Nice to have	
Ground control/ground truthing	Required		Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required		Required	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have		Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Nice to have		Highly desirable	
Land use/land cover	Required		Highly desirable	
Wetlands	Highly desirable		Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required		Highly desirable	
Bridges/culverts	Required			
Landmark features	Highly desirable		Highly desirable	
Cultural resources	Highly desirable		Nice to have	
Coastal and riverine structures	Highly desirable		Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Minor	
Cost savings/cost reduction	Major		Minor	
Cost avoidance	Major		Minor	
Increased revenues	Minor		None	
Mission-driven performance improvements	Major		Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		Minor	

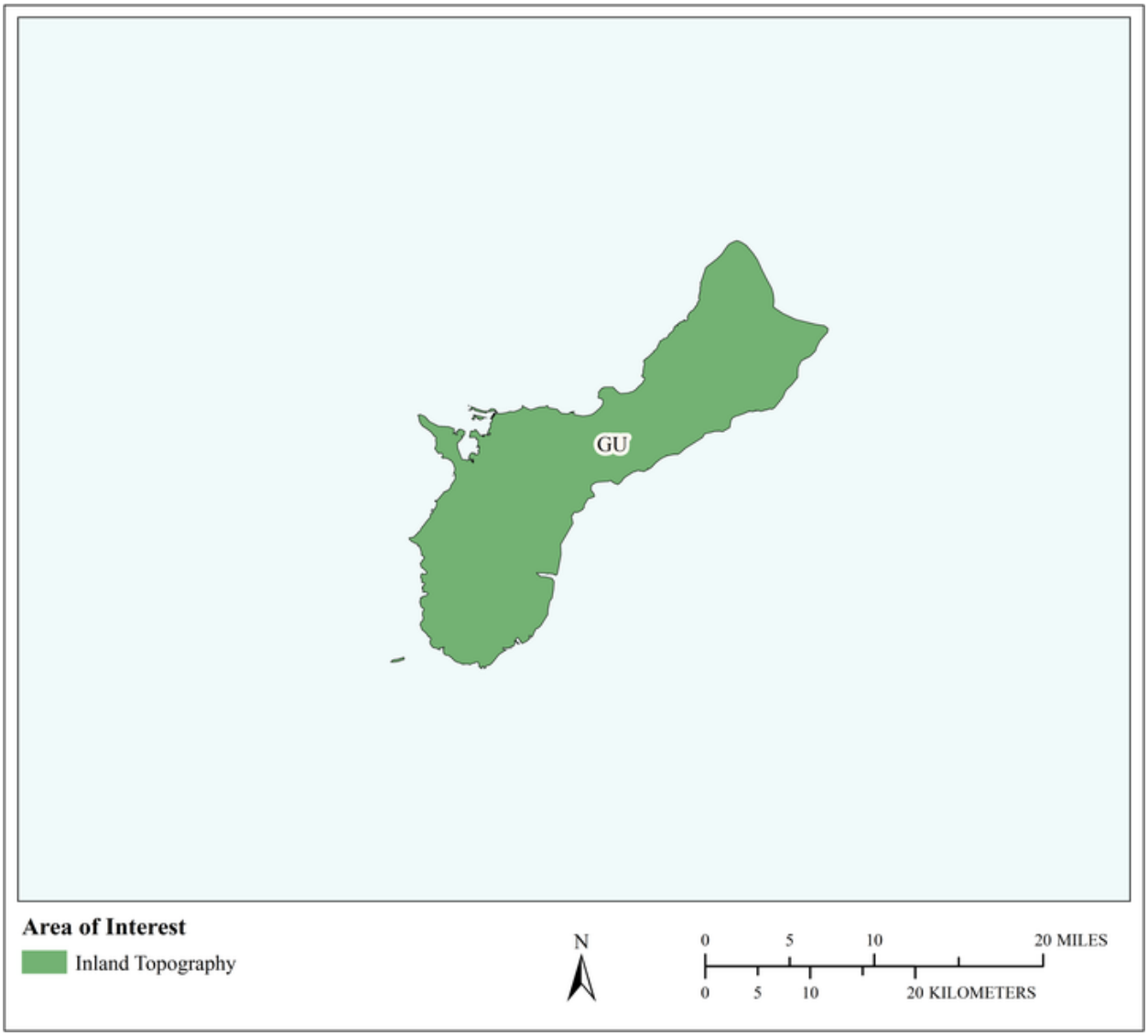
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major		Minor	
Improved customer experience	Major		Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate		Minor	
Environmental	Major		Minor	
Public safety, including life and property	Major		Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide					Minor	Unable to provide				
Cost avoidance	Major	Unable to provide					Major	Unable to provide				
Increased revenues	Minor	Unable to provide					Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide					Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,731,298					Annual dollars saved/ realized	$79,677			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide					Major	Unable to provide				
Improved customer experience	Major	Unable to provide					Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$199,879					Annual dollars saved/ realized	$84,056			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate						Moderate					
Environmental	Major						Moderate					
Public safety, including life and property	Major						Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes		Yes	
Hillshades	Yes		Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps				
Cross sections			Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Real Estate, Banking, Mortgage, and Insurance



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Assessment of risk for natural hazards (e.g., sinkholes, flooding) to inform insurance policy rates and the determination of mandatory insurance. Building permit compliance.
MCA Title	Real Estate, Banking, Mortgage, and Insurance
MCA ID	60108
Organization Type	State or U.S. Territorial government
Organization Name	Territory of Guam
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 25 - Real Estate, Banking, Mortgage, and Insurance
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

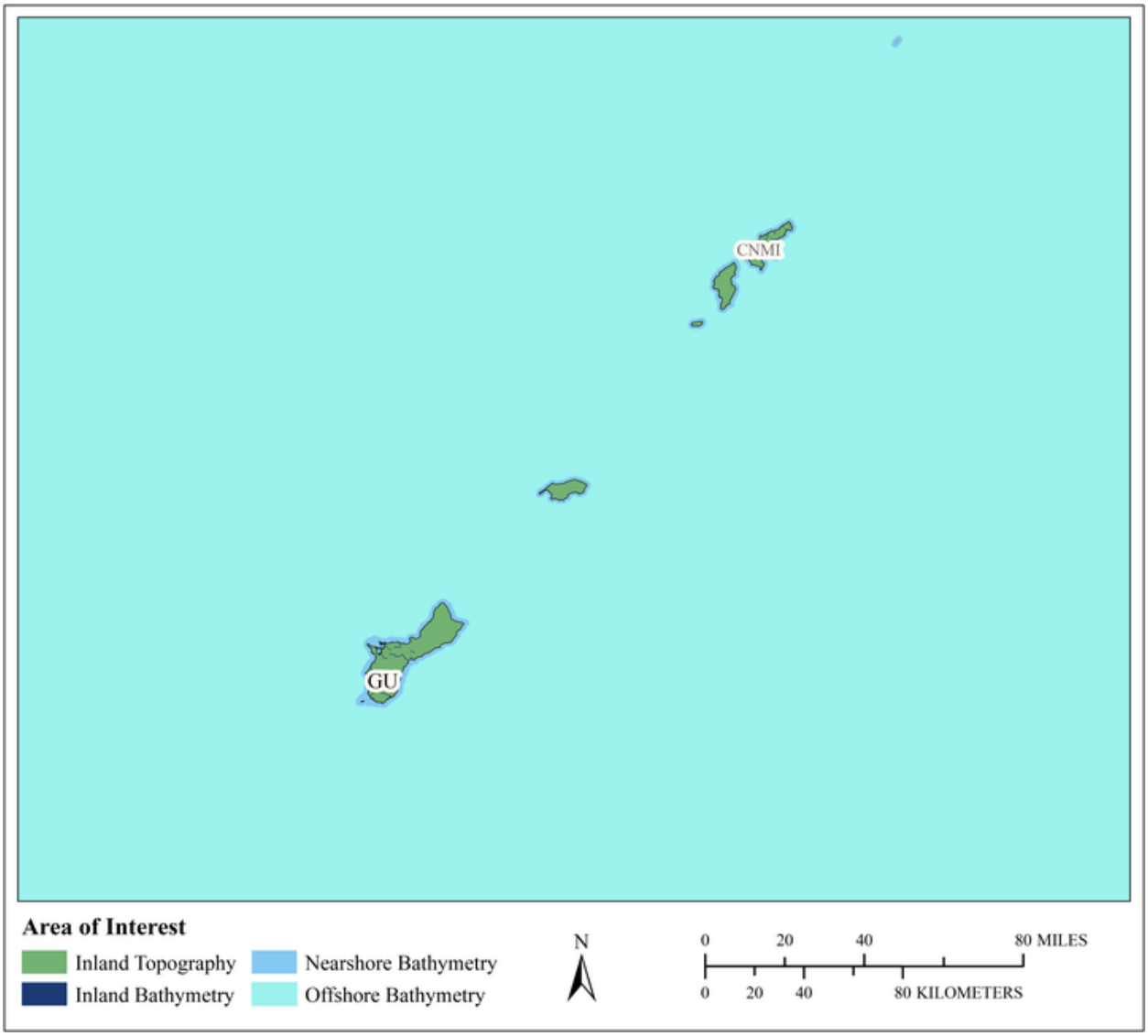
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Moderate			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$223,572									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Research and Education



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	States and/or Territories	States and/or Territories	States and/or Territories	Custom description
Sub Area Requirements	Areas not shown on map: Federated States of Micronesia, Marshall Islands, Palau	Areas not shown on map: Federated States of Micronesia, Marshall Islands, Palau	Areas not shown on map: Federated States of Micronesia, Marshall Islands, Palau	Guam, CNMI, Micronesia main islands, and Palau, out to the EEZ

MCA Description	Response
Mission Critical Activity	Research and education. Technical capacity building to support climate science adaptation and research in the region. Inland bathymetry are needed for freshwater biologists, H&H modeling, and watersheds.
MCA Title	Research and Education
MCA ID	21910
Organization Type	Academic or Not-for-Profit
Organization Name	University of Guam
Sub-Agency or Division	
Organization Mission	To educate and serve the citizens of Guam by providing the best available geographic information science for better decision-making.
Program Name	Center for Island Sustainability, UOG Water & Environment Research Institute College of Liberal Arts and Social Sciences Geography Program Micronesian Area Research Centre UOG Marine Laboratory College of Natural & Applied Sciences
Total Annual Program Budget	
Primary Business Use	BU 26 - Education K12 and Beyond, Basic Research
Secondary Business Use	BU 03 - Coastal Zone Management
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Bamboo trees, corals, seagrass beds, small morphological features (caused by erosion, like gunnels)

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required

Inland Bathy Feature Size Requirements	Response
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B	QL1B	Order 3
Update Frequency	4-5 years	4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI	6-10 years for areas with less change			
Acceptable Horizontal Error	Less than 20 cm	The best horizontal accuracy achievable for the vertical accuracy I need	Less than 50 cm	The best horizontal accuracy achievable for the vertical accuracy I need
Acceptable Vertical Error	Less than 5 cm	Up to 20 cm	Less than 10 cm	Up to 5 meters
How far onshore needed			To the fall line	
How far down the beach profile needed	To MHHW		Below MLLW	
Tide correction requirement			MHW	No requirement for tide correction
Cross sections and/or transects meet needs	Partial	Partial		Partial
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Required	Required	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Required	Required	Highly desirable	Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Highly desirable	Highly desirable	Required	Required
DEM for entire AOI needs to be seamless	Required	Required	Required	Highly desirable	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	Nice to have
DTM	Required	Required	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Required	Required	Required	Required
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Nice to have	Highly desirable	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	Required

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Required	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Required	Nice to have
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	Nice to have
Ground control/ground truthing	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Highly desirable
Nautical and/or navigation charts			Required	Highly desirable
Acoustic imagery of the seafloor			Required	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Highly desirable
Underwater videography			Required	Highly desirable
Bottom texture			Required	Highly desirable
Bottom type			Required	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Highly desirable	Highly desirable	Required	Highly desirable
Water column properties - Physical			Required	Highly desirable
Water column properties - Chemical			Required	Highly desirable
Water column properties - Biological			Required	Highly desirable
Currents			Required	Highly desirable
Tide/wave heights			Required	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Required	Highly desirable
Boundaries			Required	Highly desirable
Routes			Highly desirable	Highly desirable
Offshore cadastral			Highly desirable	Highly desirable
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Required	Required	Required	Highly desirable
Wetlands	Required	Required	Required	Highly desirable
Estuaries			Required	Highly desirable
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have	Required	
Cultural resources	Highly desirable	Nice to have	Required	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	LIDAR (accessed via hydroguam.net), 2007 lidar-derived DEM & DSM (QL2) 2012 lidar-derived DEM	USGS collected, not yet available	Multi-beam sonar, SHOALS 2001 & 2007 lidar data for Guam	Google Earth
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast		Yes	Yes	Yes
NCEI				
Open Topography				
NOAA nautical charts				Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Government of Guam GIS Department			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other	Yes		Yes	
Other description	Hydroguam.net		Apra Harbor, And from colleagues	
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available	Major	Moderate
Cost savings/cost reduction	Major	Inland bathy data not available	Major	Moderate
Cost avoidance	Major	Inland bathy data not available	Major	Moderate
Increased revenues	I don't know	Inland bathy data not available	Major	None
Mission-driven performance improvements	Major	Inland bathy data not available	Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available	Major	Major
Improved response or timeliness	I don't know	Inland bathy data not available	Major	Major
Improved customer experience	Moderate	Inland bathy data not available	Major	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Inland bathy data not available	Major	Major
Environmental	Major	Inland bathy data not available	Major	Major
Public safety, including life and property	Moderate	Inland bathy data not available	Major	Moderate

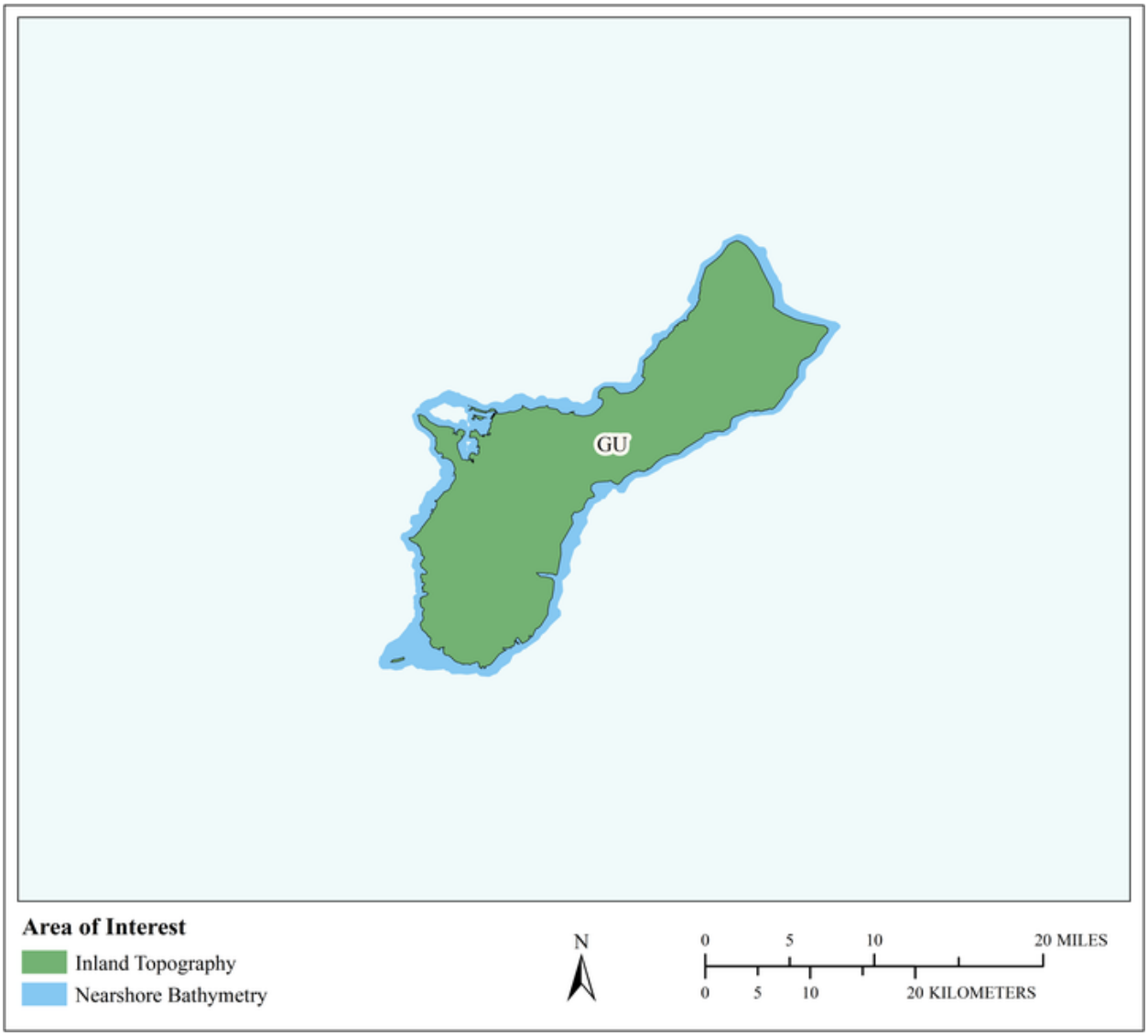
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Time savings description	More efficient modeling and mapping.											
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	None			Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues description							Increased output of quality products that will help others to increase their revenue. We as a university don't sell the products but provide it as a service to others.					
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Other operational benefits	Major	Unable to provide					Major	Unable to provide				
Other operational benefits description	Since we also provide data to many different agencies/ companies the benefits are not restricted to our actual research projects but have a far wider reach. Widespread use of data by other agencies/companies.											
Future annual operational benefits added during validation		Annual dollars saved/ realized	$33,814		Annual dollars saved/ realized	$8,842		Annual dollars saved/ realized	$2,855		Annual dollars saved/ realized	$7,576
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness description							We as the university are usually not involved in response work.					
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Other customer service benefits	Major	Unable to provide										
Other customer service benefits description	Since we also provide data to many different agencies/ companies the benefits are not restricted to our actual research projects but have a far wider reach. Widespread use of data by other agencies/companies.											
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$80,826					Annual dollars saved/ realized	$112			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major			Major		
Education or outreach description	We provide a lot of the data to various other entities											
Environmental	Major			Major			Major			Major		
Public safety, including life and property	None			Major			Major			Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other	Widespread use of data by other agencies/companies			
Other benefits	Major			
Other description	Same as above. Since we also provide data to many different agencies/ companies the benefits are not restricted to our actual research projects but have a far wider reach			

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes			Yes
Aspect maps	Yes		Yes	Yes
Curvature maps	Yes		Yes	
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes	Yes	
Hydrologic Flow Accumulation Grids	Yes	Yes	Yes	
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Recreation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Elevation data are needed for mapping existing hiking and off-road trails, updating recreational maps, and watershed planning. Planning and development of recreational facilities such as rafting, boating, swimming, diving, and fishing areas; golf courses. Location- based products and services such as maps and guides. Tourism. Trail and vista site planning. Orienteering.
MCA Title	Recreation
MCA ID	60109
Organization Type	State or U.S. Territorial government
Organization Name	Territory of Guam
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 27 - Recreation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1		QL0B	
Update Frequency	4-5 years		4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter		Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm		Up to 30 cm	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable		Highly desirable			Not required
Entire AOI under same environmental conditions	Required		Highly desirable			Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Nice to have			Not required
DEM for entire AOI needs to be seamless	Required		Nice to have			Not required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know		I don't know			I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable		Required	
DTM	Nice to have		Highly desirable	
DEM	Required		Required	
Raw point cloud data	Nice to have		Not required	
Classified point cloud	Highly desirable		Highly desirable	
Edited/cube XYZ			Nice to have	
Full waveform	Not required		Not required	
Bathymetric Attributed Grid (BAG)			Nice to have	
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Not required		Not required	
Ground control/ground truthing	Nice to have		Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required		Not required	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Not required		Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Not required	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Not required		Highly desirable	
Land use/land cover	Nice to have		Highly desirable	
Wetlands	Highly desirable		Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required		Highly desirable	
Bridges/culverts	Nice to have			
Landmark features	Highly desirable		Highly desirable	
Cultural resources	Highly desirable		Highly desirable	
Coastal and riverine structures	Not required		Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Minor	
Cost savings/cost reduction	Moderate		Minor	
Cost avoidance	Major		Minor	
Increased revenues	None		Minor	
Mission-driven performance improvements	Major		Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate		Minor	

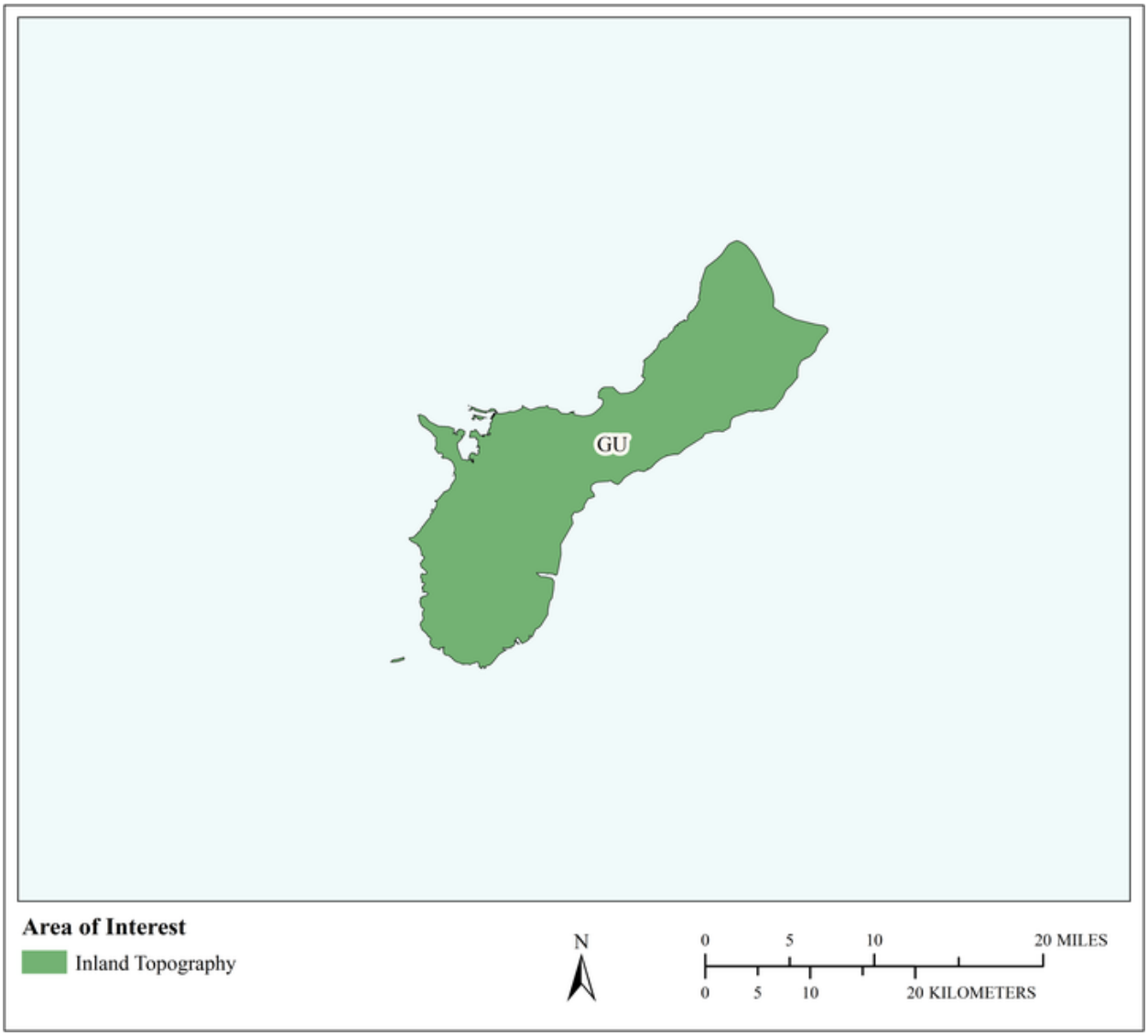
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate		Minor	
Improved customer experience	Moderate		Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate		Minor	
Environmental	Major		Minor	
Public safety, including life and property	Major		Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide					Major	Unable to provide				
Cost avoidance	Major	Unable to provide					Major	Unable to provide				
Increased revenues	None						Moderate	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide					Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,476					Annual dollars saved/ realized	$56,340			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Major	Unable to provide				
Improved response or timeliness	Minor	Unable to provide					Major	Unable to provide				
Improved customer experience	Major	Unable to provide					Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate						Major					
Environmental	Moderate						Major					
Public safety, including life and property	Moderate						Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	
Contours	Yes		Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes		Yes	
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes		Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Telecommunications



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Telecommunication tower site selection. Design of radio and radar systems. Interference analysis. Path profiles. Undersea telecommunication route selection and deployment.
MCA Title	Telecommunications
MCA ID	60110
Organization Type	State or U.S. Territorial government
Organization Name	Territory of Guam
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 28 - Telecommunications
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Highly desirable			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

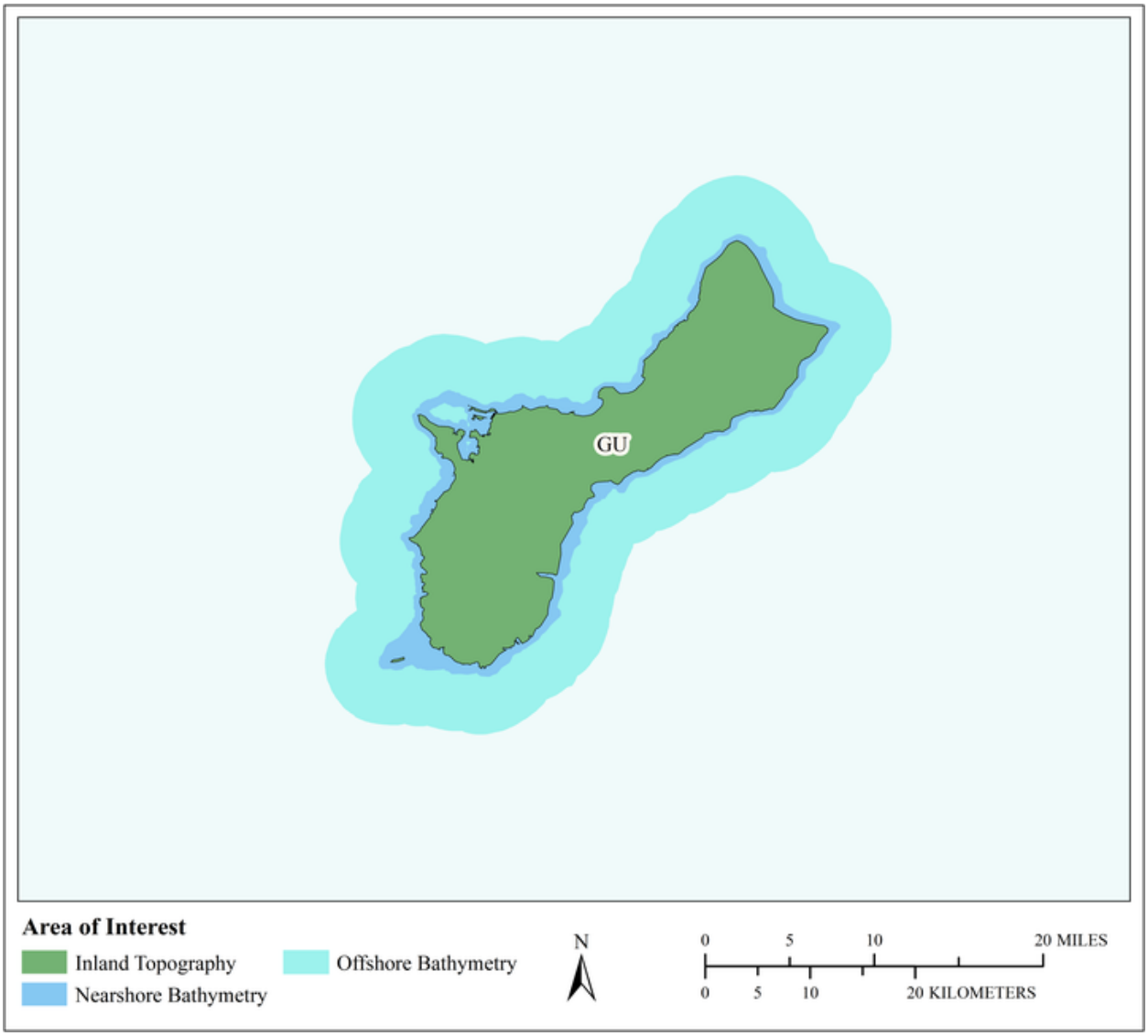
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Military



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	Required
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Raw LAS files can be used by NAVFAC to generate forest structure over disturbed limestone forest to determine best restoration actions. Tactical military operations. Strategic defense. Amphibious landings and logistics over-the-shore. Operation of ships and submarines. Weapons system testing. Management of flight facilities and offshore launch or target areas.
MCA Title	Military
MCA ID	60111
Organization Type	State or U.S. Territorial government
Organization Name	Territory of Guam
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 29 - Military
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	I don't know
Tops of vegetation	I don't know
Tops of submerged structures, objects	I don't know
Tops of submerged vegetation	I don't know
Subcanopy of vegetation/understory	I don't know
River/lake bottom	I don't know
Nearshore elevation (<10 m deep)	Required
Sea surface	I don't know
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	
Smallest 3D features needed	
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	I don't know		I don't know	I don't know
Update Frequency	I don't know		I don't know	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	I don't know		I don't know	I don't know
Acceptable Vertical Error	I don't know		I don't know	I don't know
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	I don't know
Hydro-enforcement	I don't know
Hydro-conditioning	I don't know
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	I don't know		I don't know	I don't know		I don't know
Entire AOI under same environmental conditions	I don't know		I don't know	I don't know		I don't know
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	I don't know		I don't know	I don't know		I don't know
DEM for entire AOI needs to be seamless	I don't know		I don't know	I don't know		I don't know
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know		I don't know	I don't know		I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	I don't know		I don't know	I don't know
DTM	I don't know		I don't know	I don't know
DEM	I don't know		I don't know	I don't know
Raw point cloud data	I don't know		I don't know	I don't know
Classified point cloud	I don't know		I don't know	
Edited/cube XYZ			I don't know	I don't know
Full waveform	I don't know		I don't know	I don't know
Bathymetric Attributed Grid (BAG)			I don't know	I don't know
Breaklines required for standard hydro-flattening	I don't know			
Additional breaklines for hydro-enforcement of culverts	I don't know			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			I don't know	I don't know
Tide Predictions			I don't know	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			I don't know	I don't know
Intensity imagery/sidescan imagery	I don't know		I don't know	I don't know
Ground control/ground truthing	I don't know		I don't know	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			I don't know	I don't know
Nautical and/or navigation charts			I don't know	I don't know
Acoustic imagery of the seafloor			I don't know	I don't know
Aerial and/or satellite imagery	I don't know		I don't know	I don't know
Underwater videography			I don't know	I don't know
Bottom texture			I don't know	I don't know
Bottom type			I don't know	I don't know
Submerged features			I don't know	I don't know
Subbottom characteristics			I don't know	I don't know
Geologic and seismic data	I don't know		I don't know	I don't know
Water column properties - Physical			I don't know	I don't know
Water column properties - Chemical			I don't know	I don't know
Water column properties - Biological			I don't know	I don't know
Currents			I don't know	I don't know
Tide/wave heights			I don't know	I don't know
Sea ice conditions			I don't know	I don't know
Habitat distribution and classification			I don't know	I don't know
Boundaries			I don't know	I don't know
Routes			I don't know	I don't know
Offshore cadastral			I don't know	I don't know
Lease areas			I don't know	I don't know
Fixed obstructions			I don't know	I don't know
Floating observation/navigation systems			I don't know	I don't know
Shorelines – current, historic, change rates	I don't know		I don't know	
Land use/land cover	I don't know		I don't know	I don't know
Wetlands	I don't know		I don't know	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			I don't know	I don't know
Inland surface water features	I don't know		I don't know	
Bridges/culverts	I don't know			
Landmark features	I don't know		I don't know	
Cultural resources	I don't know		I don't know	
Coastal and riverine structures	I don't know		I don't know	
Overhead structures			I don't know	
Lowest Floor Elevation of Buildings	I don't know			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know		I don't know	I don't know
Cost savings/cost reduction	I don't know		I don't know	I don't know
Cost avoidance	I don't know		I don't know	I don't know
Increased revenues	I don't know		I don't know	I don't know
Mission-driven performance improvements	I don't know		I don't know	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know		I don't know	I don't know

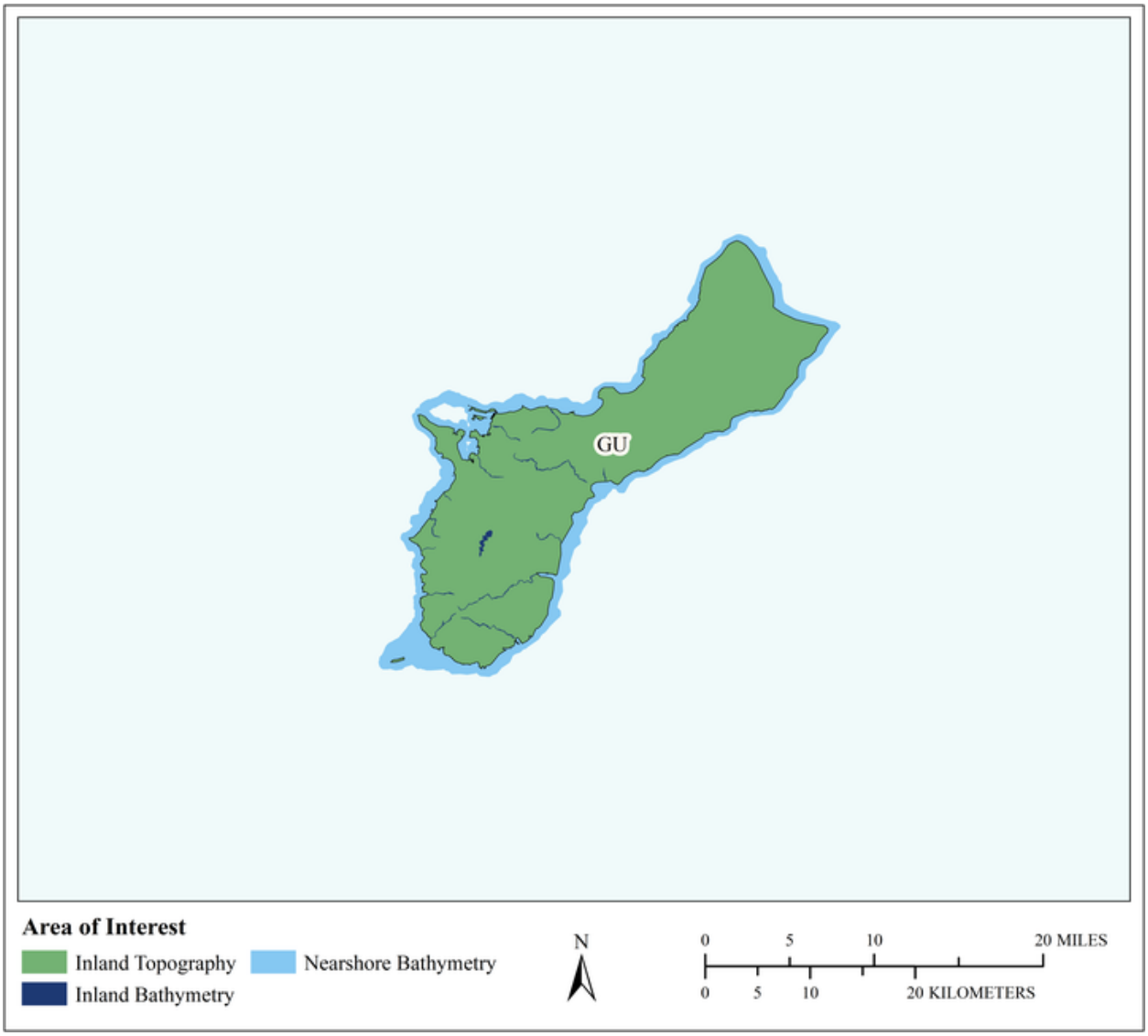
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	I don't know		I don't know	I don't know
Improved customer experience	I don't know		I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know		I don't know	I don't know
Environmental	I don't know		I don't know	I don't know
Public safety, including life and property	I don't know		I don't know	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	I don't know	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	I don't know	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues	I don't know	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	I don't know	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	I don't know	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience	I don't know	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know						I don't know			I don't know		
Environmental	I don't know						I don't know			I don't know		
Public safety, including life and property	I don't know						I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Land Boundary Management and Land Development Zoning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Land Boundary Management and Land development Zoning
MCA Title	Land Boundary Management and Land Development Zoning
MCA ID	21519
Organization Type	State or U.S. Territorial government
Organization Name	Department of Land Management
Sub-Agency or Division	
Organization Mission	Management and disposition of all public lands.
Program Name	Cadastral surveying and mapping
Total Annual Program Budget	
Primary Business Use	BU 30 - Maritime and Land Boundary Management
Secondary Business Use	BU 23 - Urban and Regional Planning
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Sewer manholes, curb and gutter, other manmade improvements, riverbanks, shorelines, ground elevations of critical items

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	Cross sections and/or transects meet needs	QL2B	
Update Frequency	4-5 years	2-3 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Less than 50 cm	Less than 50 cm	
Acceptable Vertical Error	Up to 10 cm	Less than 10 cm	Up to 40 cm	
How far onshore needed			500 meters inland	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MLLW	
Cross sections and/or transects meet needs	Partial	Yes		
Cross section/transect requirement	0.1m vertical every 5m or change of elevation	0.1m vertical every 5m or change of elevation		

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have		Highly desirable	Nice to have
Entire AOI under same environmental conditions	Nice to have	Nice to have	Nice to have		Highly desirable	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Required	Highly desirable		Required	Highly desirable
DEM for entire AOI needs to be seamless	Nice to have	Required	Highly desirable		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	
DTM	Highly desirable	Highly desirable	Highly desirable	
DEM	Highly desirable	Highly desirable	Highly desirable	
Raw point cloud data	Nice to have	Nice to have	Nice to have	
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Nice to have	Not required	
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Highly desirable	
Sea ice conditions			Not required	
Habitat distribution and classification			Not required	
Boundaries			Highly desirable	
Routes			Not required	
Offshore cadastral			Highly desirable	
Lease areas			Highly desirable	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Required	Highly desirable	Highly desirable	
Wetlands	Required	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Highly desirable	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Lidar provided by GovGU DPW 2013	Field acquisition only; survey grade		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes	Yes		
Other description	Provided by other government agency	Fieldwork		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	None	None	
Cost savings/cost reduction	Major	None	None	
Cost avoidance	I don't know	None	None	
Increased revenues	Minor	None	None	

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Mission-driven performance improvements	Moderate	None	None	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know	None	None	
Improved response or timeliness	Moderate	None	None	
Improved customer experience	Moderate	None	None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	None	None	
Environmental	Minor	None	None	
Public safety, including life and property	Minor	None	None	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$47,034	Major	Unable to provide		Major	Unable to provide				
Time savings description	Reduced field visits. Rely more on computer modeling.											
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Minor	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Increased revenues	None			None			None					
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Minor					
Environmental	Minor			Minor			Minor					
Public safety, including life and property	Minor			Minor			I don't know					
Other												
Other benefits				Major								
Other description				Boundary delineations along rivers, streams, etc. will be more precisely defined								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps	Yes	Yes		
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

Hawai'i

Current status of elevation data for Hawai'i

The State of Hawai'i has a growing collection of topographic lidar, both as smaller project-focused efforts and two island-wide projects, and hopefully the trend will continue. Much of the funding for elevation data has come from, and will likely continue to come from, federal sources. However, the State of Hawai'i is exploring how to provide seed state funds toward lidar. The Hawai'i Statewide GIS Program has allocated a small amount of funding for FY 19-20 and FY 20-21 for lidar projects. Also, local government has gotten involved, such as Hawai'i County in the Big Island project.

By island, lidar is in work for the Big Island, collected at Quality Level 1 (QL1), and is being considered for the island of Kauai. The island of Oahu is 70% covered by QL3 data that is close to QL2. Future projects may proceed island by island. Federal interest remains strong and the clear need for bathymetric lidar should drive federal and other investments there too.

Importance of elevation data to Hawai'i

State of Hawai'i

- Irrigation system design. Detailed site analysis to support precision farming. Analysis of farm sedimentation and runoff. Engineering and construction of dams, reservoirs, and distribution to farmers; pump, drain, and well placement; disaster response; flood risk analysis resulting from acts of terrorism and natural hazards (HI Dept of Agriculture).
- Planning, analysis, decision support, and visualization to support all agencies (HI Statewide GIS Program).
- Stormdrain compliance, drainage basin mapping. Marine construction, building and maintaining piers and wharves (HIDOT Harbors).
- Fate and transport of contaminants. Pollution risk mitigation. Runoff and sedimentation analyses. Point- or non-point source pollution modeling. Management of contaminants and marine debris - point, non-point, vessel, and atmospheric pollution; spills; trash.
- Forest health assessment. Determination of standing inventory of forest resources. Prescribed burn planning. Analysis of carbon stocks for trade. Harvest systems planning.
- Conservation engineering. Soils and wetlands mapping and characterization. Modeling of biological and ecological systems. Erosion control. Rainfall penetration studies, impervious surfaces. Assessment of blue carbon stocks.
- Conservation planning for wildlife refuges and marine sanctuaries. Conservation of critical habitats. Management of diverse migratory bird habitats, coral reef and coral communities, marine mammals, protected fish species, and trust resources.
- Geologic mapping and analysis. Sinkhole and steephead mapping, monitoring, and analysis. Identification of geomorphologic units. Landslide hazard mapping and assessment. Karst mapping, including springs and caves. Aquifer recharge.
- Onshore or offshore mineral extraction. Monitoring sand as a local resource. Seabed resources. Open mine volume computations. Stockpile analysis. Environmental impact assessment and site restoration.
- Alternate energy development – solar, tidal, wind, wave, and ocean current. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Low head power potential for hydropower.

- Discovery and analysis of underwater archaeological and historical cultural sites. Site protection and preservation planning. Discovery and analysis of Native American and other historical cultural sites and subsistence activities.
- Flood risk modeling and mapping of riverine and coastal areas. Dam/dike/levee safety analysis. Emergency management. Flood forecasts.
- Modeling and mapping the effects of sea level rise or subsidence. Population and economic vulnerability assessments. Coastal inundation and infrastructure assessment.
- Determination of forest fuel and fire susceptibility. Fire behavior modeling to support wildfire suppression activities. Wildland/urban interface building identification. Post fire analysis to determine landslide prone areas.
- Infrastructure and border protection. Coastal search and rescue. Population dynamics. Emergency fuel supply and movement. Line of sight analysis in urban areas. Disaster response. Flood risk analysis resulting from acts of terrorism.
- Road and railroad route selection and maintenance. Slope analysis for autonomous cars. GPS navigation visualization.
- Assessment of risk for natural hazards (e.g., sinkholes, flooding) to inform insurance policy rates and the determination of mandatory insurance. Building permit compliance.
- Planning and development of recreational facilities such as rafting, boating, swimming, diving, and fishing areas; ski slopes; and golf courses. Location- based products and services such as maps and guides. Tourism. Trail and vista site planning. Orienteering.
- Telecommunication tower site selection. Design of radio and radar systems. Interference analysis. Path profiles. Undersea telecommunication route selection and deployment.

Higher Education (National Disaster Preparedness Training Center, University of Hawai'i at Manoa)

- Natural Hazard Mitigation; mapping and estimating forest resources using lidar; broad support of scientific research; study forest changes. Mapping and estimating forest resources using lidar. Better elevation data are needed where gaps exist, including the higher elevations in Oahu, also the Big Island. Data are needed for identification and mapping of vegetation, including native vs. invasive species, vegetation structure, biomass, species mapping, and growing status. Elevation data are also important for orthorectification of imagery.

Pacific Disaster Center

- Disaster based situational awareness, and risk assessment (e.g. dam modeling, coastal flooding, tsunami inundation, etc.).

Private Sector

- Flight planning for aerial surveys; accurate, high-resolution elevation information is required to ensure safety during flight operations as well as maintain optimal quality for data products; flights conducted at low altitudes often require following the terrain to maintain a constant distance from the ground (Resource Mapping HI).
- Energy development and delivery – electric, wind, water, hydroelectric, geothermal; vegetation management; slope analysis, zoning, all factor into infrastructure management; ensure no adverse impacts to at risk species (Hawaiian Electric).
- Urban and Regional Planning - Slope analysis (Kamehameha Schools).
- Map, monitor, and analyze canopy changes; watershed analysis for trash and runoff in streambeds and riparian buffers during heavy rains; future data preparation for carbon sequestration of trees

in conservation areas; urban tree inventory and maintenance; urban tree canopy assessment (Smart Trees Pacific).

Maui County

- Land development and zoning; utilities, emergency management, real property, watershed conservation.

Hawai'i Geographic Information Coordinating Council

- Adoption and use of high-resolution and accurate data for decision makers and Geospatial practitioners in Hawai'i.

High-level summary of elevation data requirements

A mix of QL1 and QL2 data are required for the state. QL2 can work on more exposed rural landscapes, however, the prevalence of very dense vegetation over much of the state supports the need for QL1. Hawai'i's dependence on its coastal resources (including coastal topography in addition to nearshore and offshore bathymetry) benefit most from higher quality data. QL1 was cited most frequently for inland topography and QL0B for nearshore bathymetry. Generally respondents indicated a need for inland bathymetry at QL1B. Offshore data requirements include Order 1a, though in some cases needs could be met with cross sections and transects. All data types require an update frequency of 4-5 years to meet most user needs.

High-level summary of benefits that would come from higher resolution elevation data

Along with government participation, numerous potential non-government (business, nonprofit, and university) participants were identified in Hawai'i. This led to a variety of applications and benefits - natural resource inventory (trees), disaster potential (flood, landslide, tsunami), habitat management (both onshore and off), cost avoidance (offshore and coastal zone), and utilities (electrical grid). Future estimated benefits exceed $75 million and these include vegetation (tree) inventory savings from QL1 lidar exceeding $5 million; high-resolution nearshore/offshore data can save over $10 million through cost avoidance and reduced expensive hourly site work; improved response for electrical grid servicing expected to save over $4 million.

Additional comments

All the major Hawaiian islands (including Ni'ihau) require lidar data. The previous acquisition missed the majority of the mountainous areas where forests are critical to the sustainability of the state. Higher data acquisition costs for Hawai'i should be accounted for. Data quality costs are a lesser portion of the project budget so it could foster higher QL1 data.

Other lidar technology that can apply to Hawai'i's dense vegetation and steep terrain – such as single photon (depending on the Big Island results), drones, structure-from-motion, etc. should be considered. A new requirement by Hawai'i Coastal Zone Management program (CZM) has initiated a project to generate high-resolution Tsunami Design Zone (TDZ) maps for the Island of O'ahu.

The State of Hawai'i has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

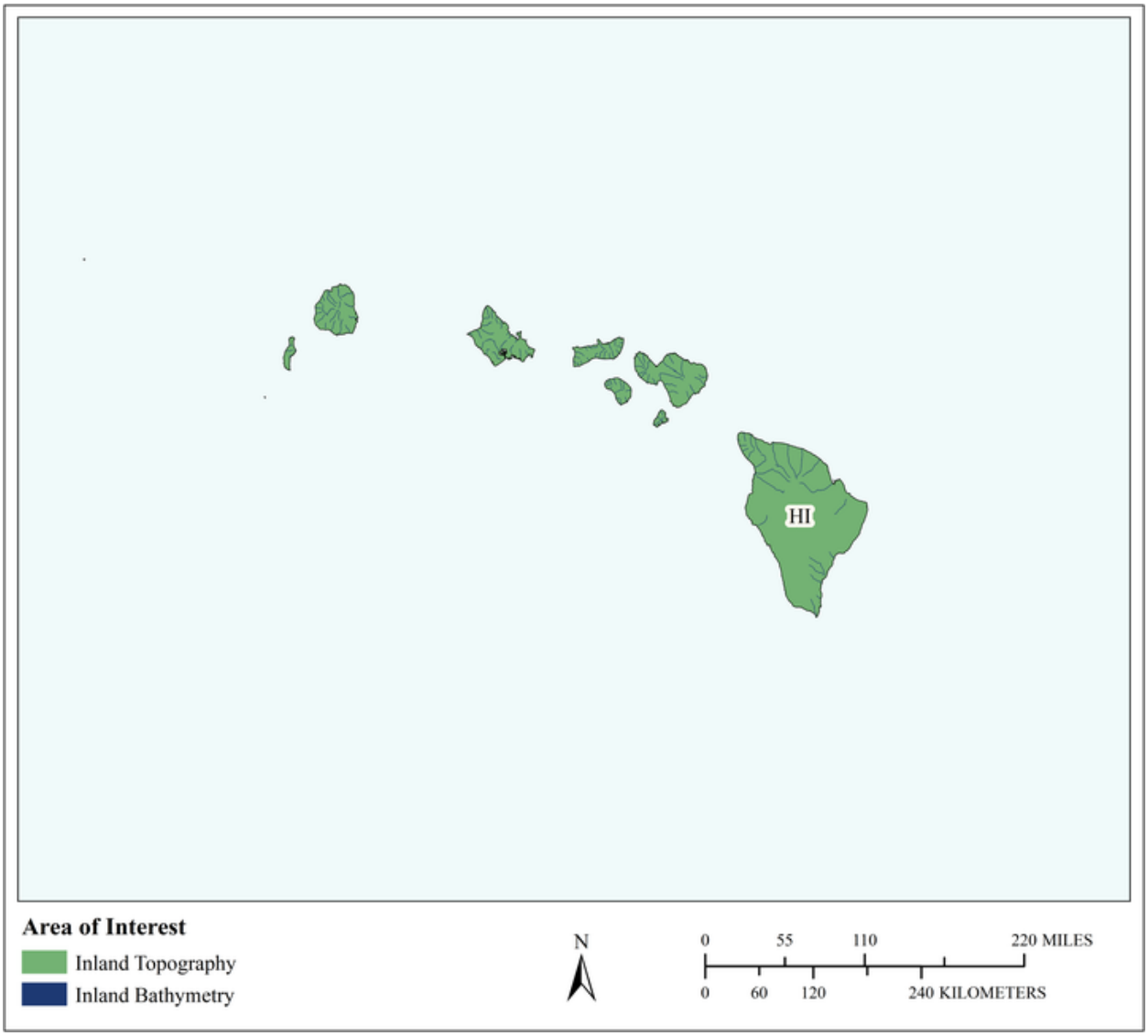
MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	State of Hawai'i	60112	Water Supply and Quality	Inland Topo	QL2	4-5 years	$35,677	$9,556	Moderate	Major	Moderate
				Inland Bathy	QL1B	6-10 years	$154,343	$16,129	Moderate	Major	Moderate
BU 03 – Coastal Zone Management	State of Hawaii	22113	Planning, Analysis, Decision Support, and Visualization to Support All Hawaii State Agencies	Inland Topo	Cross sections and/or transects meet needs	2-3 years	$3,296,732	$279,897	I don't know	Moderate	Moderate
				Inland Bathy	Cross sections and/or transects meet needs	2-3 years	$823,315	$325,627	I don't know	Moderate	Moderate
				Nearshore Bathy	QL0B	2-3 years	$855,600	$1,645,187	I don't know	Moderate	Moderate
				Offshore Bathy	Cross sections and/or transects meet needs	2-3 years	$360,075	$132,537	I don't know	Moderate	Moderate
BU 04 – Forest Resource Management	State of Hawai'i	60113	Forest Resources Management	Inland Topo	QL1	2-3 years	$25,441	$36,879	Major	Major	Major
BU 06 – Natural Resource Management	State of Hawai'i	60114	Natural Resources Conservation	Inland Topo	QL1 HD	4-5 years	$252,383	$926,829	Major	Major	Major
				Inland Bathy	QL0B	6-10 years	$34,207	$1,539	Major	Major	Major
				Nearshore Bathy	QL1B	6-10 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate
BU 07 – Wildlife and Habitat Management	State of Hawai'i	60115	Wildlife and Habitat Management	Inland Topo	QL2	4-5 years	$1,532	$4,427	Moderate	Major	Moderate
				Inland Bathy	QL2B	4-5 years	$12,283	$7,424	Moderate	Moderate	Moderate
				Nearshore Bathy	QL0B	4-5 years	$431	$25	Moderate	Major	Moderate
				Offshore Bathy	Special Order	4-5 years	$3,853	$268	Moderate	Major	Major
BU 08 – Agriculture	Hawaii Dept of Agriculture	21649	Agriculture Management	Inland Topo	QL2	4-5 years	$13,326	$6,030	Moderate	Major	Major
				Inland Bathy	QL4B	4-5 years	$13,326	$6,030	Moderate	Major	Major
BU 09 – Fisheries Management and Aquaculture	State of Hawai'i	60116	Fisheries Management and Aquaculture	Inland Bathy	QL0B	6-10 years	$12,875	$5,859	Major	Major	Moderate
				Nearshore Bathy	QL0B	6-10 years	$68,390	$5,022	Moderate	Major	Minor
BU 10 – Geologic Assessment	State of Hawai'i	60117	Geologic Assessment and Hazard Mitigation	Inland Topo	QL1	4-5 years	$1,358,277	$23,844	Major	Major	Major

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 11 – Geologic Resource Extraction	State of Hawai'i	60118	Geologic Resource Mining and Extraction	Inland Topo	QL1 HD	2-3 years	$1,571	$1,042	Minor	Major	Major
				Offshore Bathy	Order 1b	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 12 – Renewable Energy Resources	State of Hawai'i	60119	Renewable Energy Resources	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	None
				Nearshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Offshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 14 – Cultural Resource Management	State of Hawai'i	60120	Cultural Resources Preservation and Management	Inland Topo	QL1	4-5 years	$1,179	$1,031	Minor	Minor	Minor
BU 15 – Flood Risk Management	State of Hawai'i	60121	Flood Risk Management	Inland Topo	QL2	4-5 years	$903,454	$158,076	Major	Moderate	Major
				Inland Bathy	QL1B	4-5 years	$62,760	$70,463	Moderate	Moderate	Major
				Nearshore Bathy	QL2B	4-5 years	$82,424	$61,088	Major	Moderate	Major
BU 16 – Sea Level Rise and Subsidence	State of Hawai'i	60122	Sea Level Rise and Subsidence	Inland Topo	QL1 HD	4-5 years	$338,764	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Minor
BU 17 – Wildfire Management	State of Hawai'i	60123	Wildfire Management, Planning, and Response	Inland Topo	QL1	4-5 years	$34,572	Unable to quantify	Major	Major	Major
BU 18 – Homeland Security	State of Hawai'i	60124	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management	Inland Topo	QL2	4-5 years	$189,821	$3,355	Major	Moderate	Major
				Inland Bathy	QL0B	4-5 years	$53,458	$3,410	Major	Moderate	Major
				Nearshore Bathy	QL1B	6-10 years	$4,010	$115	Moderate	Moderate	Major
BU 19 – Land Navigation	State of Hawai'i	60125	Land Navigation and Safety	Inland Topo	QL0	2-3 years	$83,356	$6,731	Minor	Major	Major
BU 21 – Aviation Navigation	Resource Mapping Hawaii	21983	Flight Planning for Remote Sensing Aerial Surveys	Inland Topo	QL3	Annually	Unable to quantify	Unable to quantify	None	None	None
				Inland Bathy	I don't know	Annually	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	I don't know	Annually	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 21 – Aviation Navigation	State of Hawai'i	60126	Aviation Navigation and Safety	Inland Topo	QL1 HD	Annually	$21,752	$27,091	Minor	Moderate	Moderate
				Nearshore Bathy	I don't know	Annually	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 22 – Infrastructure Management	Hawaiian Electric	21730	Energy Development and Delivery	Inland Topo	QL0 HD	2-3 years	$1,000,000	$4,200,000	Major	Major	Major
BU 23 – Urban and Regional Planning	Kamehameha Schools	1307	Slope Analysis and Rockfall Mitigation	Inland Topo	QL1 HD	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 23 – Urban and Regional Planning	Smart Trees Pacific	1363	Urban Forest Inventory and Maintenance	Inland Topo	QL1 HD	4-5 years	$3,033,151	$1,310,545	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$4,813,583 to $4,837,583	$1,204,000	Major	I don't know	I don't know
BU 23 – Urban and Regional Planning	Hawaii Geographic Information Coordinating Council	21626	Statewide Geospatial Data Coordination	Inland Topo	QL2	4-5 years	$2,991,657	$12,675,000	Moderate	Major	Major
				Inland Bathy	QL0B	2-3 years	$2,044,120	$775,000	Minor	Major	Major
				Nearshore Bathy	QL0B	2-3 years	$2,536,180	$1,975,106	Major	Major	Major
				Offshore Bathy	Order 1	4-5 years	$32,250,612	$7,825,000	Major	Major	Major
BU 23 – Urban and Regional Planning	County of Maui	21927	Land Development and Zoning	Inland Topo	QL1	Annually	Unable to quantify	Unable to quantify	Moderate	Moderate	Major
BU 23 – Urban and Regional Planning	County of Maui, Hawaii	22291	Enterprise GIS Support for County Government and NGO Activities	Inland Topo	QL1	4-5 years	$100,000	Unable to quantify	Minor	Moderate	Moderate
BU 25 – Real Estate, Banking, and Insurance	State of Hawai'i	60127	Real Estate, Banking, Mortgage, and Insurance	Inland Topo	QL1 HD	4-5 years	$223,572	Unable to quantify	Minor	Minor	Major
				Inland Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	Major	Moderate	Major
BU 26 – Education and Basic Research	University of Hawaii at Manoa	21671	Vegetation Mapping and Inventory	Inland Topo	QL0	2-3 years	$33,814	$80,826	Major	Major	Major
				Inland Bathy	QL1B	4-5 years	$8,842	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL2B	4-5 years	$2,855	$112	Major	Major	Minor
				Offshore Bathy	Order 1a	6-10 years	$7,576	Unable to quantify	Major	Minor	Minor
BU 27 – Recreation	State of Hawai'i	60128	Recreation	Inland Topo	QL1	4-5 years	$1,476	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	4-5 years	$889	Unable to quantify	Major	Major	Moderate
				Nearshore Bathy	QL0B	4-5 years	$56,340	Unable to quantify	Major	Major	Moderate
				Offshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 28 – Telecom-munications	State of Hawai'i	60129	Telecommunications	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	QL2B	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 30 – Maritime and Land Boundary Management	HIDOT Harbors	1147	Harbor Management and Maintenance	Nearshore Bathy	QL0B	2-3 years	$100,000	Unable to quantify	Moderate	Major	Moderate
				Offshore Bathy	Order 1a	2-3 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate

MCA Title: Water Supply and Quality



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Fate and transport of contaminants. Pollution risk mitigation. Runoff and sedimentation analyses. Point- or non-point source pollution modeling. Management of contaminants and marine debris - point, non-point, vessel, and atmospheric pollution; spills; trash.
MCA Title	Water Supply and Quality
MCA ID	60112
Organization Type	State or U.S. Territorial government
Organization Name	State of Hawai'i
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B		
Update Frequency	4-5 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Required			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Highly desirable	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	Major	Minor		
Increased revenues	Minor	None		
Mission-driven performance improvements	Major	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		

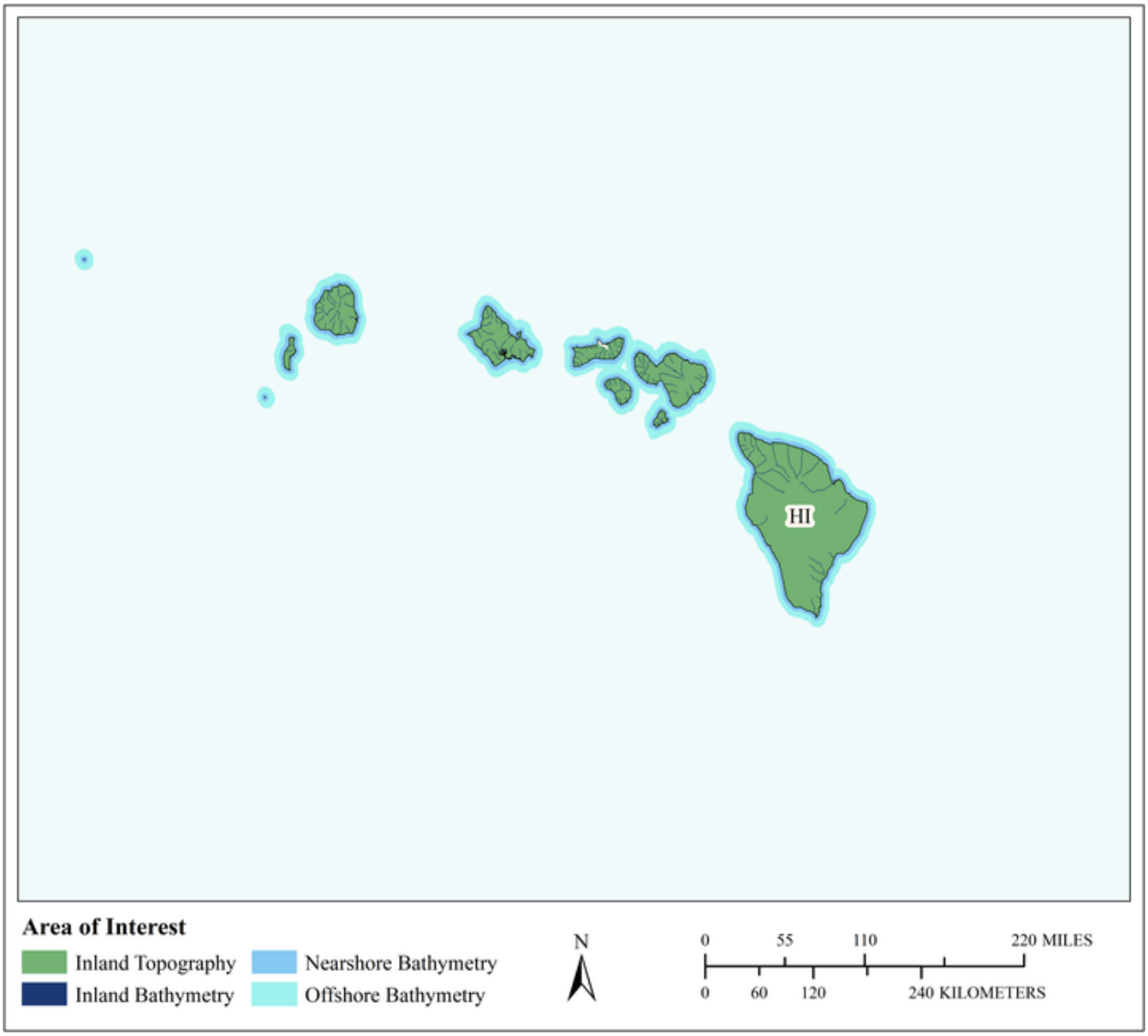
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor		
Improved customer experience	Major	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor		
Environmental	Major	Moderate		
Public safety, including life and property	Major	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$35,677		Annual dollars saved/ realized	$154,343						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide							
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$9,556		Annual dollars saved/ realized	$16,129						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate								
Environmental	Major			Major								
Public safety, including life and property	Moderate			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Planning, Analysis, Decision Support, and Visualization to Support All Hawaii State Agencies



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements	Hawaii, Kauai, Maui, and Honolulu Counties, HI	Hawaii, Kauai, Maui, and Honolulu Counties, HI		

MCA Description	Response
Mission Critical Activity	Planning, Analysis, Decision Support, Visualization to support all Hawaii state agencies
MCA Title	Planning, Analysis, Decision Support, and Visualization to Support All Hawaii State Agencies
MCA ID	22113
Organization Type	State or U.S. Territorial government
Organization Name	State of Hawaii
Sub-Agency or Division	
Organization Mission	Hawaii Statewide GIS Program - Support State Agencies with their GIS needs
Program Name	State Office of Planning
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 23 - Urban and Regional Planning
Tertiary Business Use	BU 14 - Cultural Resources Preservation and Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Individual shrub or tree, mooring anchor or small dock

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Other	Required
Other description	10 feet
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Required
Greater than 10 acres	Required
Other	Required
Other description	100 feet

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	Cross sections and/or transects meet needs	Cross sections and/or transects meet needs	QL0B	Cross sections and/or transects meet needs
Update Frequency	2-3 years	2-3 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI	More frequent updates required for urban and coastal areas			
Acceptable Horizontal Error	Less than 20 cm	Less than 50 cm	Less than 50 cm	Up to 1 meter
Acceptable Vertical Error	Up to 10 cm	Less than 10 cm	Less than 10 cm	Up to 2 meters
How far onshore needed			500 meters inland	
How far down the beach profile needed	To MLLW		To MLLW	
Tide correction requirement			MLLW	MSL
Cross sections and/or transects meet needs	Yes	Yes		Yes
Cross section/transect requirement	5 cm	1 ft/10ft		100 ft / 1000 ft

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Nice to have	Highly desirable	Nice to have
Entire AOI under same environmental conditions	Nice to have	Highly desirable	Highly desirable	Nice to have	Highly desirable	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Nice to have	Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Nice to have	Highly desirable	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Required	Required
DTM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Required	Required	Highly desirable
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Highly desirable	Highly desirable
Full waveform	Nice to have	Nice to have	Highly desirable	Highly desirable
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Nice to have
Nautical and/or navigation charts			Highly desirable	Nice to have
Acoustic imagery of the seafloor			Highly desirable	Nice to have
Aerial and/or satellite imagery	Nice to have	Nice to have	Nice to have	Not required
Underwater videography			Nice to have	Not required
Bottom texture			Highly desirable	Nice to have
Bottom type			Highly desirable	Nice to have
Submerged features			Highly desirable	Nice to have
Subbottom characteristics			Highly desirable	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Highly desirable	Nice to have
Water column properties - Physical			Highly desirable	Nice to have
Water column properties - Chemical			Highly desirable	Nice to have
Water column properties - Biological			Highly desirable	Nice to have
Currents			Highly desirable	Nice to have
Tide/wave heights			Highly desirable	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Highly desirable	Nice to have
Floating observation/navigation systems			Highly desirable	Nice to have
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Nice to have	
Land use/land cover	Nice to have	Nice to have	Nice to have	Not required
Wetlands	Nice to have	Highly desirable	Nice to have	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Nice to have	Not required
Inland surface water features	Nice to have	Required	Not required	
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Nice to have	Nice to have	Not required	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Nice to have	Required	Not required	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	USGS 10M, various Lidar, SAR 5m radar	NHD, 10M Dems, USGS DLG-derived data	ENC, USGS Topos, Various Lidar, other local data	ENC, NOAA MPA, NOAA Marine Cadaster, NOAA Digital Coast, etc.
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast		Yes	Yes	Yes
NCEI	Yes	Yes	Yes	Yes
Open Topography				
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts		Yes	Yes	Yes
USGS Inland Waters server		Yes		
USGS data series		Yes		
Marine Minerals Program GIS				Yes
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Moderate	Moderate
Cost savings/cost reduction	Major	Moderate	Moderate	Moderate
Cost avoidance	Major	Moderate	Moderate	Moderate
Increased revenues	Moderate	Moderate	Minor	Minor
Mission-driven performance improvements	Major	Moderate	Moderate	Minor

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Minor	Minor
Improved response or timeliness	Moderate	Moderate	Moderate	Moderate
Improved customer experience	Major	Moderate	Moderate	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor	Moderate	Minor
Environmental	Major	Moderate	Moderate	Moderate
Public safety, including life and property	Major	Moderate	Moderate	Moderate

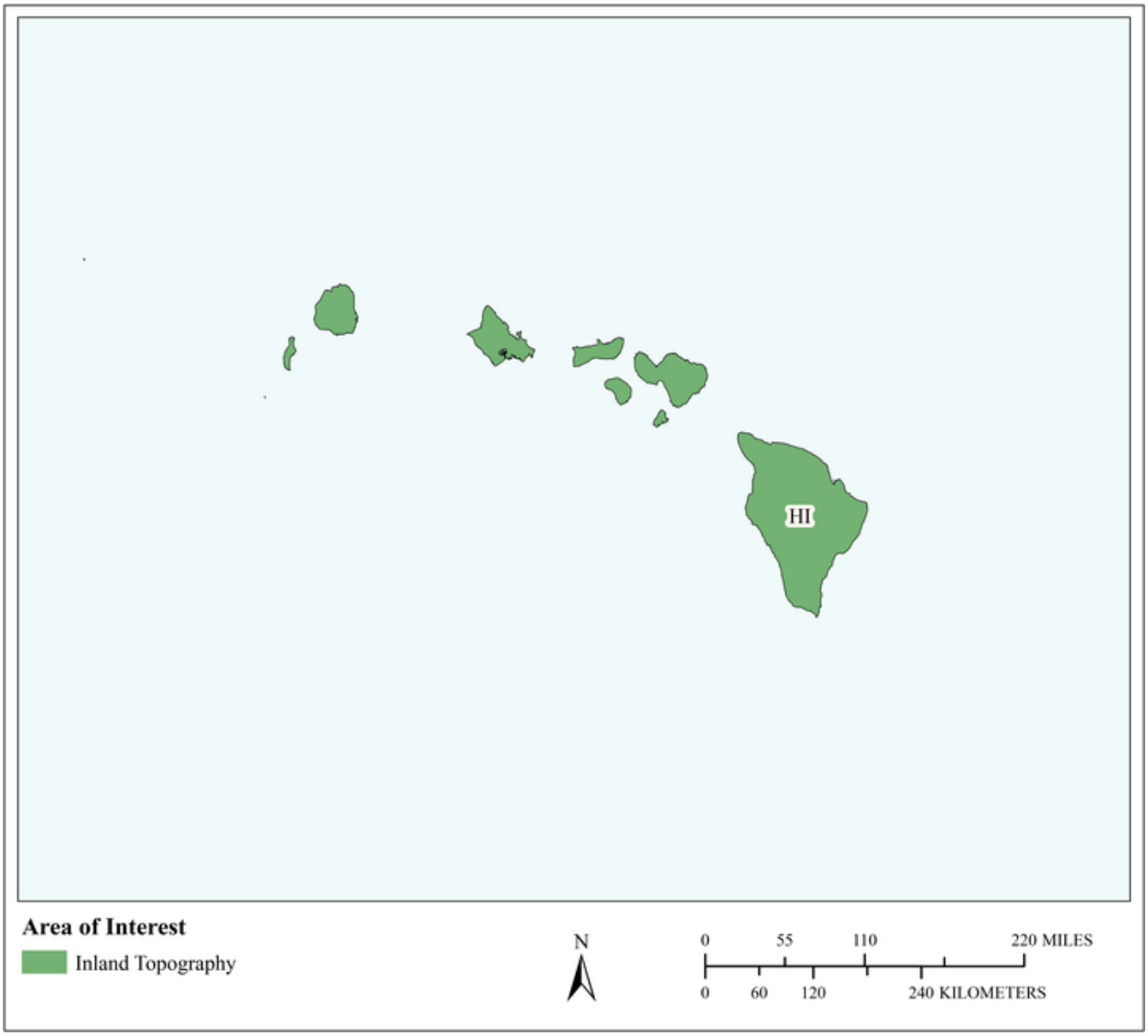
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$46,732	Moderate	Annual dollars saved/realized	$63,315	Moderate	Annual dollars saved/realized	$120,600	Moderate	Annual dollars saved/realized	$15,075
Time savings description	Less time spent on data gathering. Better modeling with more accurate elevation data. Combining data from multiple source is time consuming and introduces error. Less field work.			Better data results in better models, more accurate reviews, etc.			Permitting is more streamlined with more current, accurate data. Hours saved from field inspections of corals, etc. More current, accurate data leads to better, more trusted, modeling.			Won't be necessary to process in house; search for data, etc. Won't be necessary to process in house. Ocean field studies.		
Cost savings/cost reduction	Major	Annual dollars saved/realized	$1,250,000	Major	Annual dollars saved/realized	$525,000	Moderate	Annual dollars saved/realized	$550,000	Moderate	Annual dollars saved/realized	$275,000
Cost savings/cost reduction description	Don't have to acquire data.						Not necessary to purchase materials if data indicates not needed.			Would be prohibitively expensive for state or state agencies to acquire independently.		
Cost avoidance	Major	Annual dollars saved/realized	$1,850,000	Moderate	Annual dollars saved/realized	$225,000	Moderate	Annual dollars saved/realized	$185,000	Moderate	Annual dollars saved/realized	$45,000
Cost avoidance description	Experts processing data, we won't introduce errors. Won't have to process data.											
Increased revenues	Minor	Annual dollars saved/realized	$150,000	Minor	Annual dollars saved/realized	$10,000	Minor	Unable to provide		Moderate	Annual dollars saved/realized	$25,000
Mission-driven performance improvements	Moderate	Annual percent improvement	10%	Moderate	Annual percent improvement	12%	Moderate	Annual percent improvement	10%	Moderate	Annual percent improvement	10%
Mission-driven performance improvements description	Ability of GIS Program to facilitate provision of more and better data.			Better more accurate data leads to better models, better decision making, safer public, better use of public dollars. Improved ability to provide more and better data and products to users and the public.			Ability to provide new and better to data to GIS Program partners and the public. More accurate, current data results in better modeling, better decision making by government officials and better use of public dollars.			Better and more current data leads to improved decision making by government agencies. Ability to provide better, more current data to customers and the public.		
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Annual dollars saved/realized	$200,000	Moderate	Annual dollars saved/realized	$150,000	Moderate	Annual dollars saved/realized	$1,532,500	Moderate	Annual dollars saved/realized	$75,000
Value added to products or services description	Anticipate new and improved applications with better and more extensive data.			New applications will be developed using improved bathymetric data. Improved flood hazard maps and other public safety maps and applications will be developed.			New apps could be developed with new data.					
Improved response or timeliness	Moderate	Annual dollars saved/realized	$72,360	Moderate	Annual dollars saved/realized	$171,105	Moderate	Annual dollars saved/realized	$30,150	Moderate	Annual dollars saved/realized	$56,030
Improved response or timeliness description	Anticipate more accurate reviews with better data. Better data will result in better projections and faster warnings. Depending on type event.			Approvals will be more accurate with better data. Improved data will lead to better identification of flood-prone areas, etc.			In the case of disasters, improved data will allow responders to better know where to deploy resources. New data can be used to update existing maps and online resources. Depends on type and location of event. Better near shore information will improve information needed for permits.			Improved data should assist agencies in reviewing ocean-related permit applications (e.g., for off-shore energy).		
Improved customer experience	Moderate	Annual dollars saved/realized	$7,538	Moderate	Annual dollars saved/realized	$4,522	Moderate	Annual dollars saved/realized	$82,538	Moderate	Annual dollars saved/realized	$1,508
Improved customer experience description	Data users will save time if data is all in one place.						Likely that new data will be used in new and innovative applications, and existing apps will be improved by replacement of lower quality data with this acquisition. Many hours can be wasted trying to find the best data sources. Data users will not have to search for good data, they will know that latest acquisition is accurate and where to find it.			Having new and more accurate data all in one place will save time and lead to improved products and services.		
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know			I don't know			I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Environmental	Moderate	Moderate	Moderate	Moderate
Environmental description	Better elevation data will result in more accurate modeling			
Public safety, including life and property	Moderate	Moderate	Moderate	Moderate
Public safety, including life and property description	Better elevation data will result in more accurate modeling			

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes	Yes	Yes	Yes
Curvature maps	Yes	Yes	Yes	Yes
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness		Yes	Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Forest Resources Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Forest health assessment. Determination of standing inventory of forest resources. Prescribed burn planning. Analysis of carbon stocks for trade. Harvest systems planning.
MCA Title	Forest Resources Management
MCA ID	60113
Organization Type	State or U.S. Territorial government
Organization Name	State of Hawai'i
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Highly desirable			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

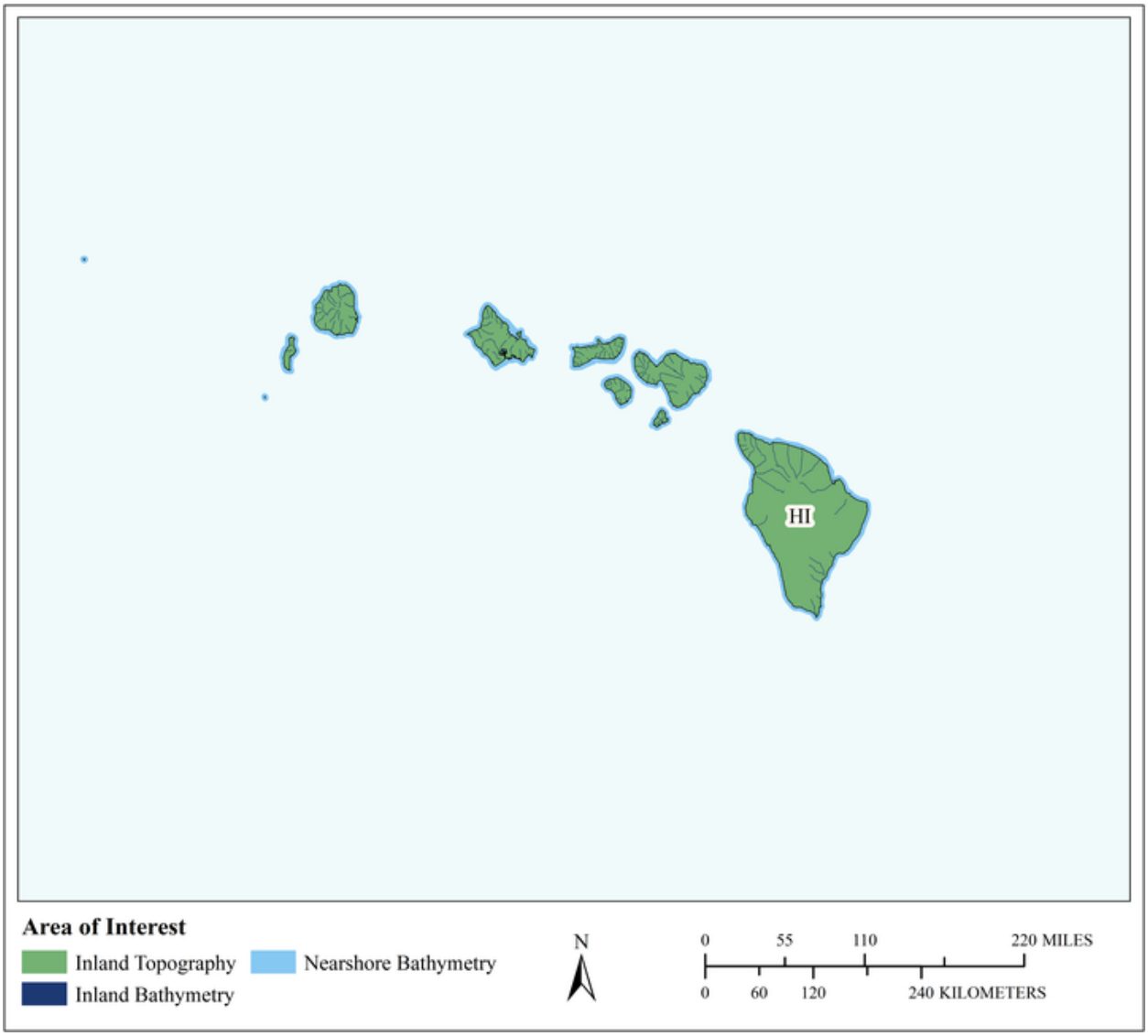
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$25,441									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$36,879									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Natural Resources Conservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation engineering. Soils and wetlands mapping and characterization. Modeling of biological and ecological systems. Erosion control. Rainfall penetration studies, impervious surfaces. Assessment of blue carbon stocks.
MCA Title	Natural Resources Conservation
MCA ID	60114
Organization Type	State or U.S. Territorial government
Organization Name	State of Hawai'i
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B	QL1B	
Update Frequency	4-5 years	6-10 years	6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Highly desirable	Required		Required	Required
Entire AOI under same environmental conditions	Required	Required	Required		Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required		Required	Required
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Required	Required	Required	
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Highly desirable	Required	
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Nice to have	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Highly desirable	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Required	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Highly desirable	Required	Highly desirable	
Land use/land cover	Required	Required	Highly desirable	
Wetlands	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Nice to have	Highly desirable	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	
Cost savings/cost reduction	Major	Major	Minor	
Cost avoidance	Major	Moderate	Minor	
Increased revenues	Minor	Minor	None	
Mission-driven performance improvements	Major	Major	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Moderate	

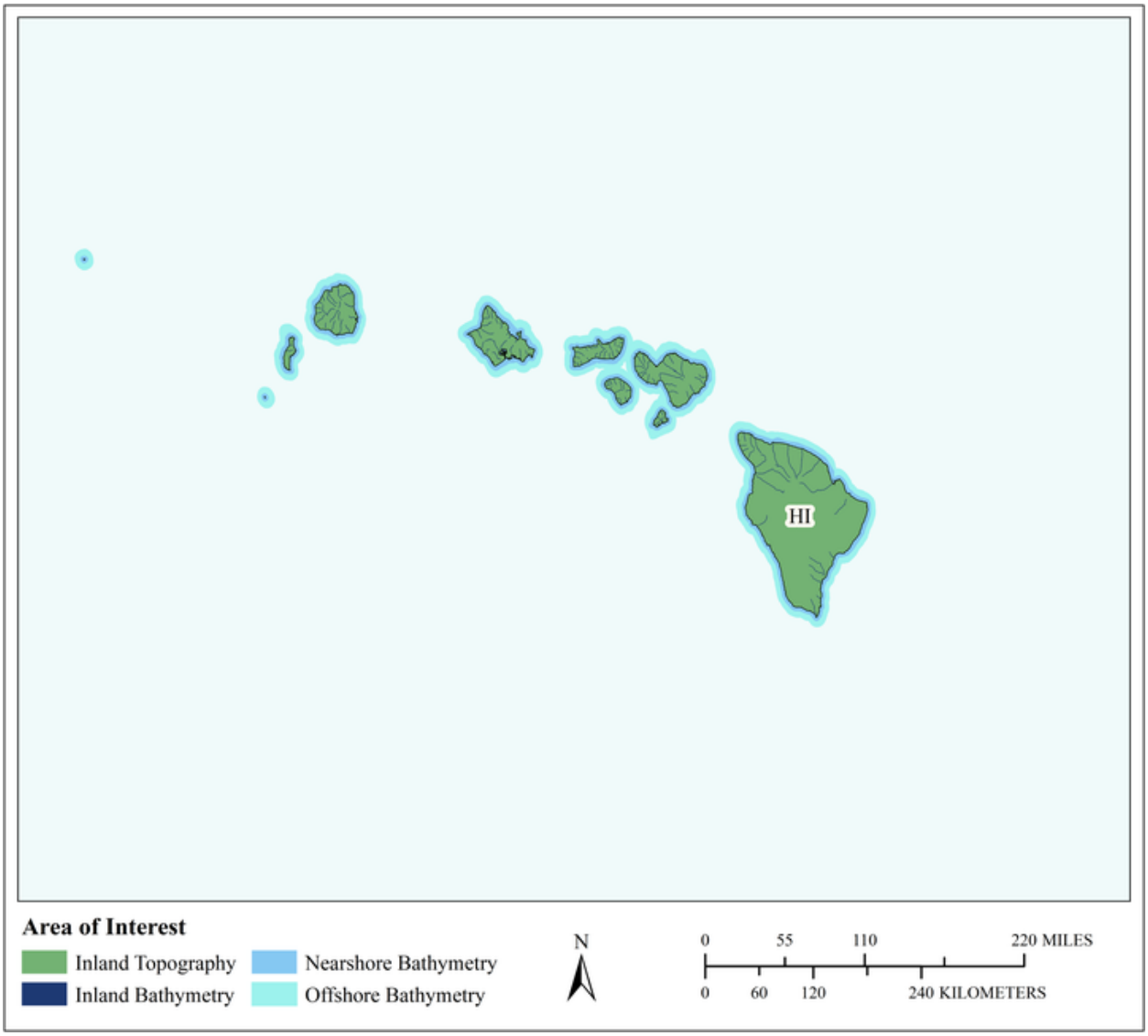
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major	Moderate	
Improved customer experience	Major	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Moderate	
Environmental	Major	Major	Major	
Public safety, including life and property	Major	Moderate	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		None					
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$252,383		Annual dollars saved/ realized	$34,207						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$926,829		Annual dollars saved/ realized	$1,539						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate					
Environmental	Major			Major			Major					
Public safety, including life and property	Major			Major			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes		Yes	
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Wildlife and Habitat Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation planning for wildlife refuges and marine sanctuaries. Conservation of critical habitats. Management of diverse migratory bird habitats, coral reef and coral communities, marine mammals, protected fish species, and trust resources.
MCA Title	Wildlife and Habitat Management
MCA ID	60115
Organization Type	State or U.S. Territorial government
Organization Name	State of Hawai'i
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B	QL0B	Special Order
Update Frequency	4-5 years	4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 2 meters	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DTM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Nice to have	Nice to have	Highly desirable
Classified point cloud	Highly desirable	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Highly desirable
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Highly desirable	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Not required	Nice to have
Lease areas			Not required	Nice to have
Fixed obstructions			Nice to have	Highly desirable
Floating observation/navigation systems			Nice to have	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Nice to have
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Highly desirable	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Nice to have	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Minor	Moderate
Cost savings/cost reduction	Major	Minor	Minor	Minor
Cost avoidance	Major	Minor	Moderate	Major
Increased revenues	None	Minor	None	None
Mission-driven performance improvements	Moderate	Moderate	Moderate	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate	Minor	Minor

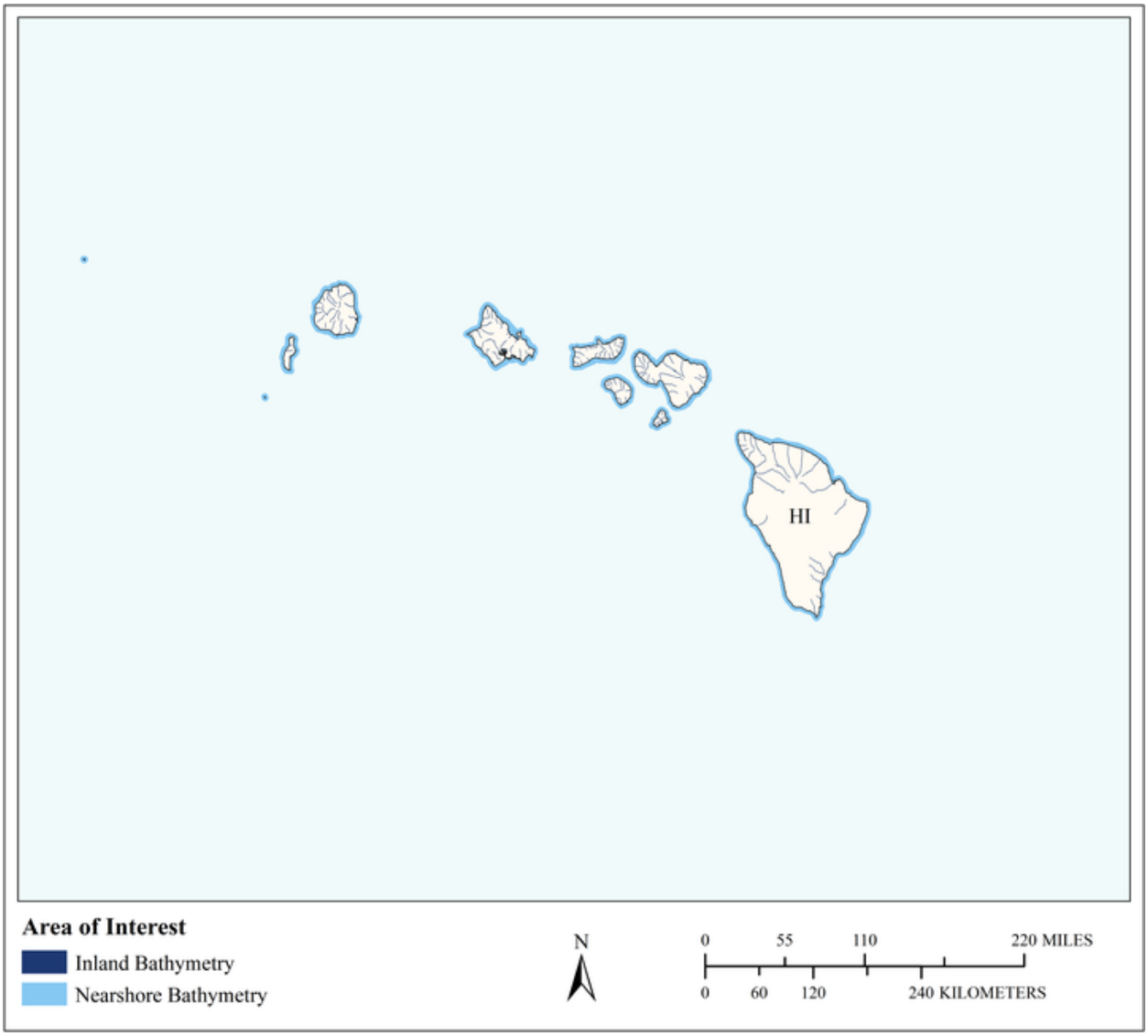
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Minor	Minor	Minor	Minor
Improved customer experience	Minor	Moderate	Minor	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Moderate	Minor	Minor
Environmental	Moderate	Moderate	Moderate	Major
Public safety, including life and property	Minor	Minor	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,532		Annual dollars saved/ realized	$12,283		Annual dollars saved/ realized	$431		Annual dollars saved/ realized	$3,853
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$4,427		Annual dollars saved/ realized	$7,424		Annual dollars saved/ realized	$25		Annual dollars saved/ realized	$268
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate			Moderate		
Environmental	Major			Moderate			Major			Major		
Public safety, including life and property	Moderate			Moderate			Moderate			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes			Yes
Curvature maps				
Cross sections	Yes			Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Fisheries Management and Aquaculture



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type		Required	Required	
Geographic Area Requirements		One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Management of fisheries. Sustainable aquaculture.
MCA Title	Fisheries Management and Aquaculture
MCA ID	60116
Organization Type	State or U.S. Territorial government
Organization Name	State of Hawai'i
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Nice to have
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order		QL0B	QL0B	
Update Frequency		6-10 years	6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error		Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error		Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season		Highly desirable	Nice to have			Nice to have
Entire AOI under same environmental conditions		Highly desirable	Highly desirable			Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless		Highly desirable	Highly desirable			Highly desirable
DEM for entire AOI needs to be seamless		Required	Highly desirable			Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM		Highly desirable	Highly desirable	
DTM		Highly desirable	Highly desirable	
DEM		Required	Required	
Raw point cloud data		Nice to have	Highly desirable	
Classified point cloud		Nice to have	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform		Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	
Breaklines required for standard hydro-flattening		Highly desirable		
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery		Nice to have	Highly desirable	
Ground control/ground truthing		Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery		Highly desirable	Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data		Nice to have	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates		Highly desirable	Highly desirable	
Land use/land cover		Highly desirable	Nice to have	
Wetlands		Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features		Required	Nice to have	
Bridges/culverts		Highly desirable		
Landmark features		Nice to have	Nice to have	
Cultural resources		Nice to have	Not required	
Coastal and riverine structures		Highly desirable	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings		Major	Moderate	
Cost savings/cost reduction		Moderate	Major	
Cost avoidance		Moderate	Minor	
Increased revenues		Moderate	Minor	
Mission-driven performance improvements		Major	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services		Major	Minor	

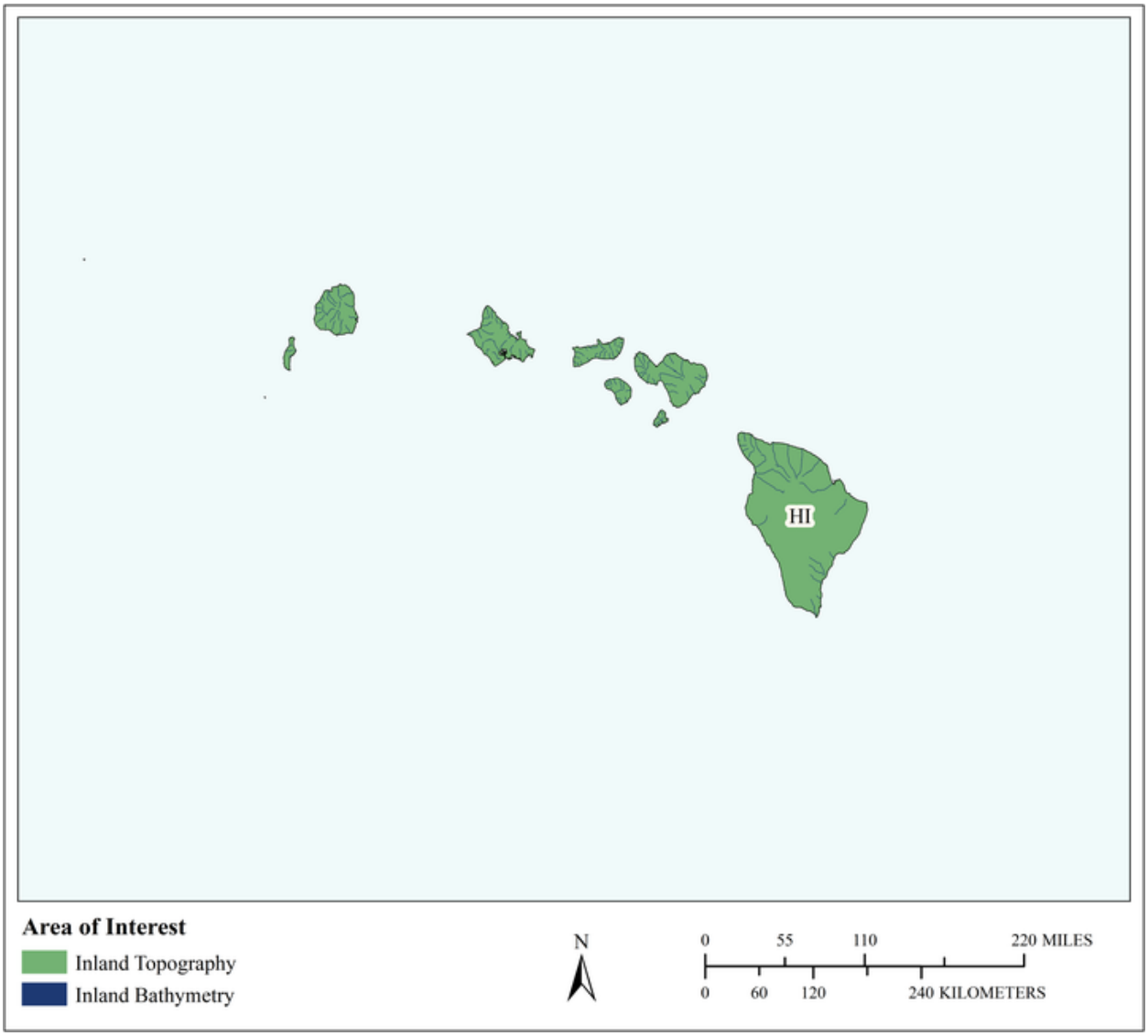
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness		Major	Moderate	
Improved customer experience		Major	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach		Minor	Moderate	
Environmental		Moderate	Moderate	
Public safety, including life and property		Minor	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings				Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction				Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance				Major	Unable to provide		Moderate	Unable to provide				
Increased revenues				None			Minor	Unable to provide				
Mission-driven performance improvements				Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation					Annual dollars saved/ realized	$12,875		Annual dollars saved/ realized	$68,390			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services				Major	Unable to provide		Minor	Unable to provide				
Improved response or timeliness				Major	Unable to provide		Major	Unable to provide				
Improved customer experience				Major	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation					Annual dollars saved/ realized	$5,859		Annual dollars saved/ realized	$5,022			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach				Major			Moderate					
Environmental				Major			Major					
Public safety, including life and property				Moderate			Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours		Yes	Yes	
Hillshades		Yes	Yes	
Slope maps			Yes	
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Agriculture Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Irrigation system design; system is gravity fed so terrain data very important. Detailed site analysis to support precision farming. Farming moving from large sugarcane and pineapple operations to smaller (to two+ acre operations) and more diversified crops supporting farm-to-table. 1,000+ farms per island served. Analysis of farm sedimentation and runoff. Engineering and construction of dams, reservoirs, and distribution to farmers. Pump, drain, and well placement – all irrigation system-related infrastructure. Disaster response; knowledge of headwaters to reservoirs to ditches to irrigated fields. Flood risk analysis resulting from acts of terrorism and natural hazards.
MCA Title	Agriculture Management
MCA ID	21649
Organization Type	State or U.S. Territorial government
Organization Name	Hawaii Dept of Agriculture
Sub-Agency or Division	
Organization Mission	Mission: To lead the State's effort to maintain the agricultural sector of Hawaii's economy, including livestock production, forestry, crops and aquaculture, in a strong and competitive condition by providing policies, services, loans, subsidies, environmental protection, land and water, operations, facilities, advice, coordination, and information so as to achieve appropriate rates of growth, high levels of employment, reasonable returns on investment, and steady gains in real personal income.
Program Name	Increase Production Value Program
Total Annual Program Budget	
Primary Business Use	BU 08 - Agriculture and Precision Farming
Secondary Business Use	BU 22 - Infrastructure and Construction Management
Tertiary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	* Meter Box; Concrete; 3' X 4' * Surface Distribution Lines; Open Air Ditches; Pipelines (12" diameter) * SCADA Communication Poles; 18' tall X 8" diameter

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Highly desirable
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL4B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 10 cm	Up to 50 cm		
How far onshore needed				
How far down the beach profile needed	To MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Required			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Required			Nice to have	
DEM for entire AOI needs to be seamless	Nice to have	Required			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level			Up to double the required TVU at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Nice to have	Nice to have		
Edited/cube XYZ		Highly desirable		
Full waveform	Not required	Highly desirable		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Required	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Highly desirable		
Land use/land cover	Required	Required		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Required	Required		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Required	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Current source are various maps and Google Earth.	Current source are various maps and Google Earth.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Hawaii			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None	None		
Cost savings/cost reduction	I don't know	I don't know		
Cost avoidance	Moderate	Moderate		
Increased revenues	I don't know	I don't know		
Mission-driven performance improvements	None	None		

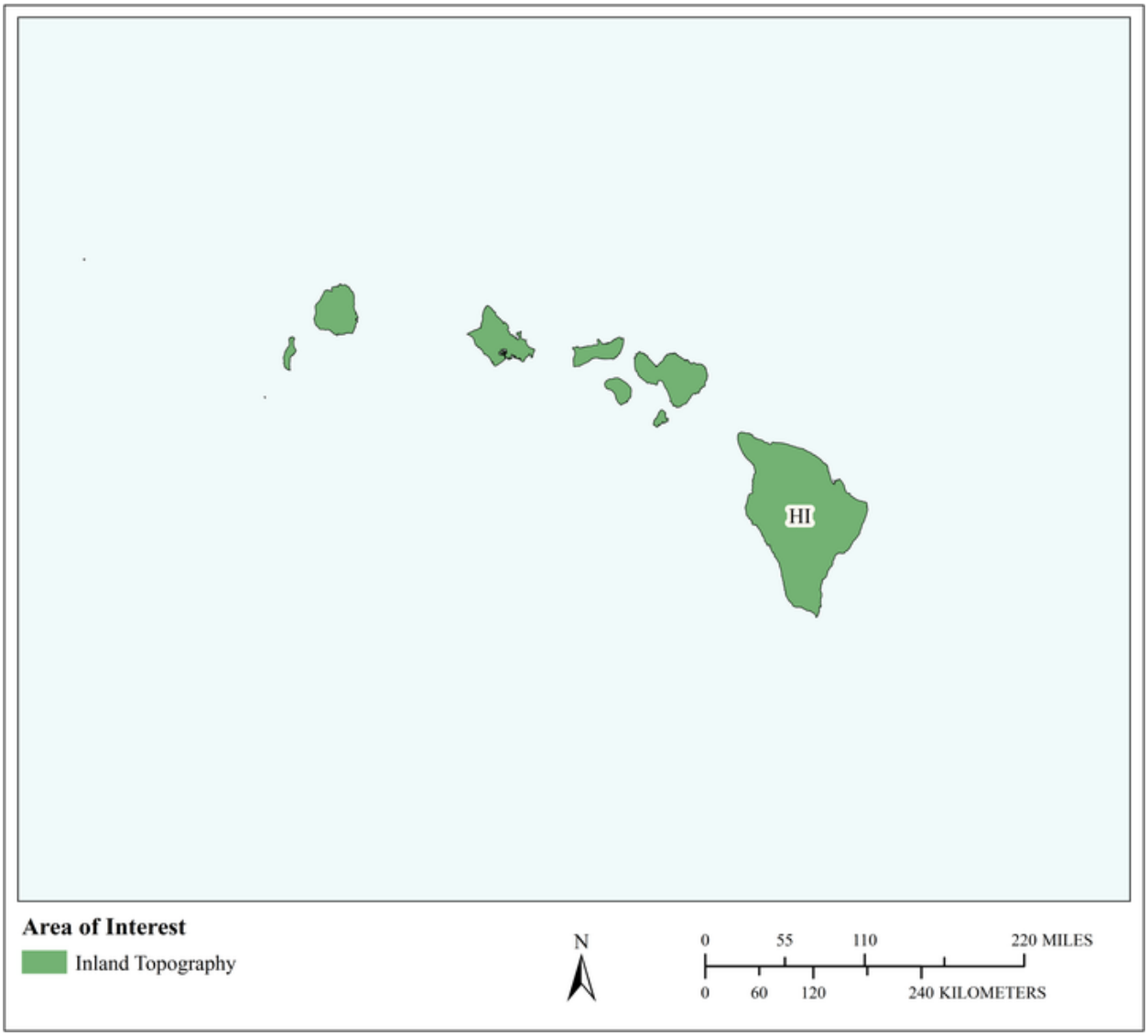
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None	None		
Improved response or timeliness	None	None		
Improved customer experience	None	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	None		
Environmental	I don't know	I don't know		
Public safety, including life and property	I don't know	I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$13,326	Major	Annual dollars saved/realized	$13,326						
Time savings description	Modeling is currently fragmented via as-built plans and maps dating to 1975. Fewer visits, especially to neighboring island areas, would be required.			We refrain from data combining. Modeling is currently fragmented via as-built plans and maps dating to 1975. Fewer visits, especially to neighboring island areas, would be required.								
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Major	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements description	Much of what we must do takes considerable effort so effectiveness would be considerable.			Much of what we must do takes considerable effort so effectiveness would be considerable.								
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Annual dollars saved/realized	$6,030	Major	Annual dollars saved/realized	$6,030						
Improved response or timeliness description	Much of our assistance to farmers are via phone and first class mail...great gains could be realized. Reviews would go much faster; approvals re: upgrades and boundary determinations would all be faster. Esri Story Mapping with current data would be a method we could employ. Faster information/coordination with first responders would enable quicker recovery. Significant improvement can be achieved.			Significant improvement can be achieved; reservoirs are remote but threaten life on three islands. Much of our assistance to farmers are via phone and first class mail...great gains could be realized. Reservoir level updates would improve and enable greater planning benefit. Reviews would go much faster; approvals re: upgrades and boundary determinations would all be faster. Esri Story Mapping with current data would be a method we could employ. Faster information/coordination with first responders would enable quicker recovery.								
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate								
Education or outreach description	Volunteers and Interns would benefit from improved systemic data modeling			Volunteers and Interns would benefit from improved systemic data modeling								
Environmental	Major			Major								
Environmental description	Improved timeliness and accuracy would benefit the environment			Improved timeliness and accuracy would benefit the environment								
Public safety, including life and property	Major			Major								
Public safety, including life and property description	Improved timeliness and accuracy would benefit the Public safety, including life and property			Improved timeliness and accuracy would benefit the Public safety, including life and property								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic Assessment and Hazard Mitigation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Geologic mapping and analysis. Sinkhole and steephead mapping, monitoring, and analysis. Identification of geomorphologic units. Landslide hazard mapping and assessment. Karst mapping, including springs and caves. Aquifer recharge.
MCA Title	Geologic Assessment and Hazard Mitigation
MCA ID	60117
Organization Type	State or U.S. Territorial government
Organization Name	State of Hawai'i
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

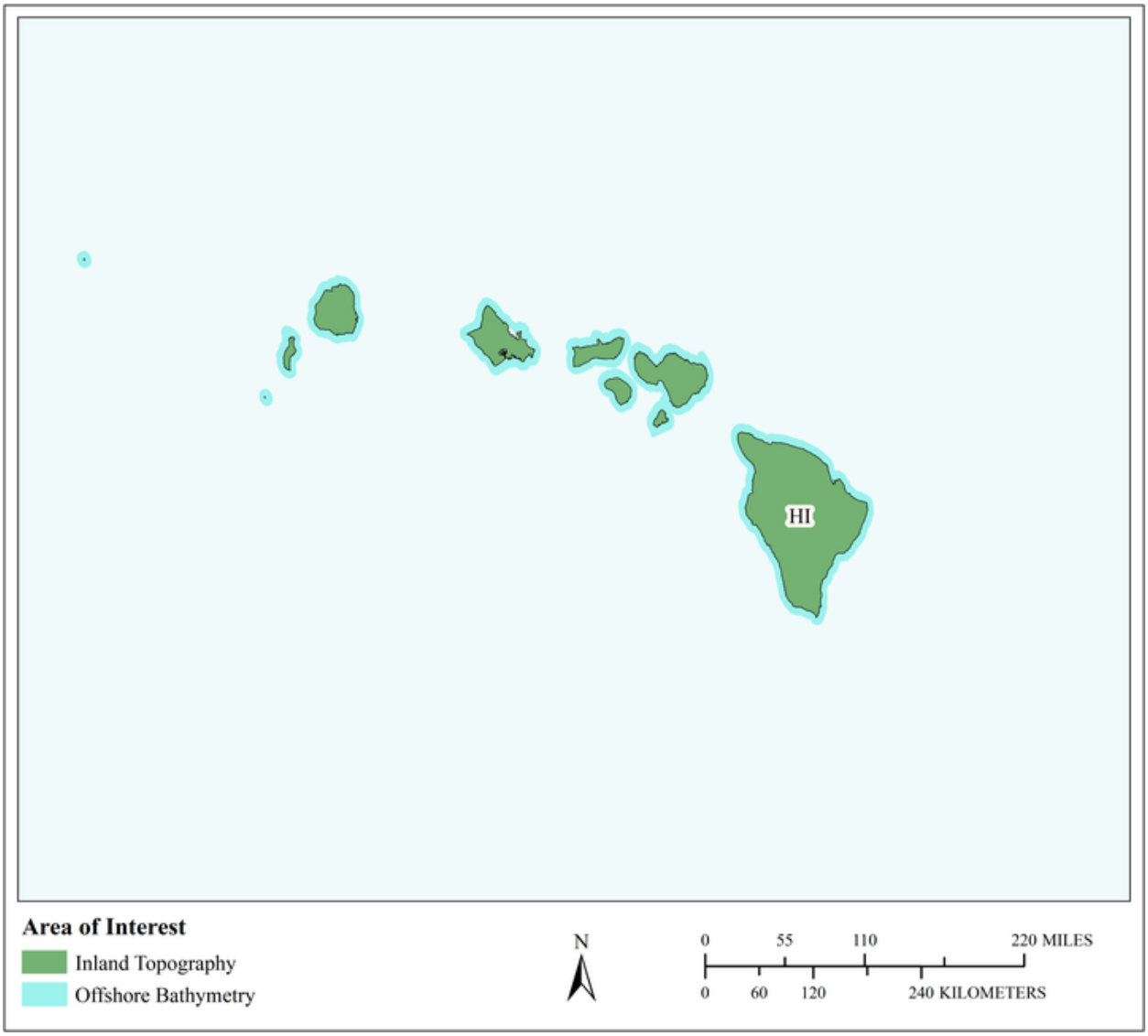
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,358,277									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$23,844									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic Resource Mining and Extraction



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			Required
Geographic Area Requirements	One or more states, territories, or counties			Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Onshore or offshore mineral extraction. Monitoring sand as a local resource. Seabed resources. Open mine volume computations. Stockpile analysis. Environmental impact assessment and site restoration.
MCA Title	Geologic Resource Mining and Extraction
MCA ID	60118
Organization Type	State or U.S. Territorial government
Organization Name	State of Hawai'i
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 11 - Geologic Resource Mining and Extraction
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			Order 1b
Update Frequency	2-3 years			4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			Up to 5 meters
Acceptable Vertical Error	Up to 20 cm			Less than 1 meter
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have			Nice to have		
Entire AOI under same environmental conditions	Highly desirable			Nice to have		
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable			Highly desirable		
DEM for entire AOI needs to be seamless	Highly desirable			Highly desirable		
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			I don't know		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			Nice to have
DTM	Required			Nice to have
DEM	Required			Nice to have
Raw point cloud data	Nice to have			Highly desirable
Classified point cloud	Highly desirable			
Edited/cube XYZ				Not required
Full waveform	Not required			Not required
Bathymetric Attributed Grid (BAG)				Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				Nice to have
Tide Predictions				Nice to have
Tidal Constituent And Residual Interpolation (TCARI)				Nice to have
Intensity imagery/sidescan imagery	Nice to have			Nice to have
Ground control/ground truthing	Nice to have			Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				Highly desirable
Nautical and/or navigation charts				Highly desirable
Acoustic imagery of the seafloor				Highly desirable
Aerial and/or satellite imagery	Required			Not required
Underwater videography				Not required
Bottom texture				Highly desirable
Bottom type				Highly desirable
Submerged features				Highly desirable
Subbottom characteristics				Highly desirable
Geologic and seismic data	Nice to have			Not required
Water column properties - Physical				Not required
Water column properties - Chemical				Not required
Water column properties - Biological				Not required
Currents				Not required
Tide/wave heights				Not required
Sea ice conditions				Not required
Habitat distribution and classification				Nice to have
Boundaries				Nice to have
Routes				Nice to have
Offshore cadastral				Nice to have
Lease areas				Not required
Fixed obstructions				Not required
Floating observation/navigation systems				Not required
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Nice to have			Nice to have
Wetlands	Nice to have			Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				Nice to have
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			I don't know
Cost savings/cost reduction	Moderate			I don't know
Cost avoidance	Moderate			I don't know
Increased revenues	None			I don't know
Mission-driven performance improvements	Moderate			I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			I don't know

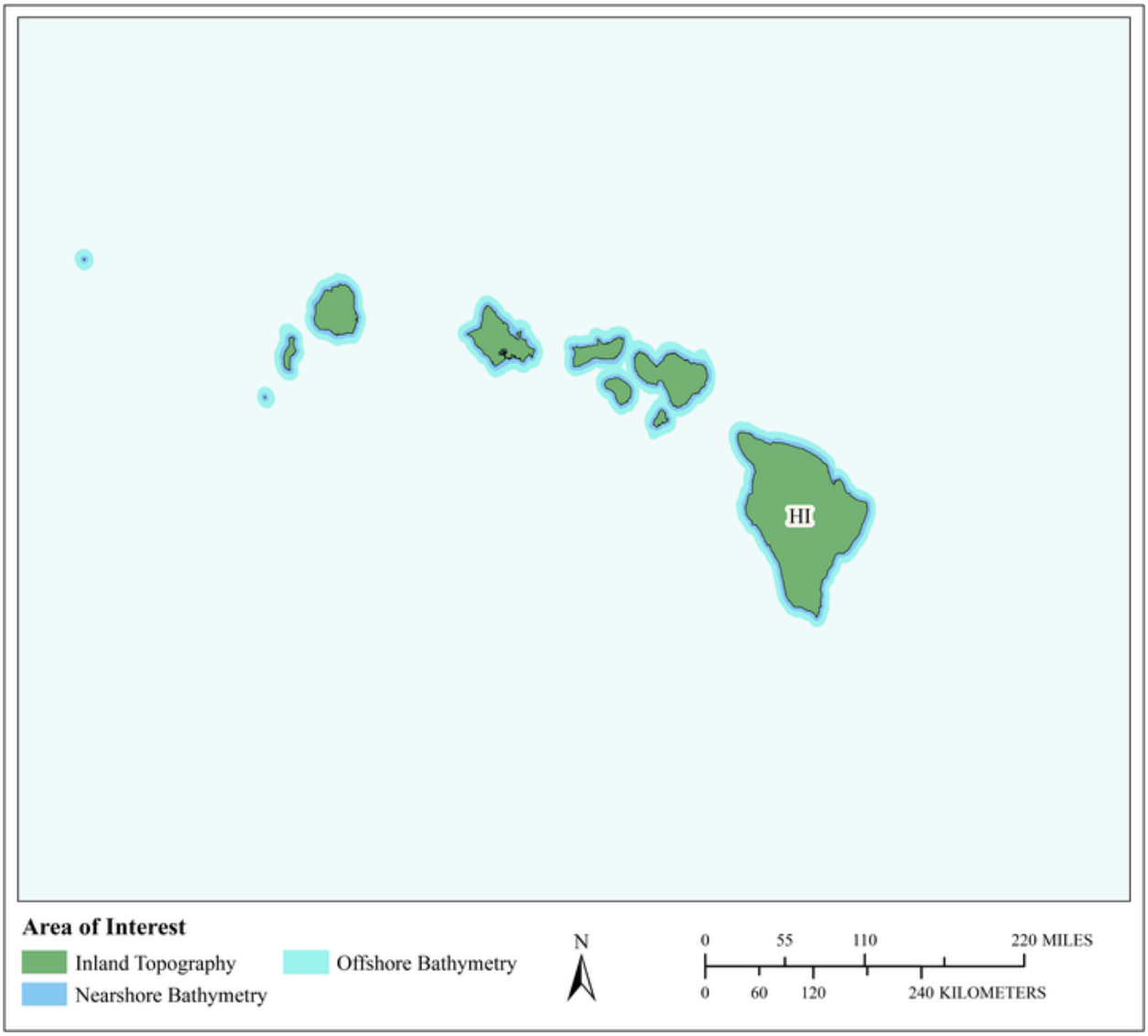
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate			I don't know
Improved customer experience	Moderate			I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			I don't know
Environmental	Major			I don't know
Public safety, including life and property	Moderate			I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide								I don't know	Unable to provide	
Cost savings/cost reduction	Minor	Unable to provide								I don't know	Unable to provide	
Cost avoidance	Minor	Unable to provide								I don't know	Unable to provide	
Increased revenues	None									I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide								I don't know	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,571									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide								I don't know	Unable to provide	
Improved response or timeliness	Major	Unable to provide								I don't know	Unable to provide	
Improved customer experience	Moderate	Unable to provide								I don't know	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,042									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor									I don't know		
Environmental	Major									I don't know		
Public safety, including life and property	Major									I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			Yes
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Renewable Energy Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	Required
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Alternate energy development – solar, tidal, wind, wave, and ocean current. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Low head power potential for hydropower.
MCA Title	Renewable Energy Resources
MCA ID	60119
Organization Type	State or U.S. Territorial government
Organization Name	State of Hawai'i
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2		I don't know	I don't know
Update Frequency	6-10 years		I don't know	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter		I don't know	I don't know
Acceptable Vertical Error	Up to 20 cm		I don't know	I don't know
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable		I don't know	I don't know		I don't know
Entire AOI under same environmental conditions	Highly desirable		I don't know	I don't know		I don't know
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable		I don't know	I don't know		I don't know
DEM for entire AOI needs to be seamless	Highly desirable		I don't know	I don't know		I don't know
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		I don't know	I don't know		I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required		I don't know	I don't know
DTM	Required		I don't know	I don't know
DEM	Required		I don't know	I don't know
Raw point cloud data	Highly desirable		I don't know	I don't know
Classified point cloud	Highly desirable		I don't know	
Edited/cube XYZ			I don't know	I don't know
Full waveform	Nice to have		I don't know	I don't know
Bathymetric Attributed Grid (BAG)			I don't know	I don't know
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			I don't know	I don't know
Tide Predictions			I don't know	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			I don't know	I don't know
Intensity imagery/sidescan imagery	Not required		I don't know	I don't know
Ground control/ground truthing	Highly desirable		I don't know	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			I don't know	I don't know
Nautical and/or navigation charts			I don't know	I don't know
Acoustic imagery of the seafloor			I don't know	I don't know
Aerial and/or satellite imagery	Highly desirable		I don't know	I don't know
Underwater videography			I don't know	I don't know
Bottom texture			I don't know	I don't know
Bottom type			I don't know	I don't know
Submerged features			I don't know	I don't know
Subbottom characteristics			I don't know	I don't know
Geologic and seismic data	Not required		I don't know	I don't know
Water column properties - Physical			I don't know	I don't know
Water column properties - Chemical			I don't know	I don't know
Water column properties - Biological			I don't know	I don't know
Currents			I don't know	I don't know
Tide/wave heights			I don't know	I don't know
Sea ice conditions			I don't know	I don't know
Habitat distribution and classification			I don't know	I don't know
Boundaries			I don't know	I don't know
Routes			I don't know	I don't know
Offshore cadastral			I don't know	I don't know
Lease areas			I don't know	I don't know
Fixed obstructions			I don't know	I don't know
Floating observation/navigation systems			I don't know	I don't know
Shorelines – current, historic, change rates	Nice to have		I don't know	
Land use/land cover	Highly desirable		I don't know	I don't know
Wetlands	Nice to have		I don't know	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			I don't know	I don't know
Inland surface water features	Nice to have		I don't know	
Bridges/culverts	Nice to have			
Landmark features	Nice to have		I don't know	
Cultural resources	Not required		I don't know	
Coastal and riverine structures	Nice to have		I don't know	
Overhead structures			I don't know	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate		I don't know	I don't know
Cost savings/cost reduction	Moderate		I don't know	I don't know
Cost avoidance	Moderate		I don't know	I don't know
Increased revenues	None		I don't know	I don't know
Mission-driven performance improvements	Minor		I don't know	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor		I don't know	I don't know

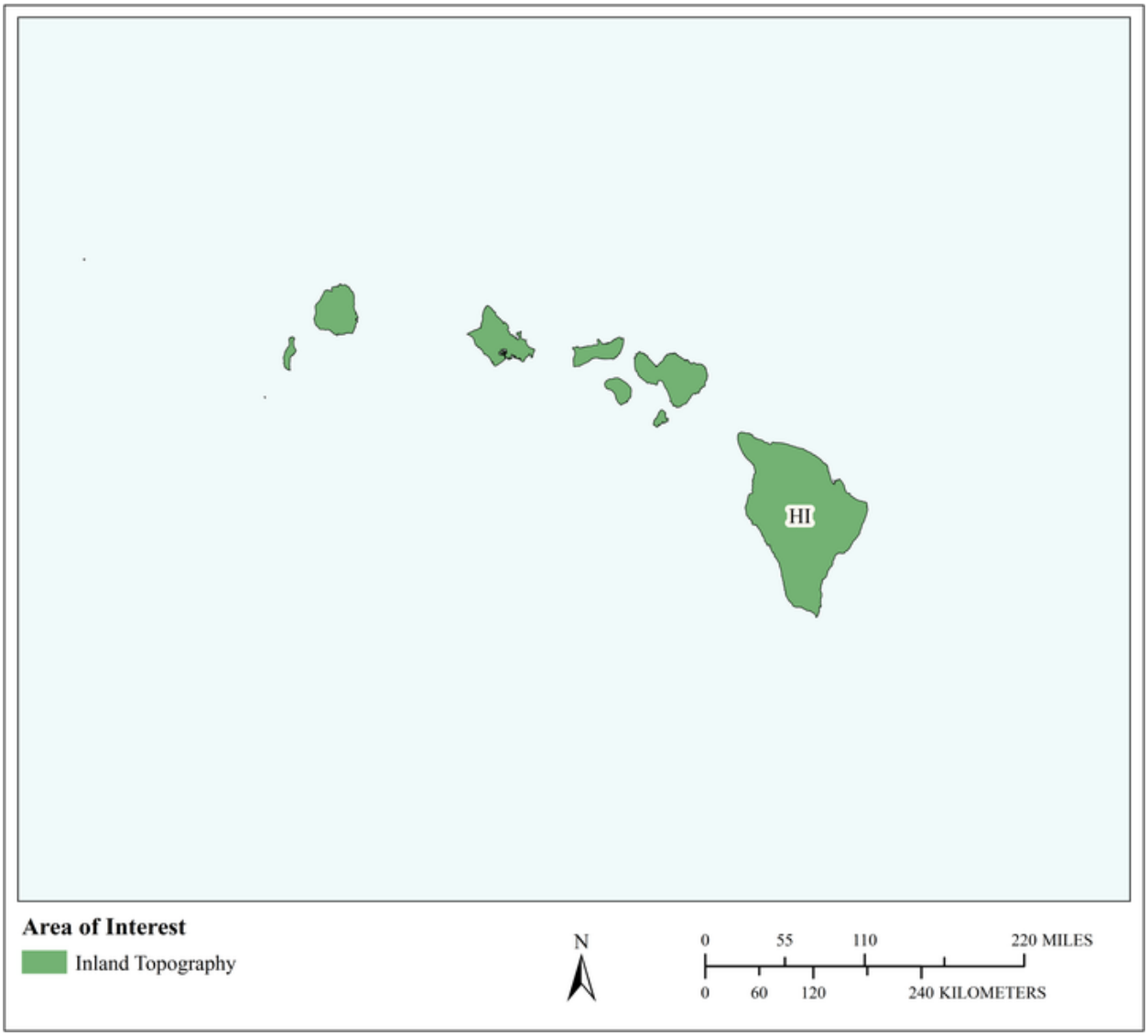
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor		I don't know	I don't know
Improved customer experience	Minor		I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor		I don't know	I don't know
Environmental	Minor		I don't know	I don't know
Public safety, including life and property	Minor		I don't know	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues	Moderate	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Minor	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor						I don't know			I don't know		
Environmental	Minor						I don't know			I don't know		
Public safety, including life and property	None						I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Cultural Resources Preservation and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Discovery and analysis of underwater archaeological and historical cultural sites. Site protection and preservation planning. Discovery and analysis of Native American and other historical cultural sites and subsistence activities.
MCA Title	Cultural Resources Preservation and Management
MCA ID	60120
Organization Type	State or U.S. Territorial government
Organization Name	State of Hawai'i
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Nice to have					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have					
DEM for entire AOI needs to be seamless	Nice to have					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Moderate			
Cost avoidance	Minor			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			

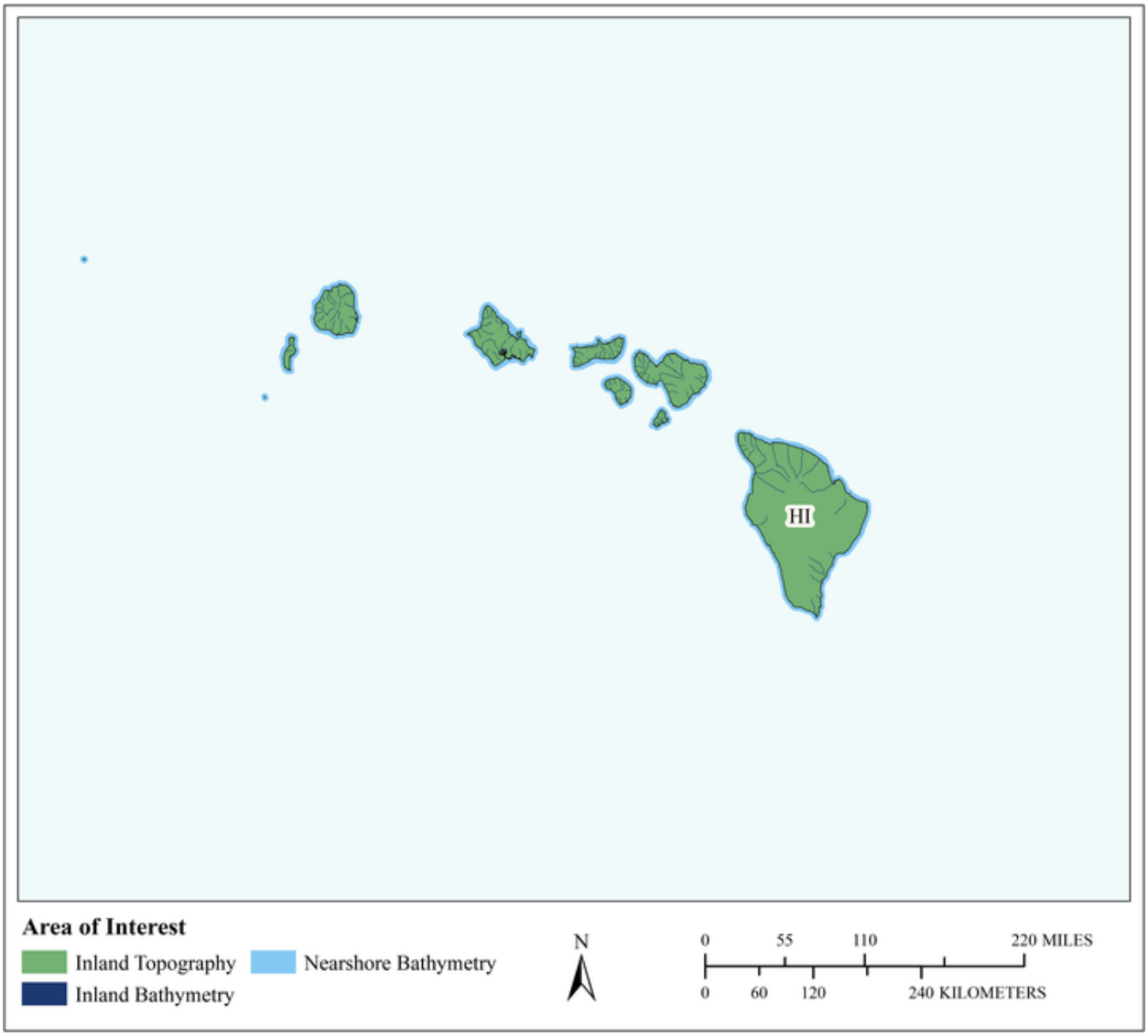
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Cost savings/cost reduction	Minor	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Moderate	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,179									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,031									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	Minor											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Flood Risk Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Flood risk modeling and mapping of riverine and coastal areas. Dam/dike/levee safety analysis. Emergency management. Flood forecasts.
MCA Title	Flood Risk Management
MCA ID	60121
Organization Type	State or U.S. Territorial government
Organization Name	State of Hawai'i
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL2B	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Highly desirable	
DTM	Required	Required	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	
Classified point cloud	Required	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Not required	
Geologic and seismic data	Nice to have	Nice to have	Not required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Highly desirable	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Not required	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Minor	
Cost savings/cost reduction	Major	Minor	Minor	
Cost avoidance	Major	Moderate	Minor	
Increased revenues	Minor	Minor	None	
Mission-driven performance improvements	Major	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Minor	

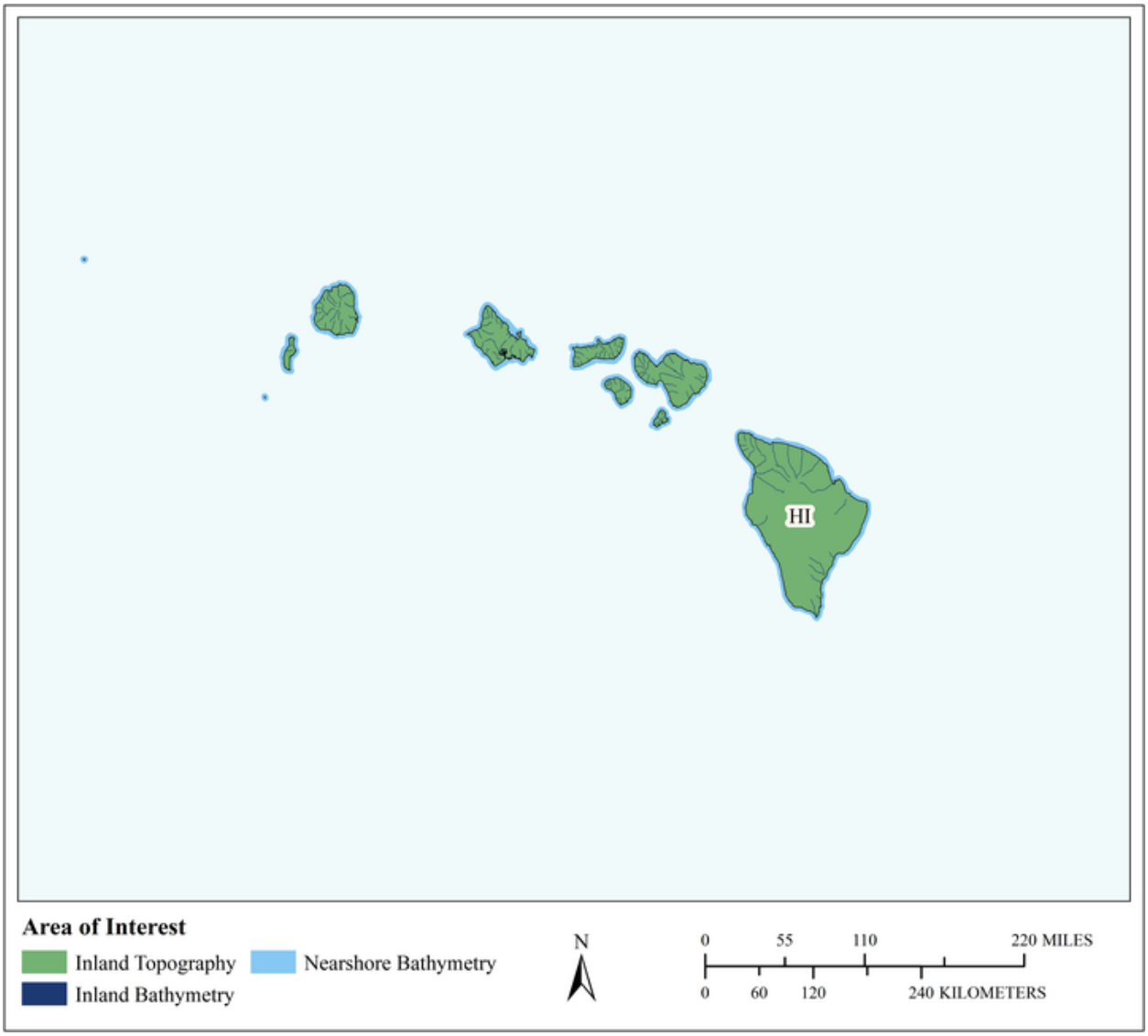
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	Minor	
Improved customer experience	Major	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor	Minor	
Environmental	Major	Moderate	Moderate	
Public safety, including life and property	Major	Moderate	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	Minor	Unable to provide		None			Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$903,454		Annual dollars saved/ realized	$62,760		Annual dollars saved/ realized	$82,424			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$158,076		Annual dollars saved/ realized	$70,463		Annual dollars saved/ realized	$61,088			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate			Major					
Environmental	Moderate			Moderate			Moderate					
Public safety, including life and property	Major			Major			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Sea Level Rise and Subsidence



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Modeling and mapping the effects of sea level rise or subsidence. Population and economic vulnerability assessments. Coastal inundation and infrastructure assessment.
MCA Title	Sea Level Rise and Subsidence
MCA ID	60122
Organization Type	State or U.S. Territorial government
Organization Name	State of Hawai'i
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 16 - Sea Level Rise and Subsidence
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL1B	QL2B	
Update Frequency	4-5 years	4-5 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Required	Required		Highly desirable	Required
Entire AOI under same environmental conditions	Highly desirable	Required	Required		Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Required		Highly desirable	Required
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have	Highly desirable	
DTM	Required	Required	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Highly desirable	Nice to have	
Classified point cloud	Required	Nice to have	Highly desirable	
Edited/cube XYZ		Not required	Not required	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Not required	Not required	
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Highly desirable	
Ground control/ground truthing	Required	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Required	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Required	Required	Highly desirable	
Wetlands	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Required	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes	Yes	Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Major	
Cost savings/cost reduction	Major	Major	Major	
Cost avoidance	Major	Major	Major	
Increased revenues	None	Minor	Minor	
Mission-driven performance improvements	Major	Major	Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	

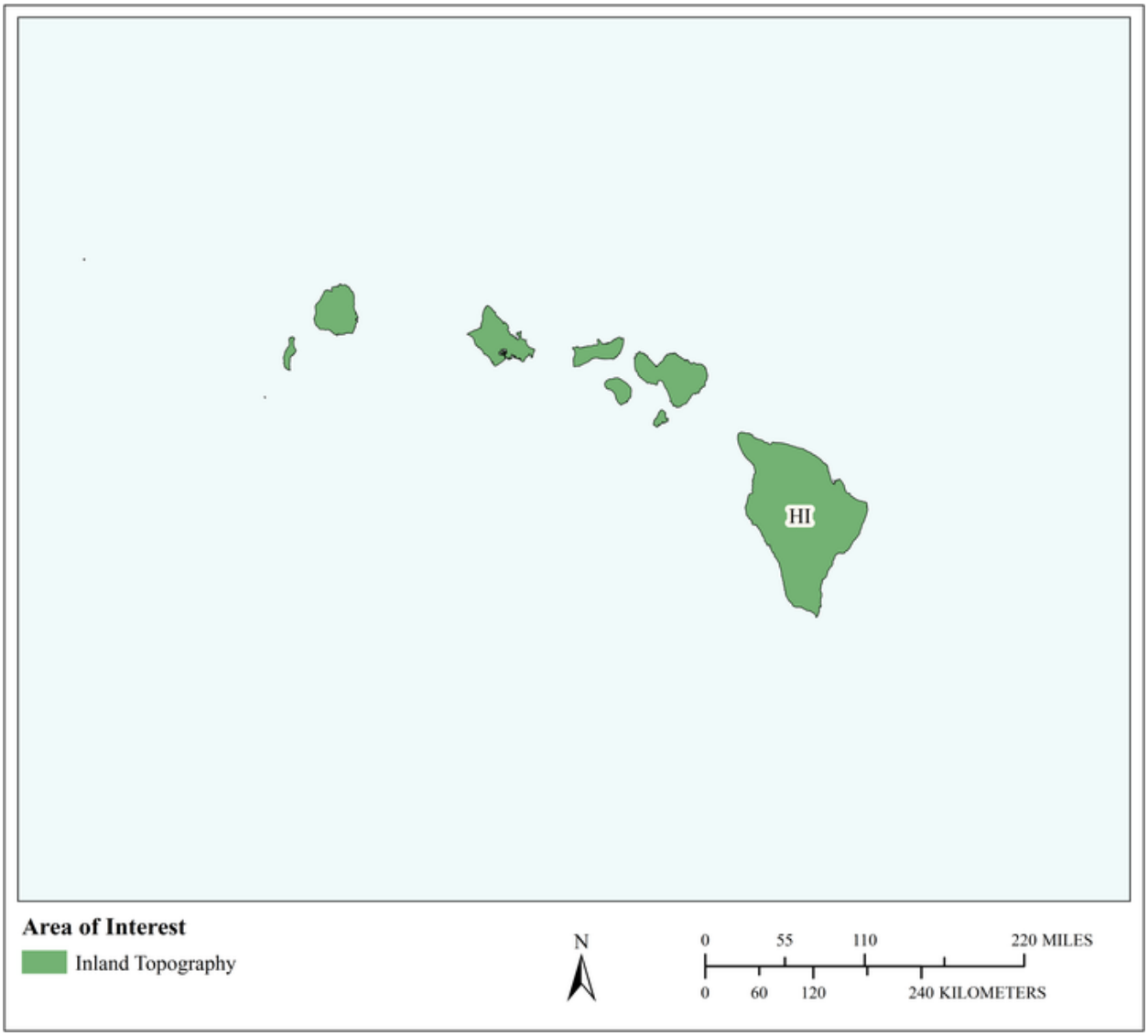
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Minor	Major	
Improved customer experience	Moderate	Moderate	Major	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Major	
Environmental	Moderate	Moderate	Major	
Public safety, including life and property	Major	Moderate	Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Increased revenues	Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$338,764									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Major					
Environmental	Moderate			Major			Major					
Public safety, including life and property	Moderate			Major			Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Wildfire Management, Planning, and Response



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of forest fuel and fire susceptibility. Fire behavior modeling to support wildfire suppression activities. Wildland/urban interface building identification. Post fire analysis to determine landslide prone areas.
MCA Title	Wildfire Management, Planning, and Response
MCA ID	60123
Organization Type	State or U.S. Territorial government
Organization Name	State of Hawai'i
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 17 - Wildfire Management, Planning, and Response
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

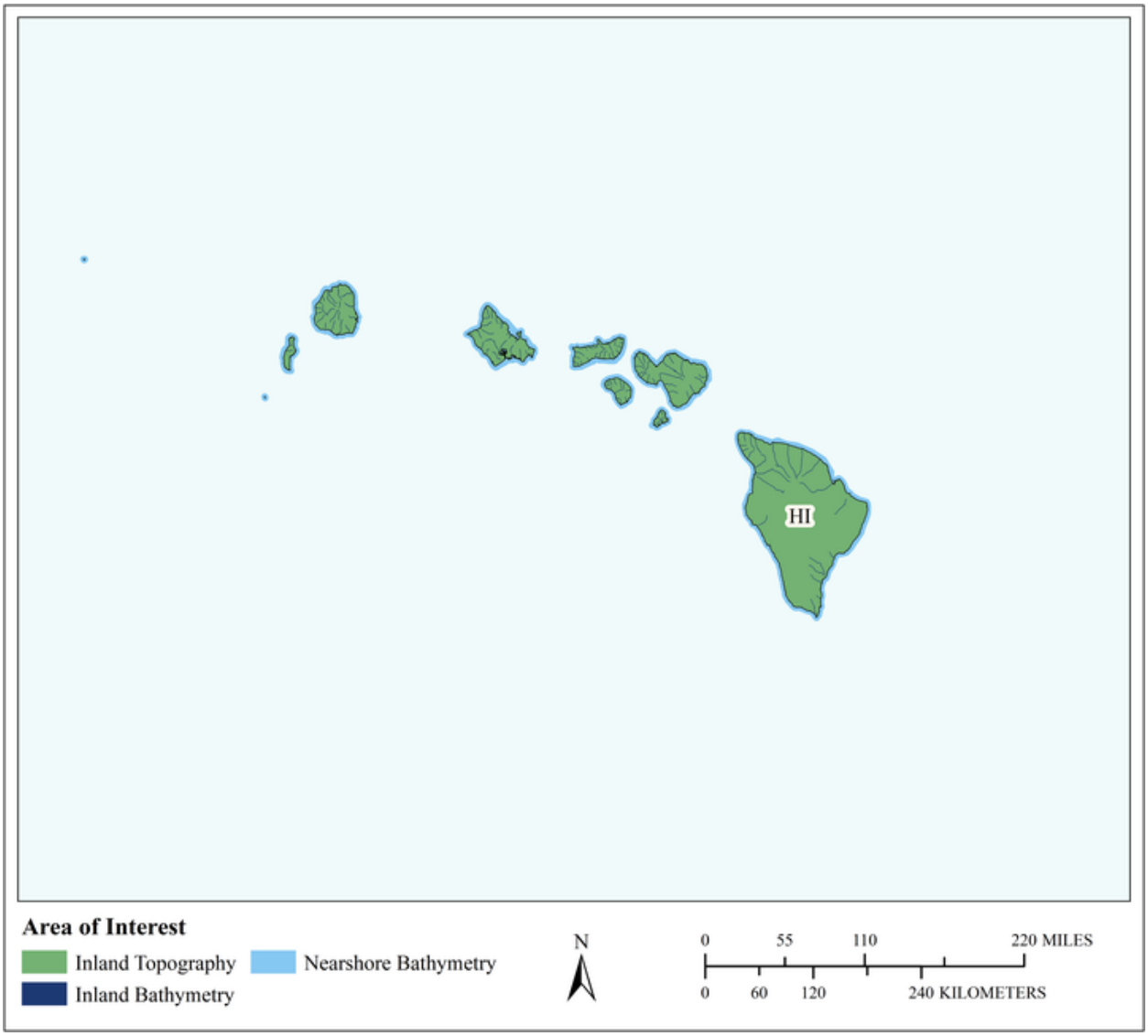
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$34,572									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Homeland Security, Law Enforcement, Disaster Response, and Emergency Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Infrastructure and border protection. Coastal search and rescue. Population dynamics. Emergency fuel supply and movement. Line of sight analysis in urban areas. Disaster response. Flood risk analysis resulting from acts of terrorism.
MCA Title	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
MCA ID	60124
Organization Type	State or U.S. Territorial government
Organization Name	State of Hawai'i
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B	QL1B	
Update Frequency	4-5 years	4-5 years	6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable		Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Required	
DTM	Required	Highly desirable	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Highly desirable	Highly desirable	
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Highly desirable	Highly desirable	
Full waveform	Nice to have	Nice to have	Highly desirable	
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Highly desirable	
Ground control/ground truthing	Required	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Required	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Highly desirable	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Nice to have	
Boundaries			Highly desirable	
Routes			Highly desirable	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	
Cost savings/cost reduction	Major	Major	Major	
Cost avoidance	Major	Moderate	Moderate	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	Moderate	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Minor	

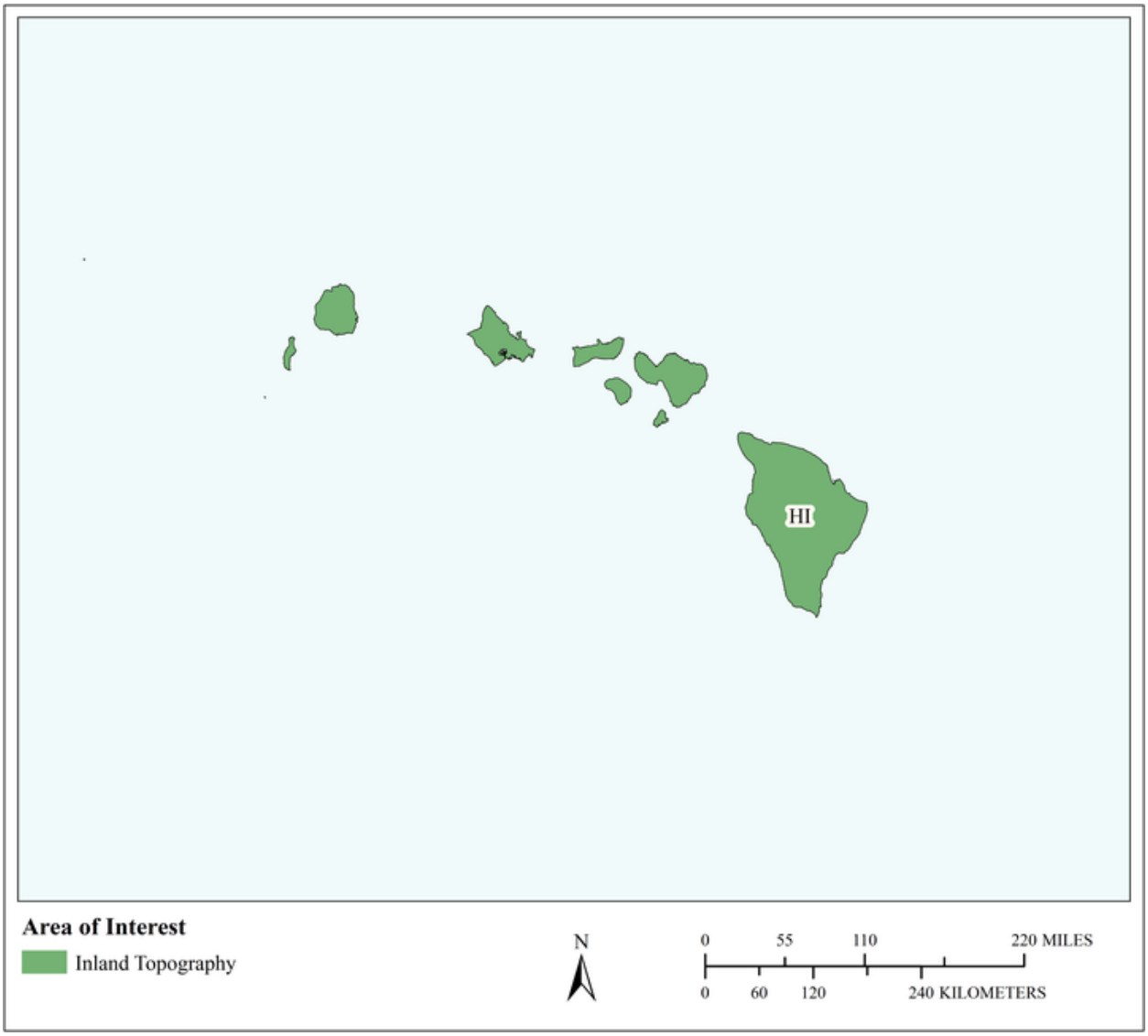
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major	Minor	
Improved customer experience	Major	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	Minor	
Environmental	Minor	Moderate	Minor	
Public safety, including life and property	Major	Major	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$189,821		Annual dollars saved/ realized	$53,458		Annual dollars saved/ realized	$4,010			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$3,355		Annual dollars saved/ realized	$3,410		Annual dollars saved/ realized	$115			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate					
Environmental	Moderate			Moderate			Moderate					
Public safety, including life and property	Major			Major			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Land Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Road and railroad route selection and maintenance. Slope analysis for autonomous cars. GPS navigation visualization.
MCA Title	Land Navigation and Safety
MCA ID	60125
Organization Type	State or U.S. Territorial government
Organization Name	State of Hawai'i
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 19 - Land Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

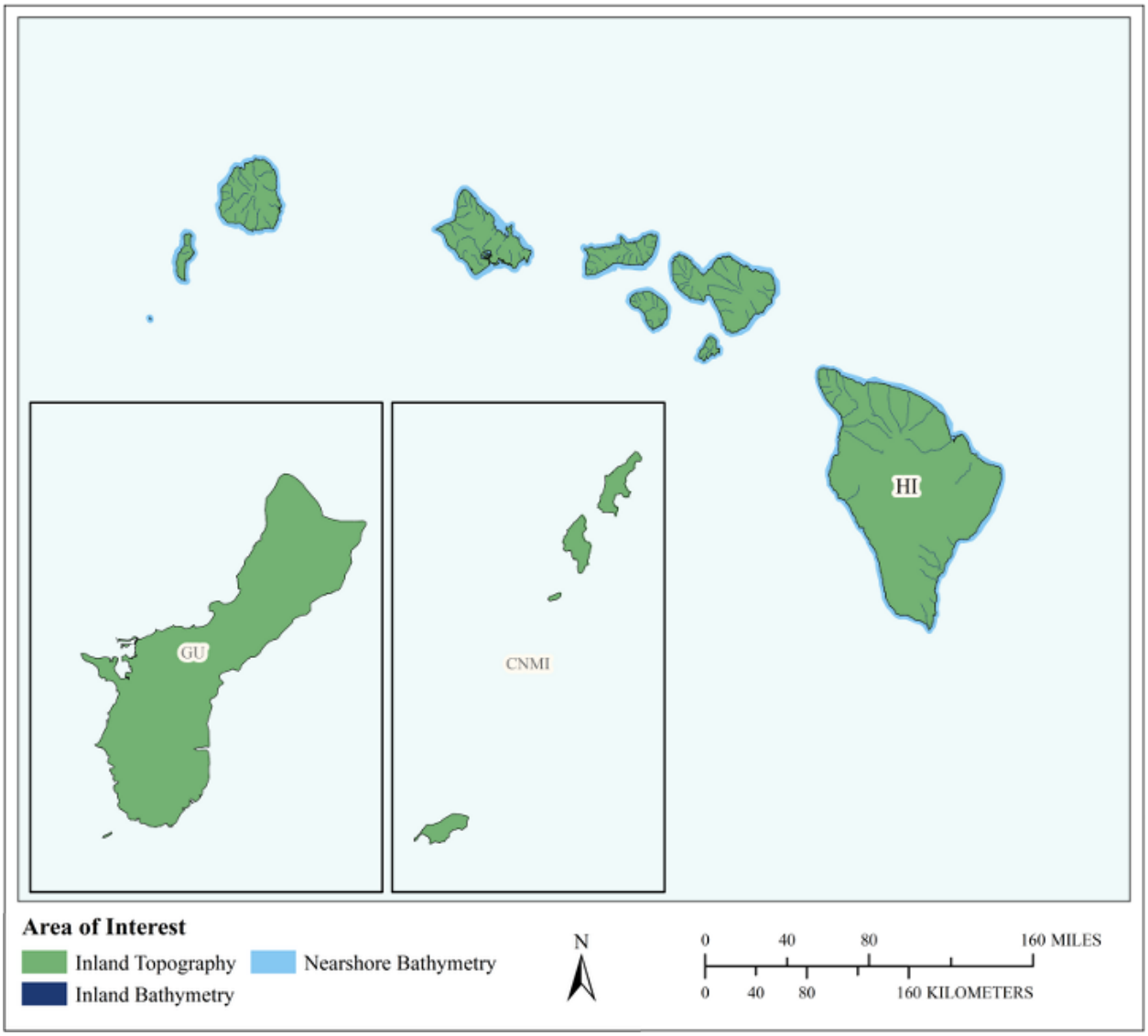
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Moderate			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Moderate	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$83,356									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$6,731									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Flight Planning for Remote Sensing Aerial Surveys



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Our mission critical activity is flight planning for aerial surveys. Accurate, high resolution elevation information is required to ensure safety during flight operations as well as maintain optimal quality for our data products. Our data collection flights are conducted at low altitudes and often require following the terrain to maintain a constant distance from the ground.
MCA Title	Flight Planning for Remote Sensing Aerial Surveys
MCA ID	21983
Organization Type	Private or Commercial
Organization Name	Resource Mapping Hawaii
Sub-Agency or Division	
Organization Mission	RMH is a locally owned and operated company which emerged from an overwhelming demand by the conservation community to develop techniques for detecting, mapping and monitoring invasive plant species over large landscapes. Since 2008, we have expanded our scope to encompass a much wider range of applications. Our strengths and abilities include: surveying very large areas where getting "boots on the ground" is difficult, mapping and monitoring using very precise measurements and providing snapshots in time (baselines) for retrospective looks at the environment. Through partnerships with other aviation and geospatial companies, we have extended our offerings to provide oblique and 3D reconstruction, unmanned aerial systems (UAS) services, lidar and other custom geospatial solutions.
Program Name	Our business is focused on the acquisition, processing, and analysis of geospatial data: ultra-high resolution ortho-imagery (up to 1cm GSD), multispectral remote sensing, digital surface and terrain models, 3D reconstruction through photogrammetry, and lidar.
Total Annual Program Budget	
Primary Business Use	BU 21 - Aviation Navigation and Safety
Secondary Business Use	BU 04 - Forest Resources Management
Tertiary Business Use	BU 23 - Urban and Regional Planning

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	The smallest 3D features we have worked with are powerlines, used by our client to assess the risk of bird strikes.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL3	I don't know	I don't know	
Update Frequency	Annually	Annually	Annually	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	
Acceptable Vertical Error	I don't know	I don't know	I don't know	
How far onshore needed			>1 kilometer inland	
How far down the beach profile needed	Not applicable		None	
Tide correction requirement			No requirement for tide correction	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Highly desirable	
DTM	Required	Required	Highly desirable	
DEM	Required	Required	Highly desirable	
Raw point cloud data	Highly desirable	Nice to have	Nice to have	
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Nice to have	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Nice to have	
Submerged features			Not required	
Subbottom characteristics			Not required	
Geologic and seismic data	Not required	Not required	Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Highly desirable	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Not required	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Required	Required	Required	
Wetlands	Required	Required	Required	
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Highly desirable	Nice to have		
Landmark features	Highly desirable	Not required	Not required	
Cultural resources	Highly desirable	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	For flight planning, we generally rely on USGS NED 10m DEMs. We also use the 2013 NOAA Oahu Topographic Lidar.	None	USACE Bathymetric Lidar	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Hawaii Statewide GIS Program (http://geoportal.hawaii.gov/)			

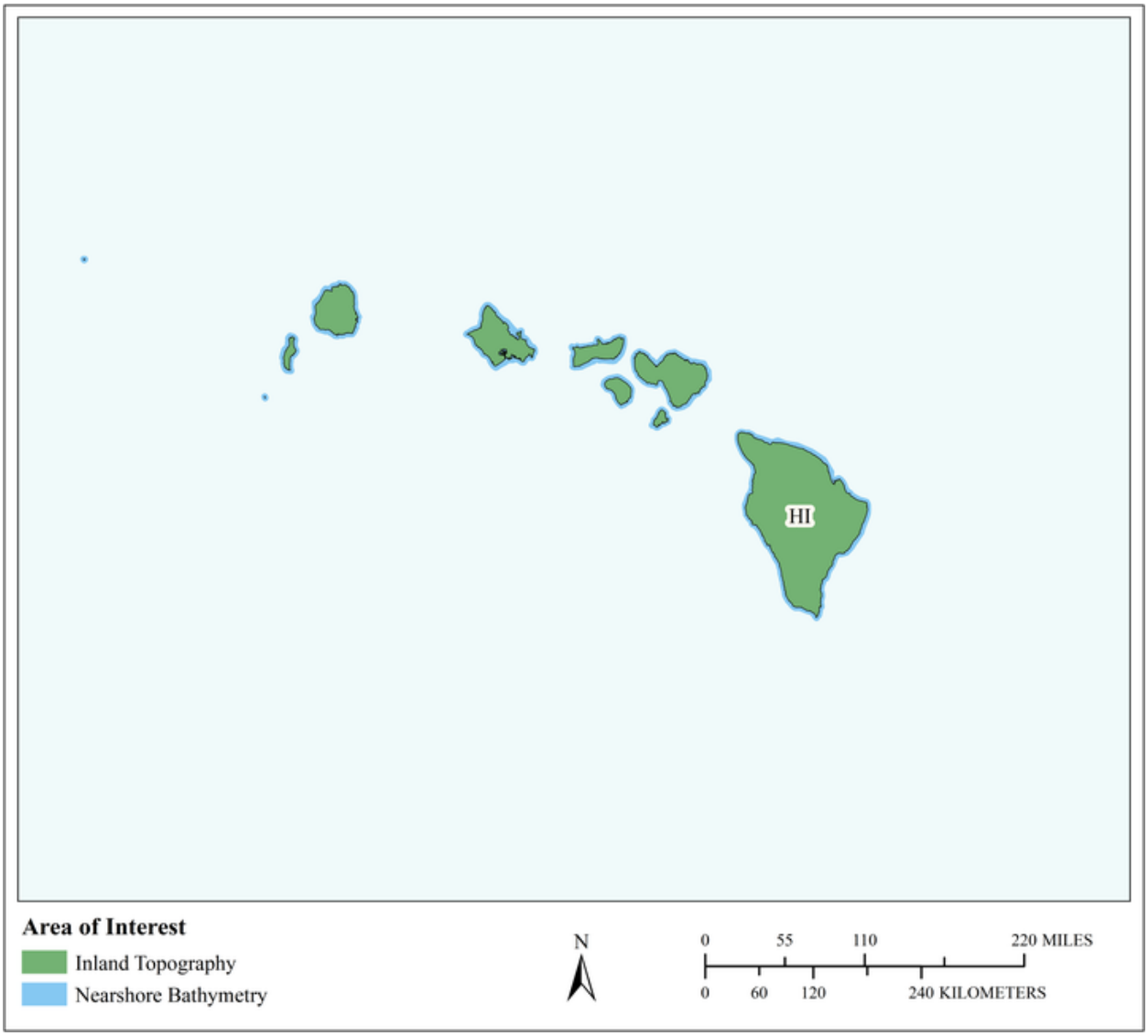
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Moderate	
Cost savings/cost reduction	Major	Minor	Moderate	
Cost avoidance	Major	Minor	Moderate	
Increased revenues	Major	None	None	
Mission-driven performance improvements	Major	Moderate	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Moderate	
Improved response or timeliness	Major	Minor	Minor	
Improved customer experience	Major	Minor	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	None	None	
Environmental	Major	None	None	
Public safety, including life and property	Major	None	None	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Increased revenues	Minor	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Other operational benefits				Minor	Unable to provide							
Other operational benefits description												
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			I don't know			I don't know					
Environmental	None			I don't know			I don't know					
Public safety, including life and property	None			I don't know			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes	Yes	Yes	
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Aviation Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of in-flight hazards and path obstructions. Aeronautical charting. Runway construction and repair.
MCA Title	Aviation Navigation and Safety
MCA ID	60126
Organization Type	State or U.S. Territorial government
Organization Name	State of Hawai'i
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 21 - Aviation Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD		I don't know	
Update Frequency	Annually		Annually	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter		I don't know	
Acceptable Vertical Error	Up to 20 cm		I don't know	
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable		Nice to have			Nice to have
Entire AOI under same environmental conditions	Required		Highly desirable			Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Highly desirable			Nice to have
DEM for entire AOI needs to be seamless	Required		Highly desirable			Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know		I don't know			I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required		Highly desirable	
DTM	Required		Highly desirable	
DEM	Required		Highly desirable	
Raw point cloud data	Highly desirable		Nice to have	
Classified point cloud	Highly desirable		Highly desirable	
Edited/cube XYZ			Nice to have	
Full waveform	Highly desirable		Nice to have	
Bathymetric Attributed Grid (BAG)			Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable		Nice to have	
Ground control/ground truthing	Required		Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required		Required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Nice to have	
Submerged features			Not required	
Subbottom characteristics			Not required	
Geologic and seismic data	Nice to have		Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Highly desirable	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Not required	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Highly desirable		Required	
Land use/land cover	Required		Required	
Wetlands	Required		Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required		Required	
Bridges/culverts	Required			
Landmark features	Required		Not required	
Cultural resources	Required		Nice to have	
Coastal and riverine structures	Highly desirable		Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes		Yes	
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Moderate	
Cost savings/cost reduction	Major		Moderate	
Cost avoidance	Major		Moderate	
Increased revenues	Major		None	
Mission-driven performance improvements	Major		Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		Moderate	

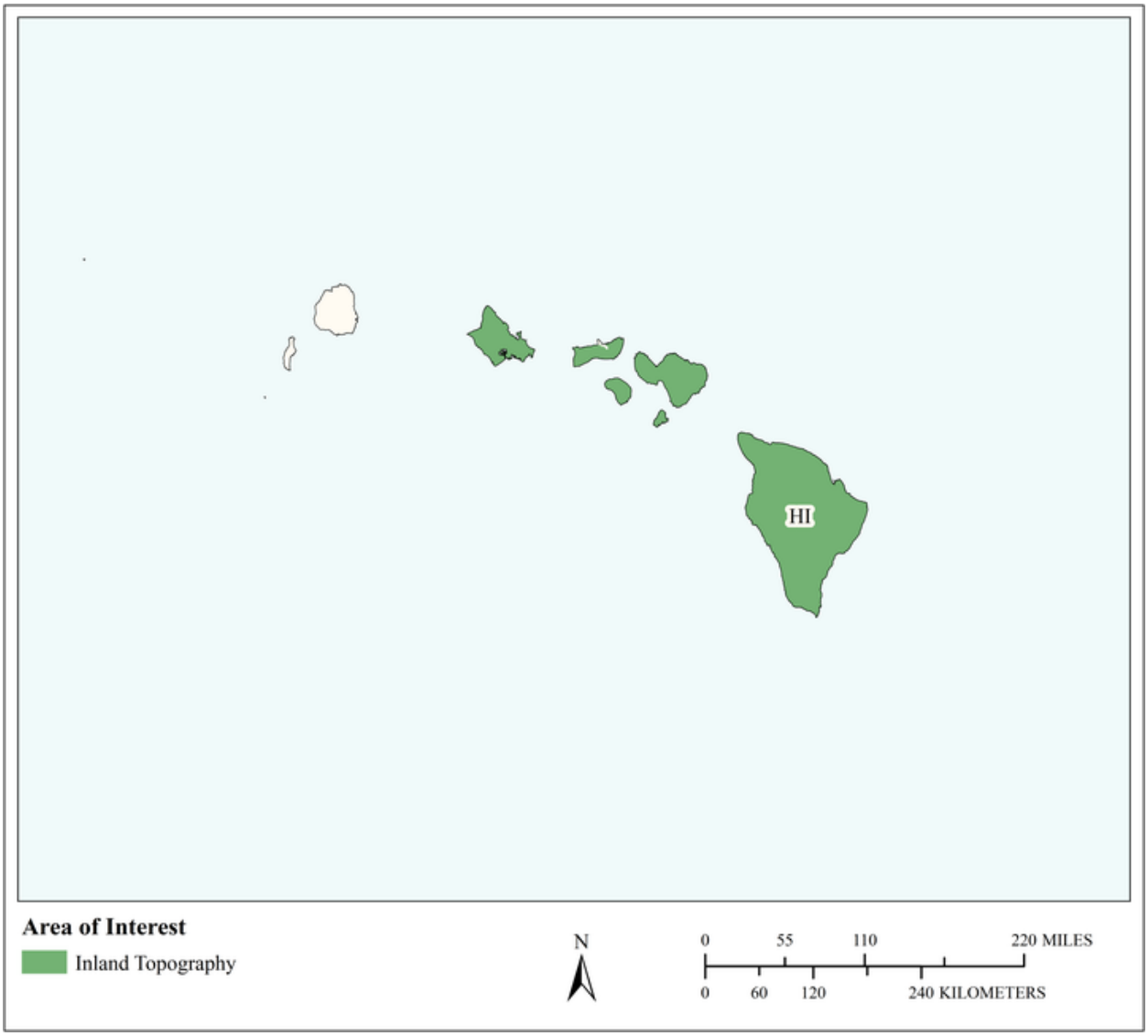
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major		Minor	
Improved customer experience	Major		Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None		None	
Environmental	Major		None	
Public safety, including life and property	Major		None	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					I don't know	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide					I don't know	Unable to provide				
Cost avoidance	Major	Unable to provide					I don't know	Unable to provide				
Increased revenues	Major	Unable to provide					I don't know	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide					Moderate	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$21,752									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					I don't know	Unable to provide				
Improved response or timeliness	Major	Unable to provide					I don't know	Unable to provide				
Improved customer experience	Major	Unable to provide					I don't know	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$27,091									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor						I don't know					
Environmental	Moderate						I don't know					
Public safety, including life and property	Moderate						I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes		Yes	
Hillshades	Yes		Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes		Yes	
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes		Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Energy Development and Delivery



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements	Hawaii, Honolulu, and Maui Counties, HI			

MCA Description	Response
Mission Critical Activity	Energy development and delivery – electric, wind, water, hydroelectric, geothermal. Vegetation management. Slope analysis, zoning, all factor into infrastructure management. Ensure no adverse impacts to at-risk species.
MCA Title	Energy Development and Delivery
MCA ID	21730
Organization Type	Private or Commercial
Organization Name	Hawaiian Electric
Sub-Agency or Division	
Organization Mission	Provide electricity to Hawaii
Program Name	Energy Delivery
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Improvements such as roadline and locations of utility poles, or walls and fences

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm			
Acceptable Vertical Error	Less than 5 cm			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed				
How far down the beach profile needed	To MHHW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Nice to have					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Highly desirable			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We currently have some lidar data of our facilities that is project specific. It is SPC Zone 3 ,4 or 5 and NAD 83. We do not have it normalized to a digital benchmark. There is intermittent ground control and inadequate data collection in many areas.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other	Yes			
Other description	Survey quality data, Lidar data privately contracted			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Moderate			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know			
Environmental	Major			
Public safety, including life and property	Major			

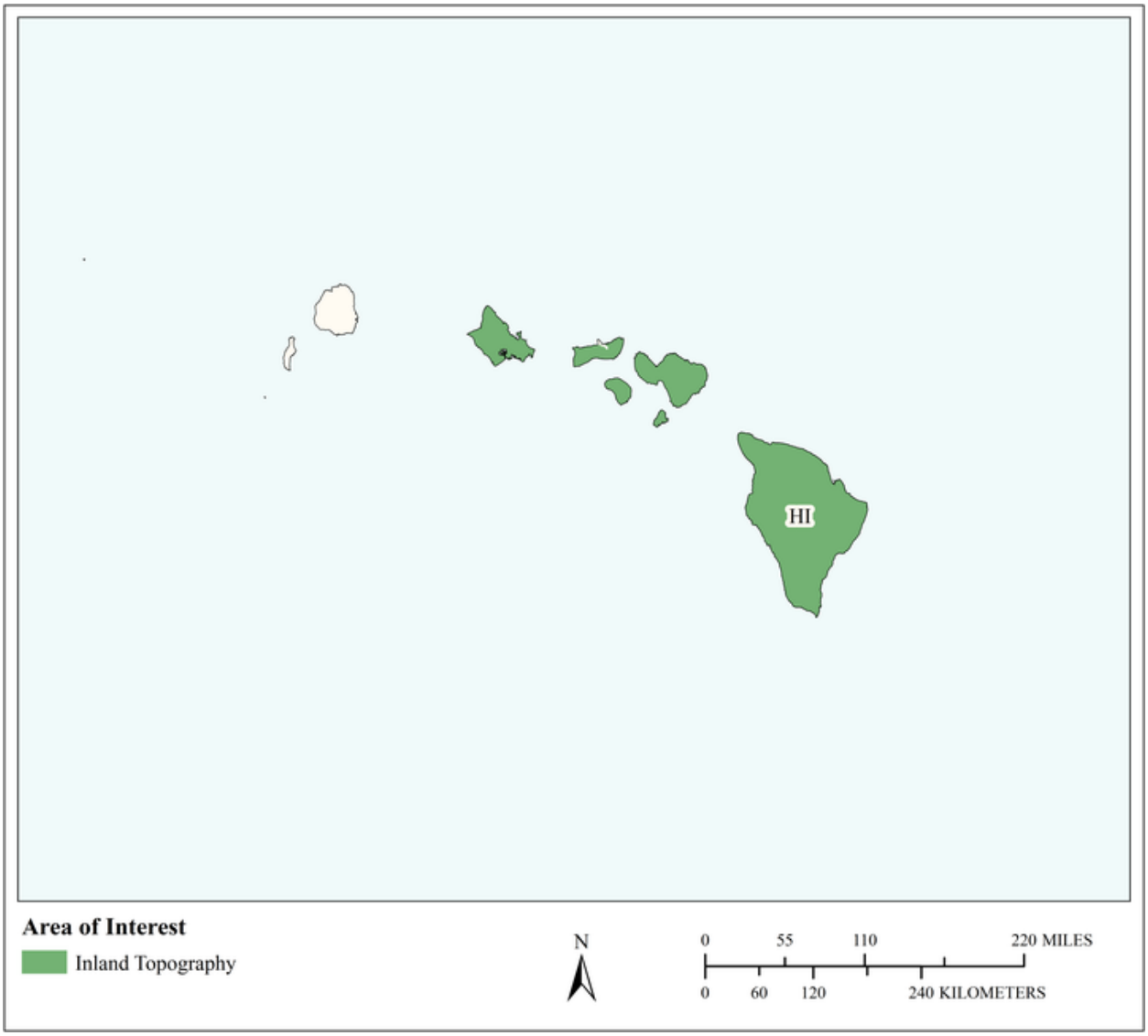
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Other operational benefits	Major	Annual dollars saved/realized	$1,000,000									
Other operational benefits description												
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Annual dollars saved/realized	$4,100,000									
Improved response or timeliness description	Available data also frees up funds for planning and analysis on a proactive basis. Can provide navigation to problem areas, safety and recovery advantages. Quicker review and response with data integration. Huge advantage to having existing state facility locations when responding to and preparing for IMT events. Huge advantage to having existing state facility locations when responding to and preparing for Incident Management Team (IMT) events.											
Improved customer experience	Major	Annual dollars saved/realized	$100,000									
Improved customer experience description	Currently our IT support for data loads is minimal, so any increase in accessibility is intrinsically linked to productivity.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Education or outreach description	Public education as to different company projects can be at a deeper level with more data available											
Environmental	Major											
Environmental description	Data which allows assessment of sensitive areas has positive impact on our functionality for planning and response											
Public safety, including life and property	Major											
Public safety, including life and property description	IMT response and recovery is greatly enhanced by at hand data and mapping capabilities											
Other	Enhanced work force engagement											
Other benefits	Moderate											

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other description	Focus on enhanced work force engagement with the next generation of employees that will be trained to use the data to plan and analyze			

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Slope Analysis and Rockfall Mitigation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements	Hawaii, Honolulu, and Maui Counties, HI			

MCA Description	Response
Mission Critical Activity	Slope analysis and rockfall mitigation. Used in preplanning for construction, which requires high accuracy. Urban areas and conservation areas may be right next to each other without buffer areas so lidar will help in planning.
MCA Title	Slope Analysis and Rockfall Mitigation
MCA ID	1307
Organization Type	Academic or Not-for-Profit
Organization Name	Kamehameha Schools
Sub-Agency or Division	
Organization Mission	Kamehameha Schools' mission is to fulfill Pauahi's desire to create educational opportunities in perpetuity to improve the capability and well-being of people of Hawaiian ancestry.
Program Name	Mālama ʻĀina and Wahi Kūpuna Natural and Cultural Resources Programs
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 14 - Cultural Resources Preservation and Management
Tertiary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Rocks to determine landslide risk and identification of cultural features and artifacts

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 40 cm			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed	To MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Required			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Classified point clouds, DSM, DTM			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes			
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	State of Hawaii and counties			
Other	Yes			
Other description	Internal UAV collection and hire external vendors (fixed wing and UAV)			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost avoidance	Major			
Increased revenues	I don't know			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	I don't know			
Public safety, including life and property	Major			

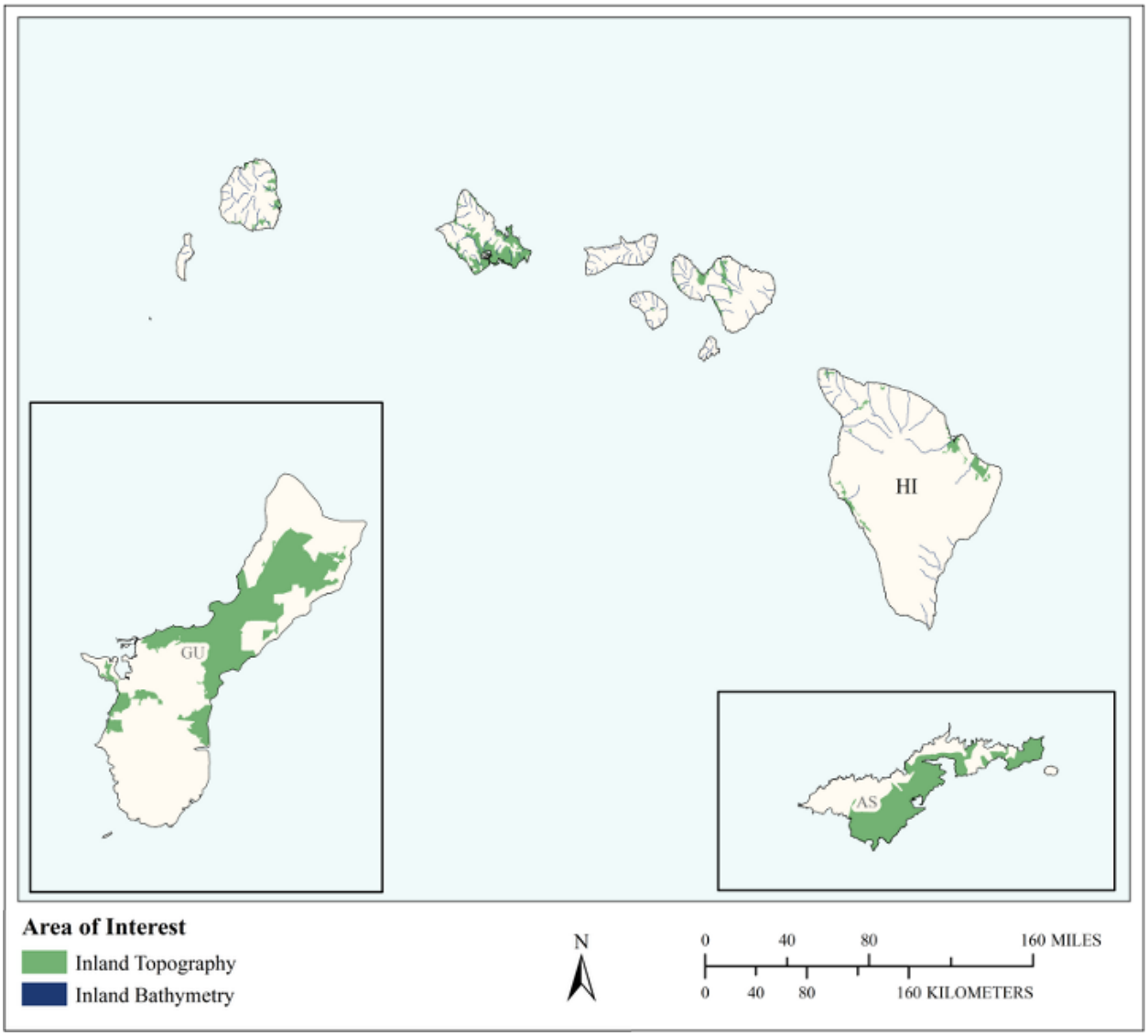
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Time savings description	Improved data would increase our ability to protect critical habitat areas and identify hazards. We have data standards so datasets match internally but not so with other publically available datasets which vary. I trust completely in your QA/QC methods. Boundary determinations is a big part of our requirements. Project planning and vendor selection is one of the biggest parts of the project for us. Reduced field visits and data acquisition efforts.											
Cost savings/cost reduction	Major	Unable to provide										
Cost savings/cost reduction description	Extraordinary cost savings for all users and much appreciated. Identification of hot spots for cultural features will save huge amounts of time/money allowing us to focus on strategic areas.											
Cost avoidance	Major	Unable to provide										
Cost avoidance description	I am the only employee to process the data and this would save an enormous amount of my time and resources. Rockfall analysis of our Conservation lands within proximity of residential properties. Currently experiencing land being covered by lava on Hawaii Island. Excellent QA/QC you provide.											
Increased revenues	Major	Unable to provide										
Increased revenues description	Assist with UH Archaeological school in identifying cultural sites on our lands.											
Mission-driven performance improvements	Major	Unable to provide										
Mission-driven performance improvements description	Assist with UH Archaeological school in identifying cultural sites on our lands. Improved site selection for development and future school locations. Create educational opportunities in perpetuity to improve the capability and well-being of people of Hawaiian ancestry.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Value added to products or services description	Standardized deliverables. Improved service with UH School of Archaeology.											
Improved response or timeliness	Major	Unable to provide										
Improved response or timeliness description	Kilauea Lava flow. Boundary determinations. Kilauea Lava flow recovery efforts. Rockfall mitigation. Sometimes have to use datasets that are 5 years old while landscape has changed.											
Improved customer experience	Major	Unable to provide										

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved customer experience description	Data collection standardization with reliable QA/QC. Currently using a variety of sources, resolution, projections from internal, county, state and federal data sources.			
Societal Benefits	**Benefits**	**Benefits**	**Benefits**	**Benefits**
Education or outreach	Major			
Education or outreach description	Cultural resource identification			
Environmental	Major			
Environmental description	Natural resource management			
Public safety, including life and property	Major			
Public safety, including life and property description	Rockfall analysis			

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Urban Forest Inventory and Maintenance



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Custom description	One or more states, territories, or counties		
Sub Area Requirements	Major urban areas of Hawai'i, American Samoa, and Guam			

MCA Description	Response
Mission Critical Activity	Urban tree inventory and maintenance. Map, monitor, and analyze canopy changes. Watershed analysis for trash and runoff in streambeds and riparian buffers during heavy rains. Future data preparation for carbon sequestration of trees in conservation areas.
MCA Title	Urban Forest Inventory and Maintenance
MCA ID	1363
Organization Type	Academic or Not-for-Profit
Organization Name	Smart Trees Pacific
Sub-Agency or Division	
Organization Mission	To promote urban forestry for the Pacific Rim nations
Program Name	Urban and community forestry
Total Annual Program Budget	$150,000
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Small trees, and paved objects. Canopy and building interface. Power line and tree canopy interaction.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Highly desirable
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Nice to have

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Not required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Less than 20 cm		
Acceptable Vertical Error	Up to 10 cm	Less than 10 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial	Partial		
Cross section/transect requirement	Individual trees and shrubs	Trees and Shrubs		

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Required			Required	
Entire AOI under same environmental conditions	Required	Required			Required	
Other	Required					
Other description	Need Consistent tree canopy					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Other		Required			Required	
Other description		Need streambed cross section			Riparian buffers in AOI	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level			Up to double the required TVU at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Required	Required		
Classified point cloud	Required	Required		
Edited/cube XYZ		Nice to have		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required	Required		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Highly desirable		
Land use/land cover	Required	Required		
Wetlands	Required	Required		
Estuaries				
Inland surface water features	Highly desirable	Highly desirable		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Highly desirable	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	2013, 1 meter LiDAR QL2, DEM, nDSM, nDTM, intensity imagery	2013, 1 meter LiDAR QL2, DEM, nDSM, nDTM, intensity imagery		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes	Yes		
NCEI	Yes	Yes		
Open Topography				
NOAA nautical charts		Yes		
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	State of Hawaii GIS Repository	State of Hawaii GIS Repository		
Other	Yes	Yes		
Other description	City of Honolulu	City of Honolulu		

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Major		
Increased revenues	Minor	Minor		
Mission-driven performance improvements	Major	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		
Improved response or timeliness	Moderate	Moderate		
Improved customer experience	Moderate	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major		
Environmental	Major	Major		
Public safety, including life and property	Minor	Moderate		
Other Current Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other		Major		
Other description		Stream bed erosion and riparian buffer repair		

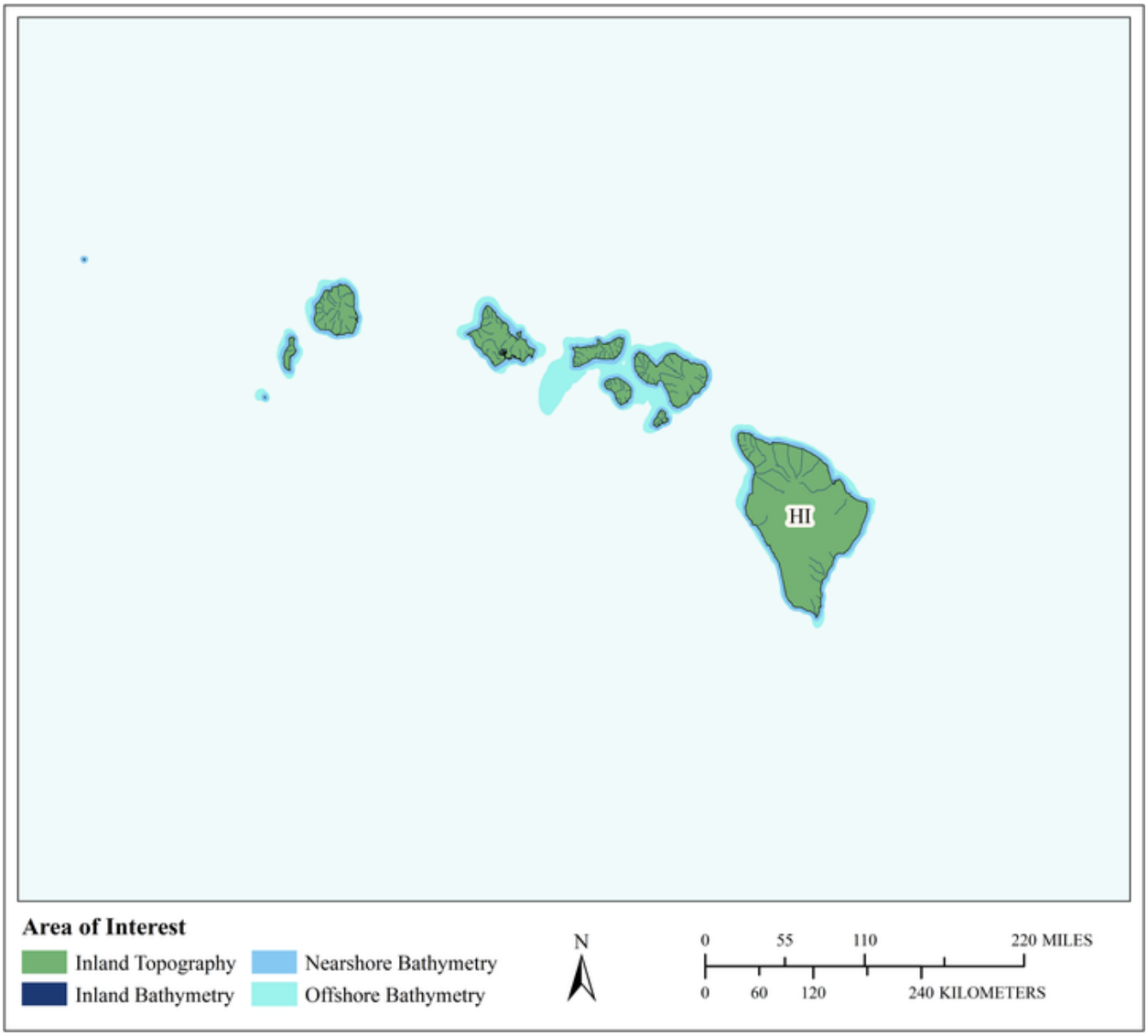
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$145,926	Major	Annual dollars saved/realized	$177,584						
Time savings description	This is particularly important for us; we have to fly between islands in the State. Less ground truthing verification. 20 hours per week saved. Better analysis of anthropological changes. Models can be rebuilt to accommodate change of requirement, like populations and gov. admin. changes. Site visits of trees. Going back to correct feature class is a hugh time expense.			Better model of trees to affect water flow. The data from NOAA and NGA is very good now. Little correction needed, mostly to add points. In Stream bank cross section analysis for tree planting. Tree inventory trips are planned every week. 20 hours per week saved. Trees by stream beds. Intra-State travel and reduce volunteers frustrations in the field.								
Cost savings/cost reduction	Major	Annual dollars saved/realized	$500,000	Major	Annual dollars saved/realized	$300,000						
Cost savings/cost reduction description	This is very important to us. We do not have the resources to buy these data.			Spend the money to slow storm run offs by planting trees.								
Cost avoidance	Major	Annual dollars saved/realized	$2,342,000	Major	Annual dollars saved/realized	$2,336,000 to $2,360,000						
Cost avoidance description	Even at QL2, we do not have the budget to process the data. The cost of tree falls onto homes and roadways after storm events and blocked access and death. Millions per storm event, assume one event per year based on disaster declarations for past 10 years. Not sure what the error rate even at QL2 as planned.			Fixing hydrology data with tree is very expensive, takes hours to run a model. Heavy run off often washes houses off hillside and flood costal business like the UH Library flood, or the last storm that flooded Big Island and Kauai. Millions per storm event, assume one event per year based on disaster declarations for past 10 years. Having Mosaic datasets helps to reduce our contract cost to generate surface features.								
Increased revenues	Major	Unable to provide		I don't know	Unable to provide							
Increased revenues description	Cannot envision what new product will be derived from this data at the moment.											
Mission-driven performance improvements	Major	Annual percent improvement	300%	Major	Annual percent improvement	1,100,000%						
Mission-driven performance improvements description	We can perform better Eco-service analysis, such as carbon store and sequestrations. Tell us where to plant new trees. It will provide better than the 2d data we currently use.			Just started to relate trees and storm runoff in urban watershed like Waikiki and others. Tells us how trees redirect run offs.								
Other operational benefits	Major	Annual dollars saved/realized	$45,225	Major	Annual dollars saved/realized	$2,000,000						
Other operational benefits description	Tree species identification. Currently we cannot determine the eco-benefits of our urban forest without species and DSH measurements.			Increase permeability Mauka and using trees in addition to buffering will reduce runoff in highly urbanized watersheds like the Alawai, Kaimuki. Millions per storm event, assume one event per year based on disaster declarations for past 10 years. Trees and storm run off in highly developed urban watershed.								
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$15,075	I don't know	Unable to provide							
Value added to products or services description	New Green Infrastructure implementation, intensification development around our rail system.											
Improved response or timeliness	Major	Annual dollars saved/realized	$1,072,360	I don't know	Unable to provide							

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Improved response or timeliness description	Tree care can be better planned remotely. This will reduce our Citizen Forester program in community forestry. Event driven, also location driven, if we block access to Waikiki, it is millions per day. State Civil Defense does this not our organization.											
Improved customer experience	Major	Annual dollars saved/realized	$223,110	Major	Annual dollars saved/realized	$1,204,000						
Improved customer experience description	Quicker data access when this is offered as a raster data service. 100 hours per week saved. Tools and uses not yet envisioned. 3D will improve our users' confidence in relying on our data for planting and maintenance decisions.			Hydrological Collections points direct trash collection efforts. $500 per quarter. Able see the location in 3D with elevation, help to plan access to steep areas, nDSM helps with route planning and hand holds. $500 per quarter. Able to show stream bed cross section with trees, improve out reach effectiveness in neighborhood board meetings.								
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Education or outreach description	Green Infrastructure can be animated for benefit analysis. Currently we cannot show our data to the public because our data set is too large.			Many schools locally are now getting involved in stream bed cleaning, tree planting and trash removal in streams. Na Wai Ekulo website began this effort								
Environmental	Major			I don't know								
Environmental description	If the public sees the problem, they can help to reduce our 5% annual loss. Canopy growth rate can be monitored while heat island effect can be tracked based on azimuth in real time											
Public safety, including life and property	Major			I don't know								
Public safety, including life and property description	Where one can predict or suspects criminals can hide or transact business.											
Other	Virtual tours for the disabled											
Other benefits	Major											
Other description	Augmented Reality can be employed for tree education and preservation purposes											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps	Yes	Yes		
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes	Yes		
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Statewide Geospatial Data Coordination



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Custom description
Sub Area Requirements				Hawai'i navigationally significant areas

MCA Description	Response
Mission Critical Activity	Adoption and use of high resolution and accurate data for decision makers and Geospatial practitioners in Hawaii.
MCA Title	Statewide Geospatial Data Coordination
MCA ID	21626
Organization Type	Academic or Not-for-Profit
Organization Name	Hawaii Geographic Information Coordinating Council
Sub-Agency or Division	
Organization Mission	The Hawaii Geographic Information Coordinating Council (HIGICC) is a private non-profit 501(c)(3) organization consisting of members of Hawai'i's geospatial community. Our goal is to provide coordination of geospatial activities among a wide range of users in order to avoid duplication of effort, promote data sharing, and maintain data standards throughout the state. HIGICC is a member of the National States Geographic Information Council (NSGIC), "an organization committed to efficient and effective government through the prudent adoption of geospatial information technologies." HIGICC strives to bring together and continue to build the geographic community into a cohesive, recognized coordinating body that facilitates the use, development, sharing, and management of geographic data and communicates the value of geographic information to citizens and decision-makers. In the State of Hawaii, GIS is recognized and effectively used as an invaluable tool by the government, business and the citizens for understanding and managing our aina (environment). The Hawaii GICC is a shared mechanism for the diverse community to identify, explore, and solve problems with geospatial information.
Program Name	HIGICC
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Tertiary Business Use	BU 04 - Forest Resources Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.

General Geographic Area and Size	
Description of smallest 3D features	Trees, signs, cultural structures and artifacts, water features down to ditches and flumes and pipes. Coral reefs, harbor navigation structures, cultural and archaeological features (ship wrecks, fish ponds).

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B	QL0B	Order 1
Update Frequency	4-5 years	2-3 years	2-3 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 30 cm	Less than 50 cm	Up to 1 meter	Up to 1 meter
Acceptable Vertical Error	Up to 10 cm	Less than 10 cm	Less than 10 cm	Up to 2 meters
How far onshore needed			To cover the beach slope	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MSL	MLLW
Cross sections and/or transects meet needs		Partial	Partial	Partial
Cross section/transect requirement		Over 100 man made reservoirs exist in the state. All are earthen dams.	A few centimeters for the vertical, one to several meters for the longitudinal sampling	One meter vertical. Many meters to kilometer longitudinal.

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable

Hydrologic Processing Required	Response
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable	Highly desirable	Nice to have	Highly desirable	Nice to have
Entire AOI under same environmental conditions	Nice to have	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Nice to have	Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Nice to have	Highly desirable	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Required	Required
DTM	Highly desirable	Highly desirable	Highly desirable	Nice to have
DEM	Required	Required	Required	Required
Raw point cloud data	Nice to have	Nice to have	Highly desirable	Nice to have
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Highly desirable	Highly desirable
Full waveform	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	Highly desirable

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Nice to have
Ground control/ground truthing	Required	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Highly desirable
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Highly desirable	Nice to have
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Water column properties - Physical			Highly desirable	Highly desirable
Water column properties - Chemical			Highly desirable	Highly desirable
Water column properties - Biological			Highly desirable	Highly desirable
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Highly desirable	Highly desirable
Routes			Highly desirable	Highly desirable
Offshore cadastral			Highly desirable	Highly desirable
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Required	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Required	Highly desirable
Wetlands	Highly desirable	Required	Highly desirable	Highly desirable
Estuaries			Highly desirable	
Inland surface water features	Highly desirable	Required	Highly desirable	
Bridges/culverts	Highly desirable	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Field surveys, existing lidar, USGS 10 meter DEM	USGS 1:24000 topo maps or dated historical drawings	ACOE SHOALs lidar data, electronic nautical maps	Miscellaneous sonar data, mainly from NOAA and the University of Hawaii
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes			Yes
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts		Yes	Yes	Yes
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes		Yes	
State repositories used	The Hawaii GIS Program has assembled all known existing lidar data, and serves it out on the internet.		Compiled ACOE SHOALs lidar data, electronic nautical maps	

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Major	Major
Cost savings/cost reduction	Major	Major	Major	Major
Cost avoidance	Major	Moderate	Major	Major
Increased revenues	Moderate	Moderate	Moderate	Moderate
Mission-driven performance improvements	Major	Major	Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate	Moderate	Major
Improved response or timeliness	Major	Moderate	Moderate	Major
Improved customer experience	Moderate	Moderate	Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor	Major	Major
Environmental	Major	Major	Major	Major
Public safety, including life and property	Major	Major	Major	Major

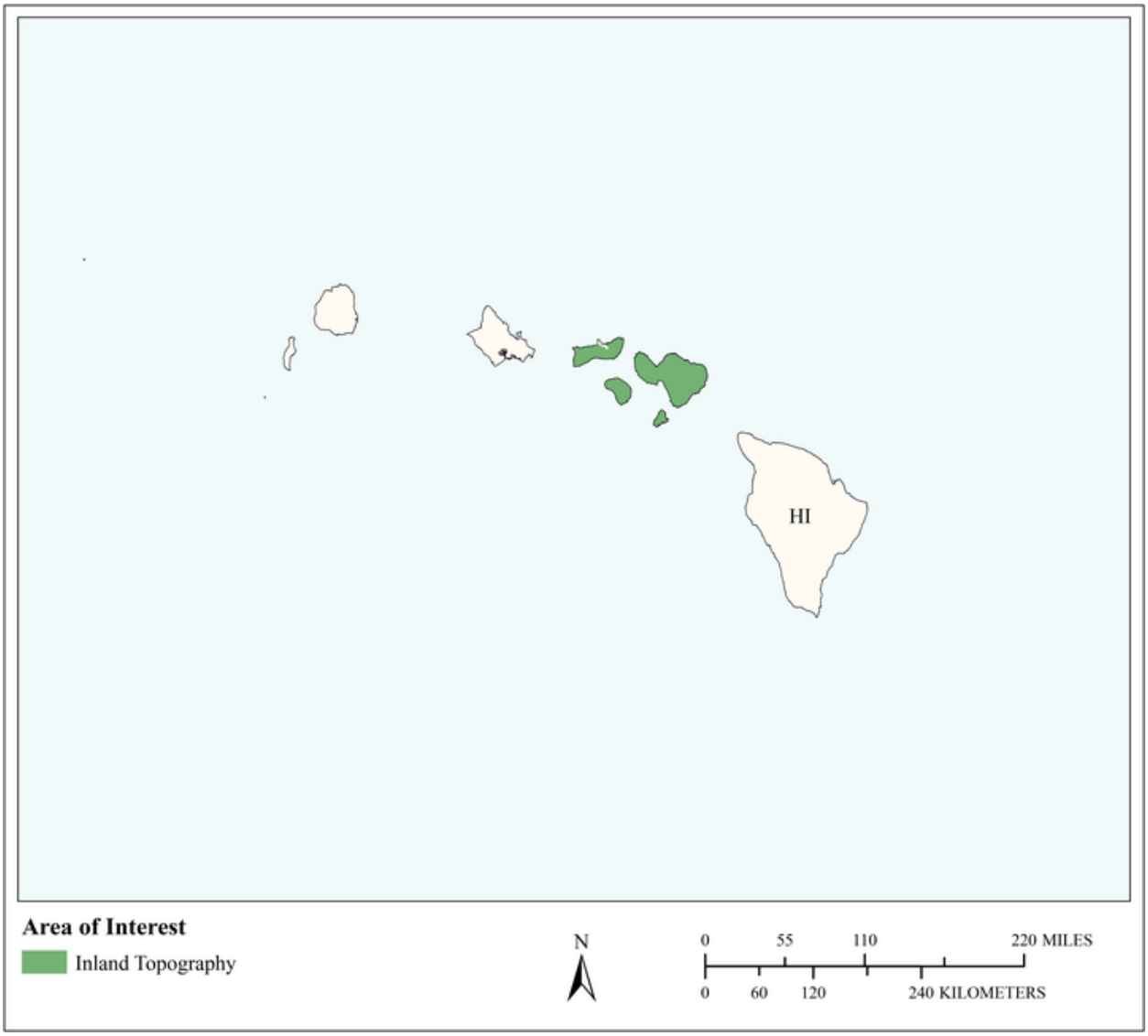
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$31,658	Major	Annual dollars saved/realized	$24,120	Major	Annual dollars saved/realized	$36,180	Major	Annual dollars saved/realized	$30,150,000
Time savings description	Travel time, equipment setup. Shoreline and sea level rise reviews and objections take time. Good data is trustworthy, no need to modify it. Lots of time to meld different datasets, projections a big issue here. Less sneaker net, external hard drives, and copying of data.			Better planning. Travel time is expensive.			Boat time is time consuming, and expensive. Large areas.			Ship time is very expensive and difficult to get.		
Cost savings/cost reduction	Major	Annual dollars saved/realized	$1,100,000	Major	Annual dollars saved/realized	$750,000	Major	Annual dollars saved/realized	$700,000	Major	Annual dollars saved/realized	$600,000
Cost savings/cost reduction description	Shared data resource for all users. Better and more accurate estimating and planning.						Large area.					
Cost avoidance	Major	Annual dollars saved/realized	$1,610,000	Major	Annual dollars saved/realized	$1,250,000	Major	Annual dollars saved/realized	$1,450,000	Major	Annual dollars saved/realized	$700,612
Cost avoidance description	Better planning,. Flooding from man made structures and diversions a problem here. Flooding and lava inundation ongoing. Requires high end workstations and software.						Expensive workstations and software required.			Shipping is valuable, undersea cabling vital to economy.		
Increased revenues	Moderate	Annual dollars saved/realized	$250,000	Minor	Annual dollars saved/realized	$20,000	Major	Annual dollars saved/realized	$350,000	Major	Annual dollars saved/realized	$800,000
Increased revenues description	90% of food is imported. Timber and agricultural products.			No inland shipping done here.			Sea cucumbers, fishes, shrimp, seaweed harvesting potentials.					
Mission-driven performance improvements	Major	Annual percent improvement	25%	Major	Annual percent improvement	20%	Major	Annual percent improvement	28%	Major	Annual percent improvement	13%
Mission-driven performance improvements description										Especially for whale sanctuaries.		
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$750,000	Major	Annual dollars saved/realized	$150,000	Major	Annual dollars saved/realized	$350,000	Major	Annual dollars saved/realized	$5,050,000
Value added to products or services description	Shoreline and flooding, major issues in Hawaii. Renewable energy is a major governor's initiative.											
Improved response or timeliness	Major	Annual dollars saved/realized	$11,750,000	Major	Annual dollars saved/realized	$525,000	Major	Annual dollars saved/realized	$1,425,106	Major	Annual dollars saved/realized	$2,650,000
Improved response or timeliness description	All of these apply, especially with the 10 million tourists per year. Future use case. Critical need. Flooding and ship grounding are problems. Needed. Mission critical.											
Improved customer experience	Major	Annual dollars saved/realized	$175,000	Major	Annual dollars saved/realized	$100,000	Major	Annual dollars saved/realized	$200,000	Major	Annual dollars saved/realized	$125,000
Improved customer experience description	Reduced margins of error. New solar and wind farm apps for example. Less calls from people needing the data.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Minor			Major			Major		
Education or outreach description	Teaching better science											
Environmental	Major			Major			Major			Major		
Environmental description	Water is ground water and aquifers, unique plant and animal species here											
Public safety, including life and property	Major			Major			Major			Major		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Public safety, including life and property description	Serious issue with flooding, lava, and tsunamis			

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				Yes
Contours				Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes			
Aspect maps			Yes	Yes
Curvature maps		Yes	Yes	Yes
Cross sections		Yes	Yes	Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness		Yes	Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Land Development and Zoning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements	Maui County, HI			

MCA Description	Response
Mission Critical Activity	Land development and zoning
MCA Title	Land Development and Zoning
MCA ID	21927
Organization Type	Regional, County, City, or other local government
Organization Name	County of Maui
Sub-Agency or Division	
Organization Mission	To manage growth in a sustainable manner that balances our economy, culture and environment.
Program Name	Regional Planning
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 03 - Coastal Zone Management
Tertiary Business Use	BU 14 - Cultural Resources Preservation and Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Swales, Canal Banks, Trees

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI	Coastal areas change most rapidly			
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 30 cm			
How far onshore needed				
How far down the beach profile needed	Below MLLW			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to triple the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required			
Land use/land cover	Nice to have			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	2 Foot DEM derived from LIDAR			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes			
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	State Open Data Portal			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Major			

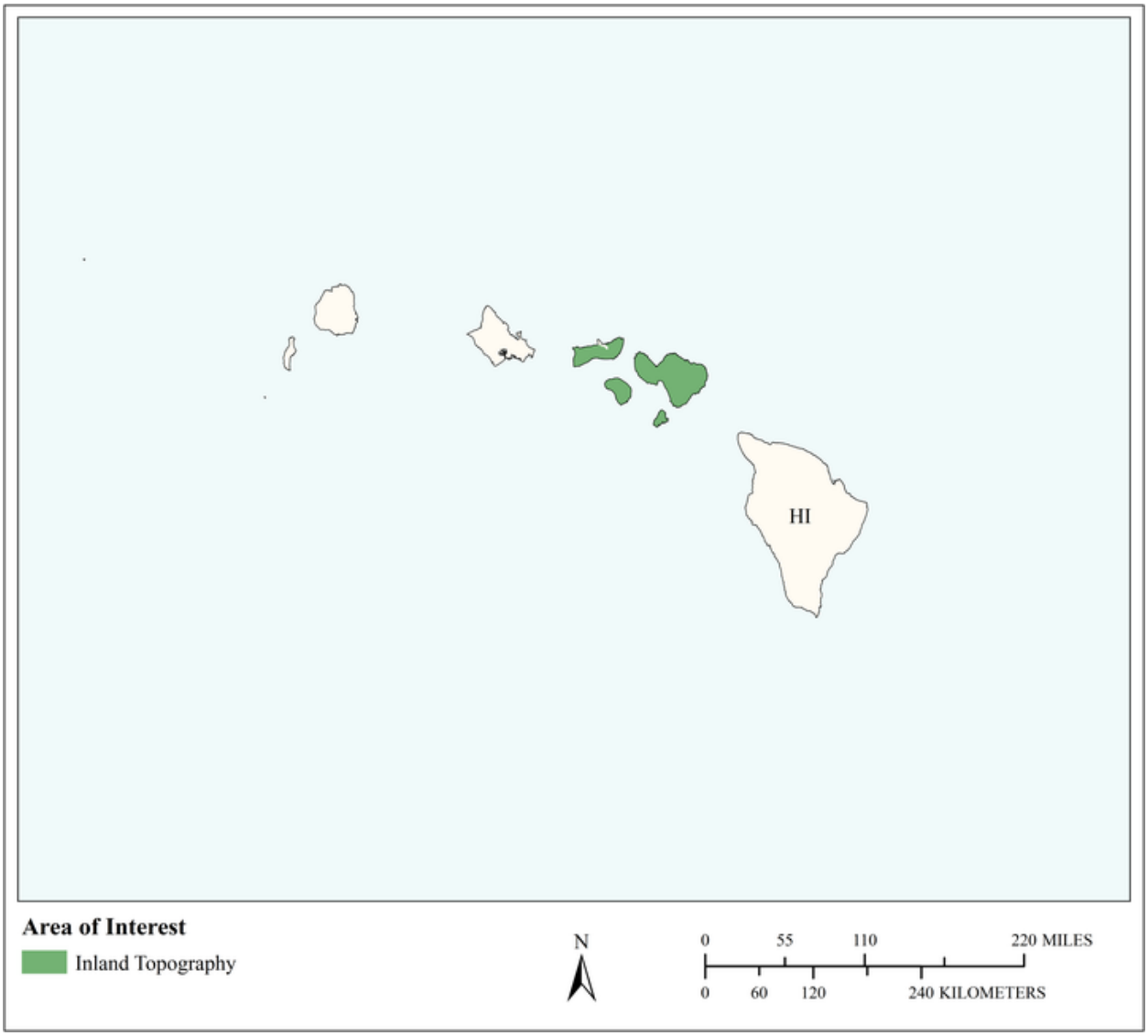
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Moderate			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Annual percent improvement	13%									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Moderate											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Enterprise GIS Support for County Government and NGO Activities



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements	Maui County, HI			

MCA Description	Response
Mission Critical Activity	It's honestly a mix of several below given the wide range of tasks our data services assist, but BU 23 encompasses the most important. Also utilities, emergency management, real property, and watershed conservation.
MCA Title	Enterprise GIS Support for County Government and NGO Activities
MCA ID	22291
Organization Type	Regional, County, City, or other local government
Organization Name	County of Maui, Hawaii
Sub-Agency or Division	
Organization Mission	Enterprise GIS support for our county government.
Program Name	Long Range Planning
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 03 - Coastal Zone Management
Tertiary Business Use	BU 22 - Infrastructure and Construction Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Individual lots for flood risk management

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI	Developed areas need more frequent collection, remote areas ~10 years/collection			
Acceptable Horizontal Error	Up to 40 cm			
Acceptable Vertical Error	Up to 30 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed	To MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Nice to have					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have					
DEM for entire AOI needs to be seamless	Nice to have					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Nice to have			
DEM	Nice to have			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	IfSAR of entire county (~13 years old/low resolution) LIDAR - partial county (~13-5 years old, 0.5m-1.0m DTM/DSM, getting quite old, newest is 2013 USACE collection which is the only dataset for which metadata/data quality is known)			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes			
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				

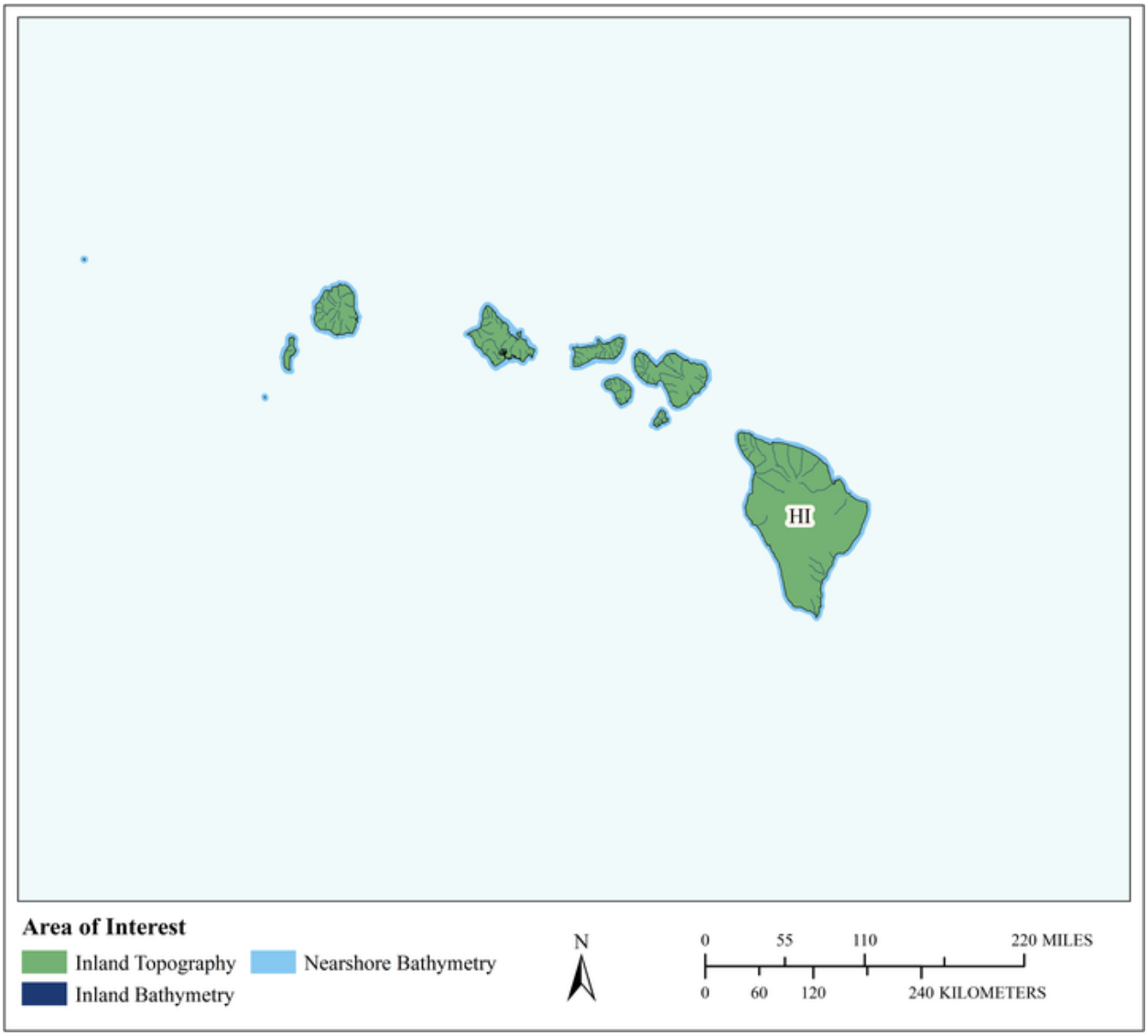
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other	Yes			
Other description	Internal contracts			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Minor			
Cost avoidance	Minor			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Moderate			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Annual dollars saved/realized	$100,000									
Cost savings/cost reduction description	100 square miles estimated at $1000/sq.mi.											
Cost avoidance	Moderate	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Moderate	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Moderate											
Public safety, including life and property	Moderate											
Public safety, including life and property description	Wildfire management											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				
Other (please specify)	Yes			
Other description	I need point clouds/raw or classified points			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Real Estate, Banking, Mortgage, and Insurance



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Assessment of risk for natural hazards (e.g., sinkholes, flooding) to inform insurance policy rates and the determination of mandatory insurance. Building permit compliance.
MCA Title	Real Estate, Banking, Mortgage, and Insurance
MCA ID	60127
Organization Type	State or U.S. Territorial government
Organization Name	State of Hawai'i
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 25 - Real Estate, Banking, Mortgage, and Insurance
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	I don't know
Rivers and Streams	
Less than 10 ft	I don't know
10 - 50 ft	I don't know
51 - 100 ft	I don't know
101 - 500 ft	I don't know
501 - 2,500 ft	I don't know
Greater than 2,500 ft	I don't know
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	I don't know
½ - 1 acre	I don't know
1.1 – 2 acres	I don't know
2.1 – 5 acres	I don't know
5.1 – 10 acres	I don't know
Greater than 10 acres	I don't know

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	I don't know	QL2B	
Update Frequency	4-5 years	I don't know	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	I don't know	Up to 5 meters	
Acceptable Vertical Error	Up to 20 cm	I don't know	Up to 40 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					I don't know	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	I don't know	Nice to have		I don't know	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	I don't know	Highly desirable		I don't know	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	I don't know	Nice to have		I don't know	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	I don't know	Highly desirable		I don't know	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	I don't know	Up to triple the required TVU at the 95% confidence level		I don't know	Up to triple the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	I don't know	Highly desirable	
DTM	Required	I don't know	Highly desirable	
DEM	Required	I don't know	Required	
Raw point cloud data	Nice to have	I don't know	Nice to have	
Classified point cloud	Required	I don't know	Nice to have	
Edited/cube XYZ		I don't know	Nice to have	
Full waveform	Nice to have	I don't know	Nice to have	
Bathymetric Attributed Grid (BAG)		I don't know	Highly desirable	
Breaklines required for standard hydro-flattening	Nice to have	I don't know		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable	I don't know	Highly desirable	
Ground control/ground truthing	Required	I don't know	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Highly desirable	I don't know	Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Highly desirable	
Bottom type			Nice to have	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	I don't know	Required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Highly desirable	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Nice to have	
Boundaries			Highly desirable	
Routes			Nice to have	
Offshore cadastral			Highly desirable	
Lease areas			Highly desirable	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Highly desirable	I don't know	Required	
Land use/land cover	Nice to have	I don't know	Highly desirable	
Wetlands	Nice to have	I don't know	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Highly desirable	I don't know	Nice to have	
Bridges/culverts	Nice to have	I don't know		
Landmark features	Nice to have	I don't know	Nice to have	
Cultural resources	Nice to have	I don't know	Nice to have	
Coastal and riverine structures	Nice to have	I don't know	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	I don't know	Major	
Cost savings/cost reduction	Major	I don't know	Major	
Cost avoidance	Major	I don't know	Moderate	
Increased revenues	None	I don't know	None	
Mission-driven performance improvements	Moderate	I don't know	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	I don't know	Major	

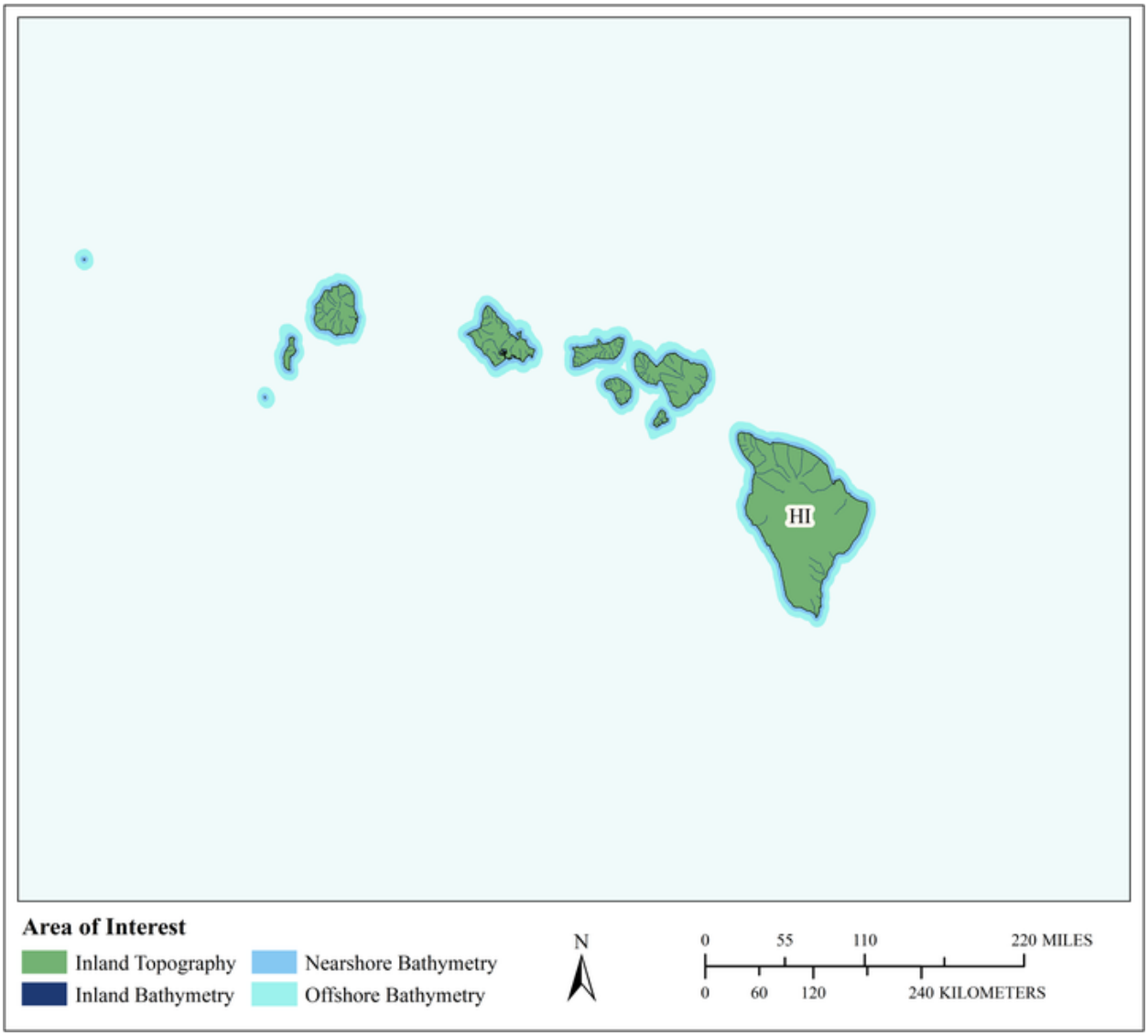
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	I don't know	Minor	
Improved customer experience	Major	I don't know	Major	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	I don't know	Major	
Environmental	Moderate	I don't know	Minor	
Public safety, including life and property	Moderate	I don't know	Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide				
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide				
Increased revenues	Minor	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$223,572									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide				
Improved customer experience	Moderate	Unable to provide		I don't know	Unable to provide		Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			I don't know			Major					
Environmental	Minor			I don't know			Moderate					
Public safety, including life and property	Major			I don't know			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	
Contours	Yes		Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids			Yes	
Hydrologic Flow Accumulation Grids			Yes	
Hydrologic networks (e.g. streams, lakes)	Yes		Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)			Yes	
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Vegetation Mapping and Inventory



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Mapping and estimating forest resources using LiDAR; Native and invasive tree species mapping. Scientific research. Study forest changes. Better elevation data are needed where gaps exist, including the higher elevations in Oahu, also the Big Island. The data are needed for identification and mapping of vegetation, including native vs. invasive species, vegetation structure, biomass, species mapping, and growing status, Elevation data are also important for orthorectification of imagery.
MCA Title	Vegetation Mapping and Inventory
MCA ID	21671
Organization Type	Academic or Not-for-Profit
Organization Name	University of Hawaii at Manoa
Sub-Agency or Division	
Organization Mission	Higher education and research
Program Name	University of Hawaii at Manoa
Total Annual Program Budget	
Primary Business Use	BU 26 - Education K12 and Beyond, Basic Research
Secondary Business Use	BU 04 - Forest Resources Management
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Individual trees

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have

Inland Bathy Feature Size Requirements	Response
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL1B	QL2B	Order 1a
Update Frequency	2-3 years	4-5 years	4-5 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI	The main 8 islands are the most important			
Acceptable Horizontal Error	Less than 20 cm	Up to 2 meters	Up to 5 meters	Up to 5 meters
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 40 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable	Nice to have	Not required	Highly desirable	Nice to have
Entire AOI under same environmental conditions	Nice to have	Required	Nice to have	Not required	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Not required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Not required	Required	Required	Highly desirable	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Highly desirable	Required	Required
DTM	Required	Highly desirable	Required	Highly desirable
DEM	Not required	Required	Required	Required
Raw point cloud data	Required	Required	Required	Required
Classified point cloud	Required	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Not required	Highly desirable	Nice to have	Nice to have
Ground control/ground truthing	Required	Highly desirable	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Highly desirable	Required	Required	Highly desirable
Underwater videography			Nice to have	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Nice to have
Geologic and seismic data	Not required	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Highly desirable	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Highly desirable
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Not required	Required	Required	
Land use/land cover	Not required	Highly desirable	Highly desirable	Nice to have
Wetlands	Not required	Highly desirable	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Not required	Required	Highly desirable	
Bridges/culverts	Not required	Highly desirable		
Landmark features	Not required	Nice to have	Highly desirable	
Cultural resources	Not required	Nice to have	Highly desirable	
Coastal and riverine structures	Not required	Required	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	NED 10m			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes			
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Major	Minor
Cost savings/cost reduction	Major	Minor	Moderate	Minor
Cost avoidance	Major	Minor	Major	Moderate
Increased revenues	Major	None	Minor	None
Mission-driven performance improvements	Major	Moderate	Major	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Major	Moderate

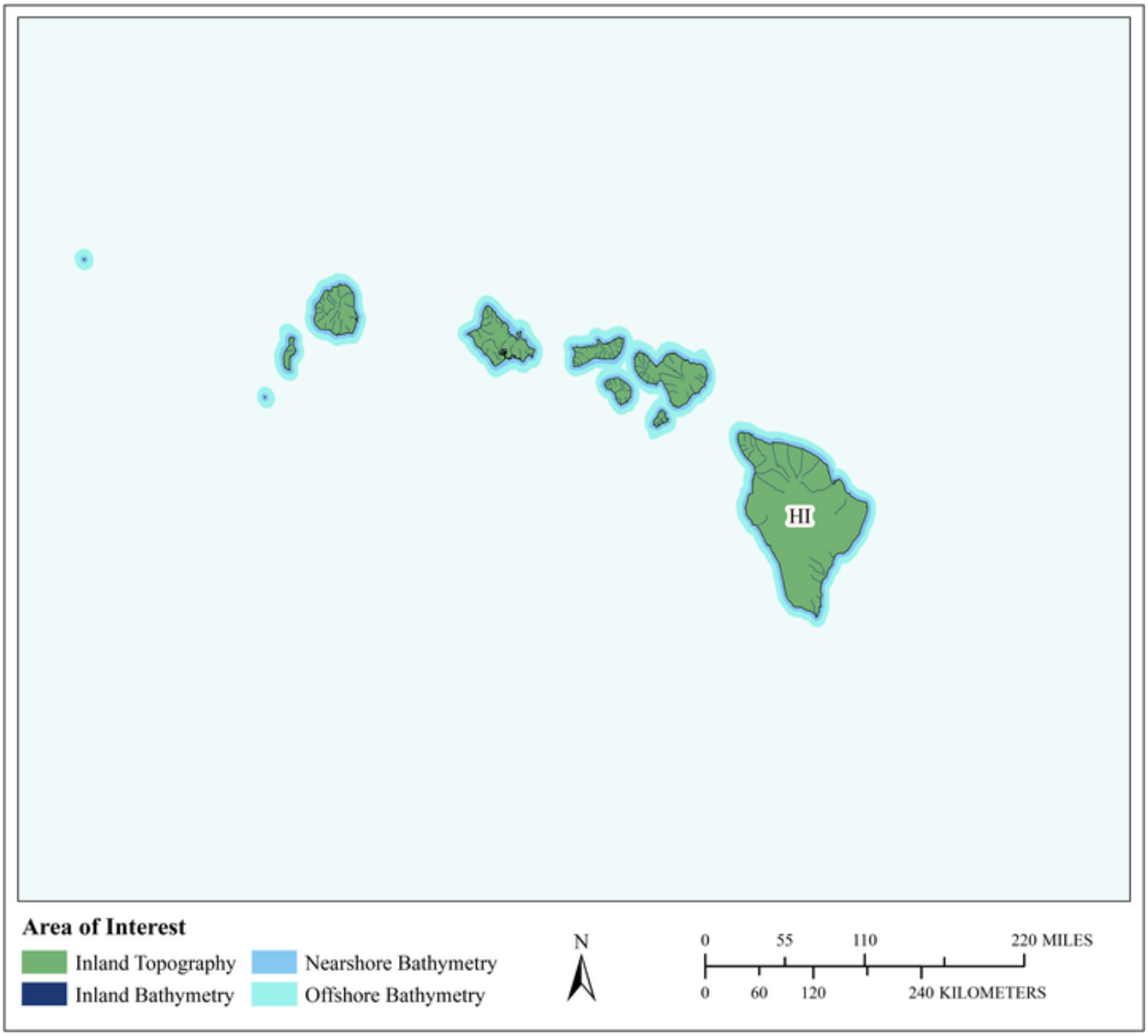
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	Minor	Minor
Improved customer experience	Major	Minor	Moderate	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major	Major	Major
Environmental	Major	Minor	Minor	Minor
Public safety, including life and property	Major	Moderate	Minor	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Time savings description	Less field work; need remote sensing for inaccessible areas. Model calibration, model validation.											
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	Major	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$33,814		Annual dollars saved/ realized	$8,842		Annual dollars saved/ realized	$2,855		Annual dollars saved/ realized	$7,576
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Other customer service benefits	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$80,826					Annual dollars saved/ realized	$112			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major			Major		
Environmental	Major			Major			Major			Minor		
Public safety, including life and property	Major			Major			Minor			Minor		
Other												
Other benefits	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes	Yes	
Contours		Yes	Yes	Yes
Hillshades			Yes	Yes
Slope maps				Yes
Aspect maps				Yes
Curvature maps				
Cross sections			Yes	Yes
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Recreation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Planning and development of recreational facilities such as rafting, boating, swimming, diving, and fishing areas; ski slopes; and golf courses. Location- based products and services such as maps and guides. Tourism. Trail and vista site planning. Orienteering.
MCA Title	Recreation
MCA ID	60128
Organization Type	State or U.S. Territorial government
Organization Name	State of Hawai'i
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 27 - Recreation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	I don't know
Update Frequency	4-5 years	4-5 years	4-5 years	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required	Highly desirable	I don't know	Not required	Not required
Entire AOI under same environmental conditions	Required	Not required	Highly desirable	I don't know	Not required	Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Nice to have	I don't know	Nice to have	Not required
DEM for entire AOI needs to be seamless	Required	Nice to have	Nice to have	I don't know	Nice to have	Not required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	I don't know
DTM	Nice to have	Highly desirable	Highly desirable	I don't know
DEM	Required	Required	Required	I don't know
Raw point cloud data	Nice to have	Nice to have	Not required	I don't know
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Nice to have	I don't know
Full waveform	Not required	Nice to have	Not required	I don't know
Bathymetric Attributed Grid (BAG)		Highly desirable	Nice to have	I don't know
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	I don't know
Tide Predictions			Nice to have	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	I don't know
Intensity imagery/sidescan imagery	Not required	Nice to have	Not required	I don't know
Ground control/ground truthing	Nice to have	Nice to have	Not required	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	I don't know
Nautical and/or navigation charts			Not required	I don't know
Acoustic imagery of the seafloor			Not required	I don't know
Aerial and/or satellite imagery	Required	Required	Not required	I don't know
Underwater videography			Not required	I don't know
Bottom texture			Nice to have	I don't know
Bottom type			Highly desirable	I don't know
Submerged features			Highly desirable	I don't know
Subbottom characteristics			Nice to have	I don't know
Geologic and seismic data	Not required	Highly desirable	Nice to have	I don't know
Water column properties - Physical			Nice to have	I don't know
Water column properties - Chemical			Nice to have	I don't know
Water column properties - Biological			Nice to have	I don't know
Currents			Nice to have	I don't know
Tide/wave heights			Nice to have	I don't know
Sea ice conditions			Not required	I don't know
Habitat distribution and classification			Highly desirable	I don't know
Boundaries			Not required	I don't know
Routes			Nice to have	I don't know
Offshore cadastral			Nice to have	I don't know
Lease areas			Nice to have	I don't know
Fixed obstructions			Highly desirable	I don't know
Floating observation/navigation systems			Highly desirable	I don't know
Shorelines – current, historic, change rates	Not required	Highly desirable	Highly desirable	
Land use/land cover	Nice to have	Highly desirable	Highly desirable	I don't know
Wetlands	Highly desirable	Highly desirable	Highly desirable	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	I don't know
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Not required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Minor	I don't know
Cost savings/cost reduction	Moderate	Minor	Minor	I don't know
Cost avoidance	Major	Minor	Minor	I don't know
Increased revenues	None	Minor	Minor	I don't know
Mission-driven performance improvements	Major	Minor	Minor	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor	Minor	I don't know

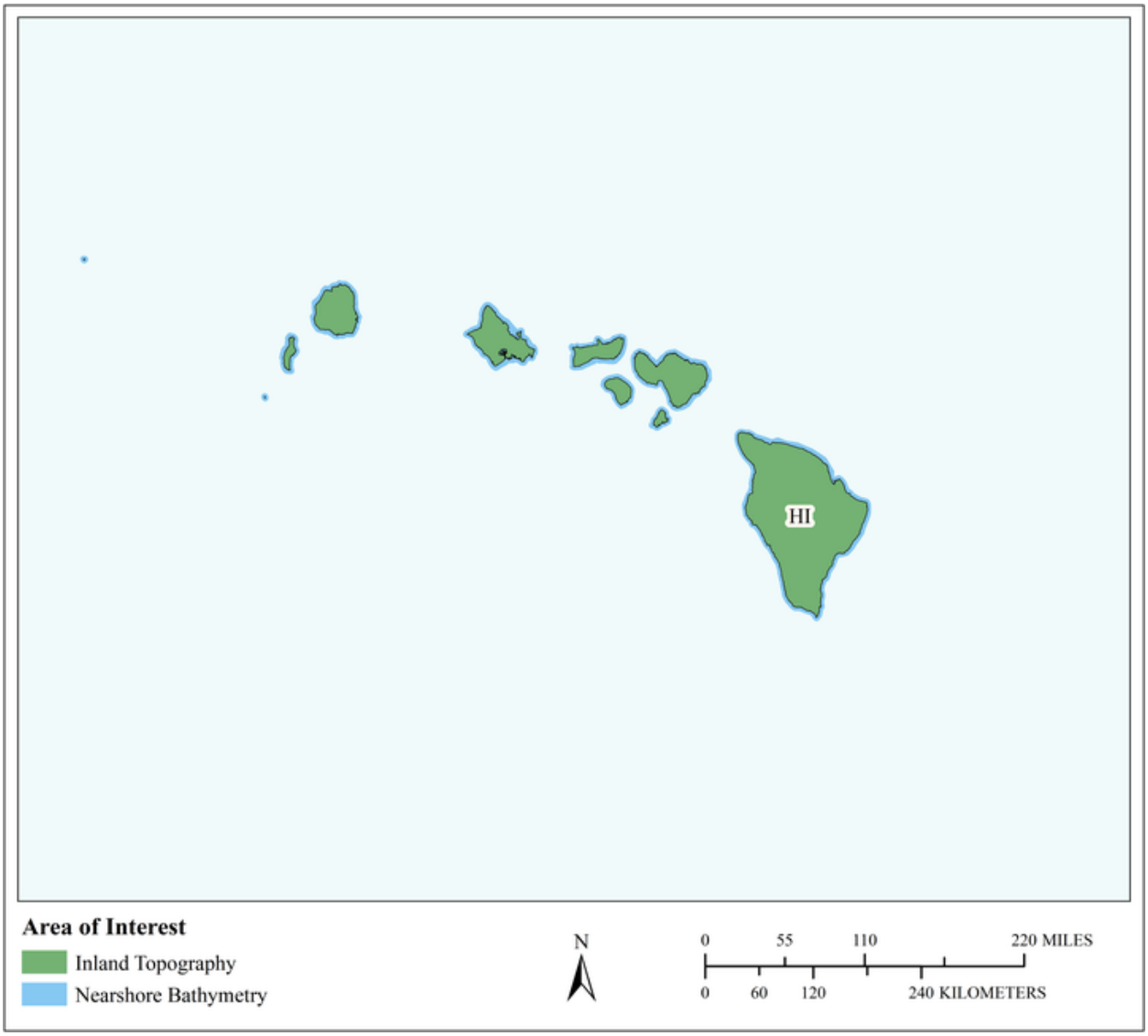
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	Minor	Minor	I don't know
Improved customer experience	Moderate	Minor	Minor	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	I don't know
Environmental	Major	Minor	Minor	I don't know
Public safety, including life and property	Major	Minor	Minor	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Increased revenues	None			Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,476		Annual dollars saved/ realized	$889		Annual dollars saved/ realized	$56,340			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Major			I don't know		
Environmental	Moderate			Major			Major			I don't know		
Public safety, including life and property	Moderate			Moderate			Moderate			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes		
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Telecommunications



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Telecommunication tower site selection. Design of radio and radar systems. Interference analysis. Path profiles. Undersea telecommunication route selection and deployment.
MCA Title	Telecommunications
MCA ID	60129
Organization Type	State or U.S. Territorial government
Organization Name	State of Hawai'i
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 28 - Telecommunications
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2		QL2B	
Update Frequency	4-5 years		4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter		Up to 5 meters	
Acceptable Vertical Error	Up to 20 cm		Up to 40 cm	
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable		Highly desirable			Nice to have
Entire AOI under same environmental conditions	Highly desirable		Highly desirable			Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Highly desirable			Nice to have
DEM for entire AOI needs to be seamless	Required		Highly desirable			Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know		I don't know			I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable		Highly desirable	
DTM	Highly desirable		Highly desirable	
DEM	Highly desirable		Highly desirable	
Raw point cloud data	Highly desirable		Highly desirable	
Classified point cloud	Required		Highly desirable	
Edited/cube XYZ			Highly desirable	
Full waveform	Highly desirable		Highly desirable	
Bathymetric Attributed Grid (BAG)			Highly desirable	
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Highly desirable		Highly desirable	
Ground control/ground truthing	Highly desirable		Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required		Highly desirable	
Underwater videography			Highly desirable	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Nice to have		Nice to have	
Water column properties - Physical			Highly desirable	
Water column properties - Chemical			Highly desirable	
Water column properties - Biological			Highly desirable	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Highly desirable	
Habitat distribution and classification			Highly desirable	
Boundaries			Highly desirable	
Routes			Highly desirable	
Offshore cadastral			Highly desirable	
Lease areas			Highly desirable	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Nice to have		Highly desirable	
Land use/land cover	Highly desirable		Highly desirable	
Wetlands	Required		Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required		Highly desirable	
Bridges/culverts	Required			
Landmark features	Required		Highly desirable	
Cultural resources	Required		Highly desirable	
Coastal and riverine structures	Required		Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		I don't know	
Cost savings/cost reduction	Major		I don't know	
Cost avoidance	Major		I don't know	
Increased revenues	None		I don't know	
Mission-driven performance improvements	Major		I don't know	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		I don't know	

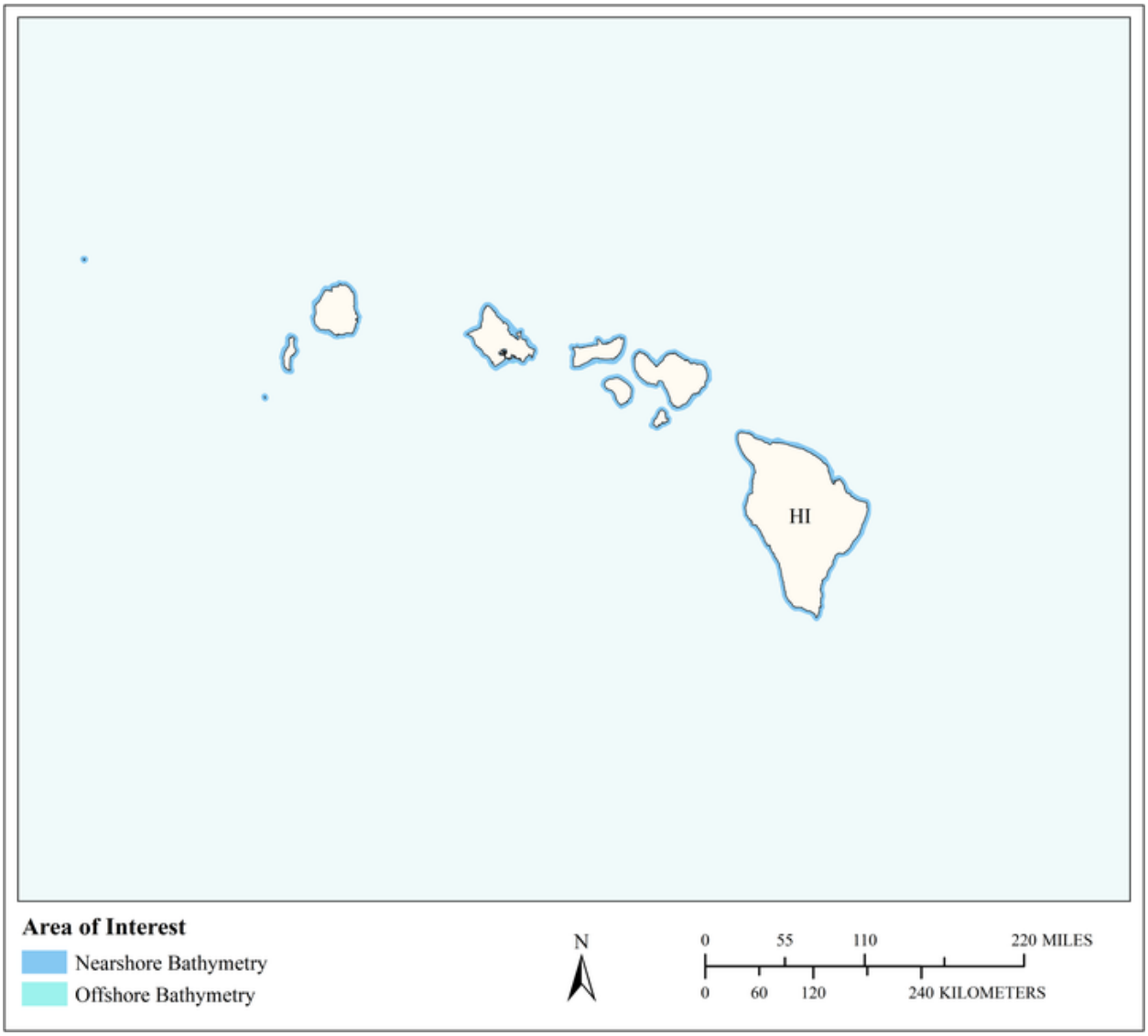
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major		I don't know	
Improved customer experience	Major		I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor		I don't know	
Environmental	Minor		I don't know	
Public safety, including life and property	Major		I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					I don't know	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide					I don't know	Unable to provide				
Cost avoidance	Major	Unable to provide					I don't know	Unable to provide				
Increased revenues	I don't know	Unable to provide					I don't know	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide					I don't know	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					I don't know	Unable to provide				
Improved response or timeliness	Major	Unable to provide					I don't know	Unable to provide				
Improved customer experience	Major	Unable to provide					I don't know	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know						I don't know					
Environmental	I don't know						I don't know					
Public safety, including life and property	I don't know						I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Harbor Management and Maintenance



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type			Required	Required
Geographic Area Requirements			Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Custom description
Sub Area Requirements				Harbor entrance channels

MCA Description	Response
Mission Critical Activity	Stormdrain compliance, drainage basin mapping. Marine construction, building and maintaining piers and wharves. Navigation, port infrastructure and waterway management.
MCA Title	Harbor Management and Maintenance
MCA ID	1147
Organization Type	State or U.S. Territorial government
Organization Name	HIDOT Harbors
Sub-Agency or Division	
Organization Mission	Manage and maintain Hawaii's commercial harbors.
Program Name	Engineering Program. Environmental Program.
Total Annual Program Budget	
Primary Business Use	BU 30 - Maritime and Land Boundary Management
Secondary Business Use	BU 01 - Water Supply and Quality
Tertiary Business Use	BU 23 - Urban and Regional Planning

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Not required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Mooring Anchor, Docks, Road and Yard elevation, Crane elevation.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order			QL0B	Order 1a
Update Frequency			2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error			Up to 1 meter	Up to 1 meter
Acceptable Vertical Error			Up to 20 cm	Up to 20 cm
How far onshore needed			1 kilometer inland	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed			Below MLLW	
Tide correction requirement			MLLW	MLLW
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season			Nice to have	Nice to have		Nice to have
Entire AOI under same environmental conditions			Nice to have	Nice to have		Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless			Highly desirable	Highly desirable		Highly desirable
DEM for entire AOI needs to be seamless			Highly desirable	Highly desirable		Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness			I don't know	I don't know		I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM			Required	Required
DTM			Required	Required
DEM			Required	Required
Raw point cloud data			Required	Required
Classified point cloud			Required	
Edited/cube XYZ			Nice to have	Nice to have
Full waveform			Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)			Nice to have	Nice to have
Breaklines required for standard hydro-flattening				
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Not required	Not required
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery			Not required	Not required
Ground control/ground truthing			Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery			Highly desirable	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data			Nice to have	Nice to have
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Nice to have	Nice to have
Routes			Highly desirable	Highly desirable
Offshore cadastral			Nice to have	Nice to have
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Required	Required
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates			Nice to have	
Land use/land cover			Nice to have	Nice to have
Wetlands			Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features			Highly desirable	
Bridges/culverts				
Landmark features			Nice to have	
Cultural resources			Highly desirable	
Coastal and riverine structures			Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used			USACE Hydrosurveys	USACE Hydrosurveys
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts			Yes	Yes
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings			I don't know	I don't know
Cost savings/cost reduction			Moderate	Moderate
Cost avoidance			Moderate	Moderate
Increased revenues			I don't know	I don't know
Mission-driven performance improvements			Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services			I don't know	I don't know

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness			Moderate	Moderate
Improved customer experience			Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach			Moderate	Moderate
Environmental			Moderate	Moderate
Public safety, including life and property			Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings							I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction							Moderate	Annual dollars saved/realized	$100,000	Moderate	Unable to provide	
Cost savings/cost reduction description							Aerial imagery.					
Cost avoidance							Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues							I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements							Moderate	Unable to provide		Moderate	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services							Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness							Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience							Moderate	Unable to provide		Moderate	Unable to provide	
Other customer service benefits							Moderate	Unable to provide		Moderate	Unable to provide	
Other customer service benefits description												
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach							Moderate			Moderate		
Environmental							Major			Major		
Public safety, including life and property							Moderate			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	Yes
Contours			Yes	Yes
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

Idaho

Current status of elevation data for Idaho

Lidar technology has advanced tremendously over the past decade. Furthermore, flooding, fire, landslides, urbanization, and other events have altered Idaho's topography and vegetation over this same time period. As of 2018, less than 20% of the State of Idaho had freely available, public lidar data that could be considered current (i.e., collected within the last 10 years or after 2008). An additional 1% of the state had lidar data collected prior to 2008. At the time of this report and by the end of 2021, it is expected that the State of Idaho will have roughly 75% of the state covered in lidar. Where lidar data (typically 1-m spatial resolution) are not available in Idaho, users must rely upon the USGS National Elevation Dataset (NED) with 10-m spatial resolution.

Importance of elevation data to Idaho

In this survey, 15 Mission Critical Activities (MCAs) were identified by survey participants with 13 primary Business Uses (BUs). Forest Resource Management and Geologic Assessment and Hazard Mitigation were identified with two MCAs. Also identified as primary BUs were water supply and quality, riverine ecosystem management, natural resources conservation, wildfire management, land navigation and safety, wildlife and habitat management, renewable energy resources, flood risk management, marine navigation and safety, aviation navigation and safety, and education and basic research.

- State of Idaho
    - To ensure clean air, water, and land in the state and protect Idaho citizens from the adverse health impacts of pollution.
    - Stream channel analysis and mapping. Stream bank erosion analysis. Aquatic and terrestrial species habitat management. Environmental management.
    - Forest health assessment. Determination of standing inventory of forest resources. Prescribed burn planning. Analysis of carbon stocks for trade. Harvest systems planning.
    - Idaho Power. Alternate energy development – solar and wind. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Low head power potential for hydropower.
    - Flood risk modeling and mapping of riverine and coastal areas. Dam/dike/levee safety analysis. Emergency management. Flood forecasts.
    - Port of Lewiston. Bathymetric measurements of submerged topography. Identification of hazards to navigation. Sediment management at ports. Movement of goods and vessels.
    - Determination of in-flight hazards and path obstructions. Aeronautical charting. Runway construction and repair.
- Idaho Department of Water Resources
    - Recharge Projects located within the Eastern Snake Plain Aquifer Groundwater Model Area: Comprehensive Aquifer Management Plans (specifically as pertains to the Eastern Snake Plain Aquifer). The objectives of Aquifer Management Plans are to: increase predictability for water users by managing for a reliable supply, create alternatives to administrative water use curtailment, manage overall demand for water within the aquifer, increase recharge to the aquifer, and reduce withdrawals from the aquifer.
- Idaho Geological Survey

    - Geologic mapping and analysis: identification of geomorphologic units, landslide hazard mapping and assessment, earthquake and fault hazard mapping, identification of tectonic geomorphologic features, analysis of mineral resources, analysis of oil and gas resources, aquifer recharge, and karst mapping, including springs and caves.
- Idaho Transportation Department (ITD)
    - Highway design, construction, and related activities: highway design requires survey grade lidar. The department has performed aerial lidar collections for routes in District 5 and District 6; other districts have not done this. These aerial lidar collects are being used for planning and preliminary design. Districts collect lidar independent of any statewide collections. Mobile lidar is planned for asset collection, along with a pavement photo log. Survey grade depth of water is needed for bridge projects as they come up.
    - ITD needs to be able to identify water features in order to avoid them or construct culverts or bridges over them when necessary. As a mission critical part of those projects, ITD requires hydraulics analysis and reports to model the expected flows as part of the capacity determination so that culverts/structures are built with sufficient stream width and freeboard, with an appropriate safety factor. To the extent that the National lidar dataset can be captured at a vertical precision of +/- 0.1', and such lidar would accurately describe the dry stream channel, this would be a significant boon to the topographic requirements that feed into ITD's projects involving roads crossing water channels, and this would increase the speed with which our projects could be developed and constructed.
- Nez Perce Tribe
    - Hazard mitigation for floods, fires, and landslides; forest resource protection; riverine fisheries management; flood modeling for planning; wildlife mitigation and monitoring of habitat; utility resource management; agriculture and rangeland management; and cultural protection and restoration.
- University of Idaho
    - Higher education research and teaching activities: research in forestry requires high-resolution elevation/lidar data to monitor forest resources and research in hydrology requires high-resolution elevation and bathymetric data.
- Idaho State University
    - Wildfire Management: support federal and state agencies in post-wildfire management and rehabilitation planning to include post-event debris flows. For post-wildfire management, elevation data are needed to model potential debris flows. Elevation data would improve the modeling of debris flow likelihood and provide additional support to Idaho and other states. The data are also needed for semi-arid ecosystem research, to include the transition areas between natural and cultural conditions.
- Boise State University
    - Education, training, and outreach to support lifelong learning: elevation data support undergraduate and graduate research. The data are used for hydrologic and hydraulic (H&H) modeling, hazard identification and resiliency, natural resources conservation (forest and rangeland management), and to study flooding and the flow of water.

High-level summary of elevation data requirements

As illustrated by the responses to this study, there is a pressing need for higher resolution elevation data in Idaho. As recognized in the Idaho Statewide Lidar Plan, Quality Level 1 (QL1) lidar data is the preferred quality level for accurate analysis across the state. While statewide lidar coverage will be a long-term

process, a challenge on the horizon for Idaho is the need for updated lidar coverage in areas where the existing data are older and where rapid change in topography and vegetation (e.g., fires) are occurring, and will no longer meet the needs of most users and stakeholders. QL1 inland topography is required across areas of the state that are heavily forested and over complex terrain and in areas where geologic fault mapping and other geologic hazards may be found. QL1B inland bathymetry is also required. Both data types should be updated every 4-5 years. Benefits from having improved elevation data include significant time savings, cost avoidance, and mission-driven performance improvements.

Additional comments

A future national elevation data program should revisit the areas containing QL2 or lower data and capture the data as QL1 or higher. Large swaths of data are preferred in order to maintain consistency and quality.

Extending the use of lidar beyond the present applications will occur as more lidar data become available, the methods for using the data become established, and staff and computing resources increase. Areas of growth that could benefit the state include improved confidence and coverage in the uses identified above as well as the expansion into more detailed analyses, project planning, implementation, and monitoring. As examples, additional training as well as integration of lidar data with other ancillary data products or mobile lidar will extend opportunities and adoption of lidar in Idaho.

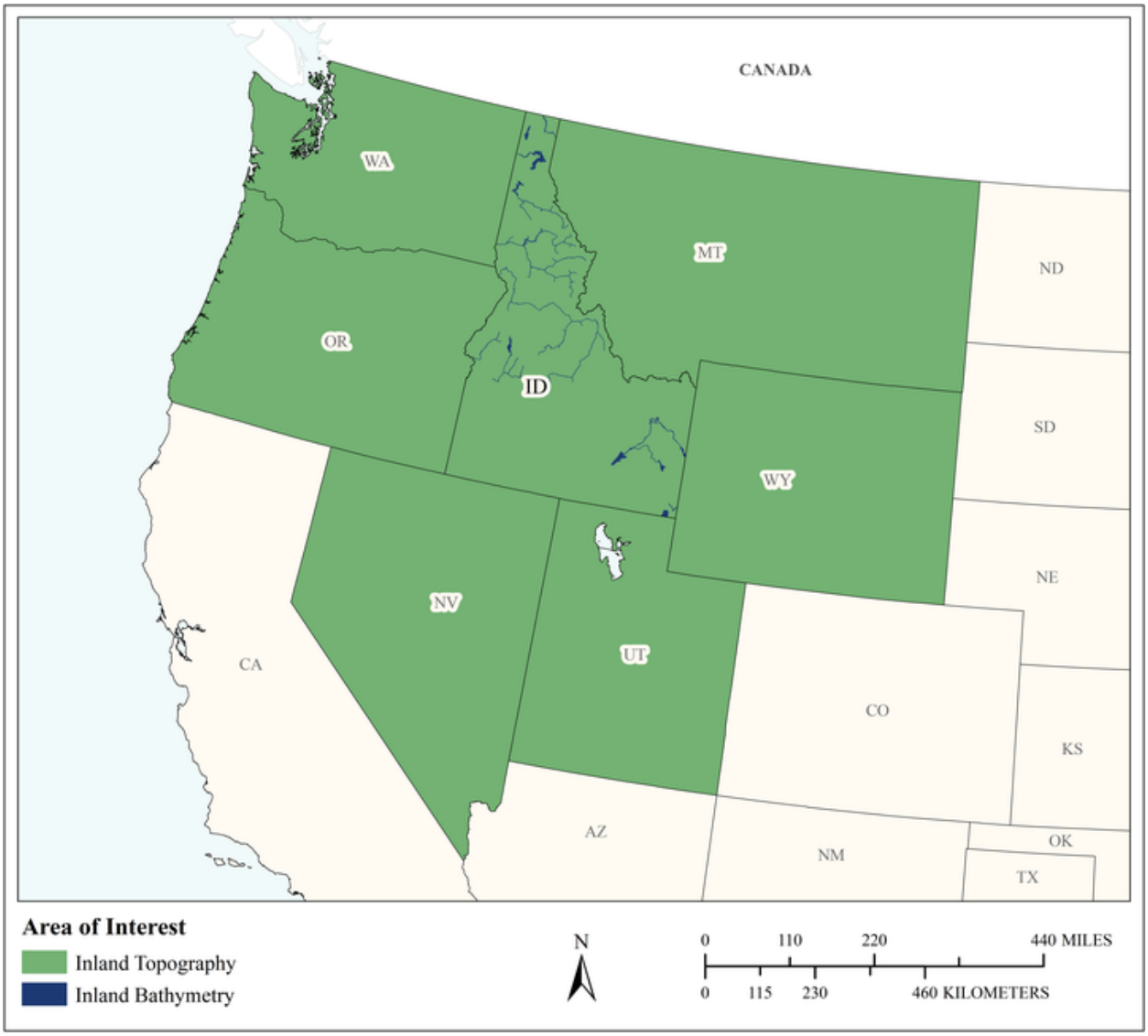
The State of Idaho has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	Idaho Department of Environmental Quality	21640	Environmental Protection	Inland Topo	QL1	2-3 years	$36,180	Unable to quantify	None	Moderate	Minor
				Inland Bathy	Cross sections and/or transects meet needs	4-5 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate
BU 02 – Riverine Ecosystem Management	State of Idaho	60130	Riverine Ecosystem Management	Inland Topo	QL1 HD	6-10 years	$127,912	$12,776	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$68,092	$4,801	Major	Major	Major
BU 04 – Forest Resource Management	University of Idaho	22407	Higher Education Research and Teaching Activities	Inland Topo	QL2	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Inland Bathy	I don't know	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 04 – Forest Resource Management	State of Idaho	60131	Forest Resources Management	Inland Topo	QL1	2-3 years	$330,414	$478,974	Major	Major	Major
BU 06 – Natural Resource Management	Nez Perce Tribe	21639	Nez Perce Tribe Homeland Asset Management	Inland Topo	QL0	4-5 years	$210,407	$31,150	Moderate	Major	Major
				Inland Bathy	QL1B	4-5 years	$52,683	$20,000	Major	Major	Major
BU 07 – Wildlife and Habitat Management	State of Idaho	60132	Wildlife and Habitat Management	Inland Topo	QL2	4-5 years	$19,906	$57,495	Moderate	Major	Moderate
BU 10 – Geologic Assessment	Idaho Department of Water Resources	1305	Recharge Projects Located Within the Eastern Snake Plain Aquifer Groundwater Model Area	Inland Topo	QL1	4-5 years	$56,030	Unable to quantify	Major	Major	Major
BU 10 – Geologic Assessment	Idaho Geological Survey	21557	Geologic Mapping and Analysis	Inland Topo	QL1	6-10 years	$17,640,510	$309,679	Major	Major	Major
				Inland Bathy	QL2B	>10 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 12 – Renewable Energy Resources	State of Idaho	60133	Renewable Energy Resources	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	None
BU 15 – Flood Risk Management	State of Idaho	60134	Flood Risk Management	Inland Topo	QL2	4-5 years	$11,733,536	$2,053,001	Major	Moderate	Major

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 17 – Wildfire Management	Idaho State University	1403	Wildfire Management	Inland Topo	QL1	6-10 years	$449,002	Unable to quantify	Moderate	I don't know	Minor
BU 19 – Land Navigation	Idaho Transportation Department, Division of Highways, District 5	22502	Highway Design, Construction, and Related Activities	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate
				Inland Bathy	Cross sections and/or transects meet needs	4-5 years	Unable to quantify	Unable to quantify	Minor	Moderate	Minor
BU 20 – Marine and Riverine Navigation	State of Idaho	60135	Marine and Riverine Navigation and Safety	Inland Bathy	QL0B	2-3 years	$1,524,362	$200,623	Moderate	Moderate	Moderate
BU 21 – Aviation Navigation	State of Idaho	60136	Aviation Navigation and Safety	Inland Topo	QL1 HD	Annually	$282,507	$351,854	Minor	Moderate	Moderate
BU 26 – Education and Basic Research	Boise State University	22118	Education, Training, and Outreach to Support Lifelong Learning	Inland Topo	QL0 HD	4-5 years	$10,140,979	$804,824	Major	Major	Major
				Inland Bathy	QL0B	6-10 years	$60,301	Unable to quantify	Major	Major	Major

MCA Title: Environmental Protection



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	To ensure clean air, water, and land in the state and protect Idaho citizens from the adverse health impacts of pollution.
MCA Title	Environmental Protection
MCA ID	21640
Organization Type	State or U.S. Territorial government
Organization Name	Idaho Department of Environmental Quality
Sub-Agency or Division	
Organization Mission	To protect human health and the quality of Idaho's air, land, and water.
Program Name	§305B Integrated Report
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Not required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Watersheds 4th-6th
Description of smallest 3D features	Small watersheds or wetlands

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	Cross sections and/or transects meet needs		
Update Frequency	2-3 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 30 cm	Less than 50 cm		
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs		Yes		
Cross section/transect requirement		100 meter spacing		

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Required			Required	
Entire AOI under same environmental conditions	Highly desirable	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Not required			Required	
DEM for entire AOI needs to be seamless	Highly desirable	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Highly desirable	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Not required		
Classified point cloud	Highly desirable	Nice to have		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Not required		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Not required		
Ground control/ground truthing	Highly desirable	Not required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required	Required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Not required		
Land use/land cover	Required	Required		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Nice to have		
Landmark features	Required	Highly desirable		
Cultural resources	Required	Highly desirable		
Coastal and riverine structures	Required	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	USGS Contours USGS 10 & 30 m DEMs	Best available		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	Inside Idaho Geospatial Clearing House	Inside Idaho geospatial clearing house		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available		
Cost savings/cost reduction	Major	Inland bathy data not available		
Cost avoidance	Major	Inland bathy data not available		

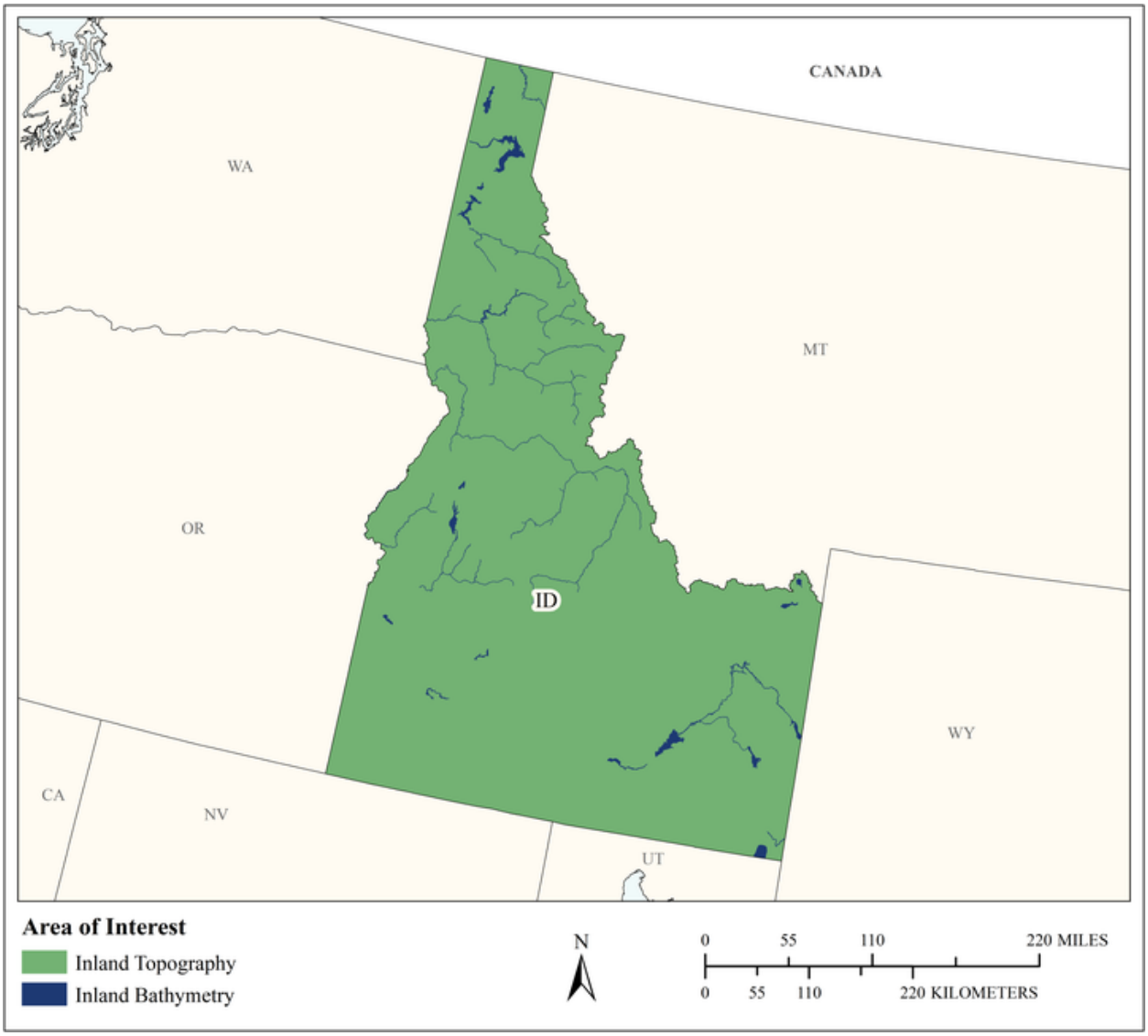
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	I don't know	Inland bathy data not available		
Mission-driven performance improvements	Moderate	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Inland bathy data not available		
Improved response or timeliness	Moderate	Inland bathy data not available		
Improved customer experience	Moderate	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	Inland bathy data not available		
Environmental	Major	Inland bathy data not available		
Public safety, including life and property	Moderate	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$36,180	Major	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide							
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide							
Increased revenues	I don't know	Unable to provide		None								
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide							
Other operational benefits				Moderate	Unable to provide							
Other operational benefits description												
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Moderate	Unable to provide		Moderate	Unable to provide							
Improved customer experience	Moderate	Unable to provide		Major	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			Moderate								
Environmental	Moderate			Major								
Public safety, including life and property	Minor			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Riverine Ecosystem Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Stream channel analysis and mapping. Stream bank erosion analysis. Aquatic and terrestrial species habitat management. Environmental management.
MCA Title	Riverine Ecosystem Management
MCA ID	60130
Organization Type	State or U.S. Territorial government
Organization Name	State of Idaho
Sub-Agency or Division	Idaho Department of Water Resources
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B		
Update Frequency	6-10 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Required			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Required	Highly desirable		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Highly desirable	Nice to have		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Moderate	Minor		
Cost avoidance	Moderate	None		
Increased revenues	None	None		
Mission-driven performance improvements	Major	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		

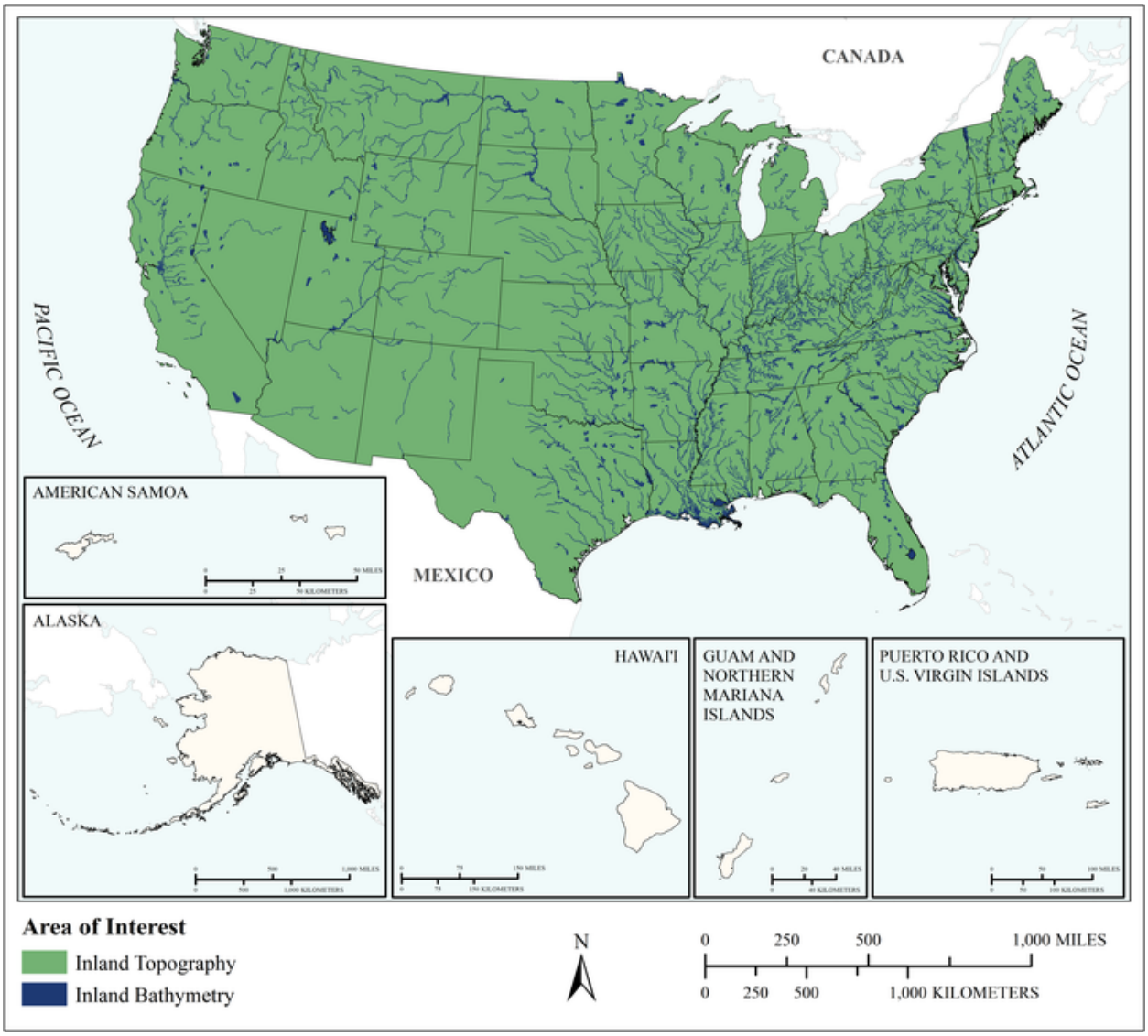
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Moderate		
Improved customer experience	Major	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate		
Environmental	Major	Major		
Public safety, including life and property	Major	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$127,912		Annual dollars saved/ realized	$68,092						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$12,776		Annual dollars saved/ realized	$4,801						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Major			Major								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Higher Education Research and Teaching Activities



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Nationwide, inland areas	Nationwide, inland areas		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Almost all of the ones listed below. Research is taking place in many of these. The College of Natural Resources needs elevation data for forest activities, and the College of Science needs bathymetry for ponds and lakes.
MCA Title	Higher Education Research and Teaching Activities
MCA ID	22407
Organization Type	Academic or Not-for-Profit
Organization Name	University of Idaho
Sub-Agency or Division	
Organization Mission	Shape the future through innovative thinking, community engagement and transformative education.
Program Name	Many college and department offering numerous majors and conducting research
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	BU 05 - Rangeland Management
Tertiary Business Use	BU 17 - Wildfire Management, Planning, and Response

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	
Ocean/sea bottom (>10 m deep)	

General Geographic Area and Size	
Average geographic extent of day-to-day area	Project size, smaller than county
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Individual tree, shrub, etc.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	I don't know		
Update Frequency	2-3 years	2-3 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI	Individual projects could have more stringent requirements			
Acceptable Horizontal Error	I don't know	I don't know		
Acceptable Vertical Error	I don't know	I don't know		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	I don't know
Hydro-enforcement	I don't know
Hydro-conditioning	I don't know
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required			Not required	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Not required	Not required			Not required	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
Other	Highly desirable					
Other description	Seamlessness is not needed between projects but is highly desirable within project areas					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Nice to have		
DTM	Required	Nice to have		
DEM	Required	Nice to have		
Raw point cloud data	Required	Nice to have		
Classified point cloud	Required	Nice to have		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Not required	Not required		
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required	Nice to have		
Ground control/ground truthing	Required	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required	Highly desirable		
Land use/land cover	Required	Not required		
Wetlands	Required	Highly desirable		
Estuaries				
Inland surface water features	Required	Highly desirable		
Bridges/culverts	Required	Not required		
Landmark features	Required	Not required		
Cultural resources	Nice to have	Not required		
Coastal and riverine structures	Not required	Not required		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Best available	Best available		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	INSIDE Idaho; Idaho LiDAR Consortuim; Idaho State University			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know	I don't know		

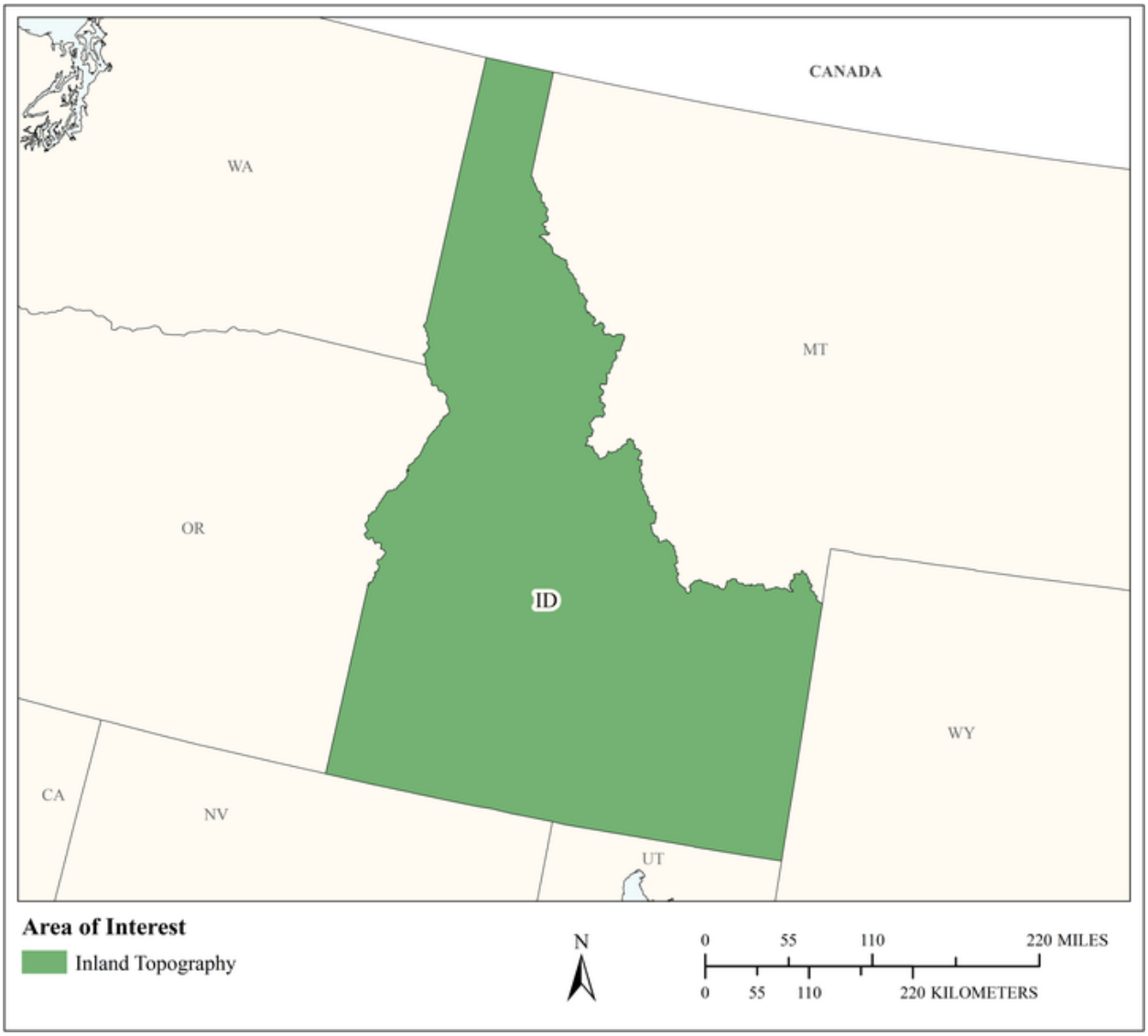
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Cost savings/cost reduction	I don't know	I don't know		
Cost avoidance	I don't know	I don't know		
Increased revenues	I don't know	I don't know		
Mission-driven performance improvements	I don't know	I don't know		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know	I don't know		
Improved response or timeliness	I don't know	I don't know		
Improved customer experience	I don't know	I don't know		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	I don't know		
Environmental	I don't know	I don't know		
Public safety, including life and property	I don't know	I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide							
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide							
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	I don't know	Unable to provide		I don't know	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	I don't know	Unable to provide		I don't know	Unable to provide							
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know								
Environmental	I don't know			I don't know								
Public safety, including life and property	I don't know			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Forest Resources Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Forest health assessment. Determination of standing inventory of forest resources. Prescribed burn planning. Analysis of carbon stocks for trade. Harvest systems planning.
MCA Title	Forest Resources Management
MCA ID	60131
Organization Type	State or U.S. Territorial government
Organization Name	State of Idaho
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Highly desirable			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

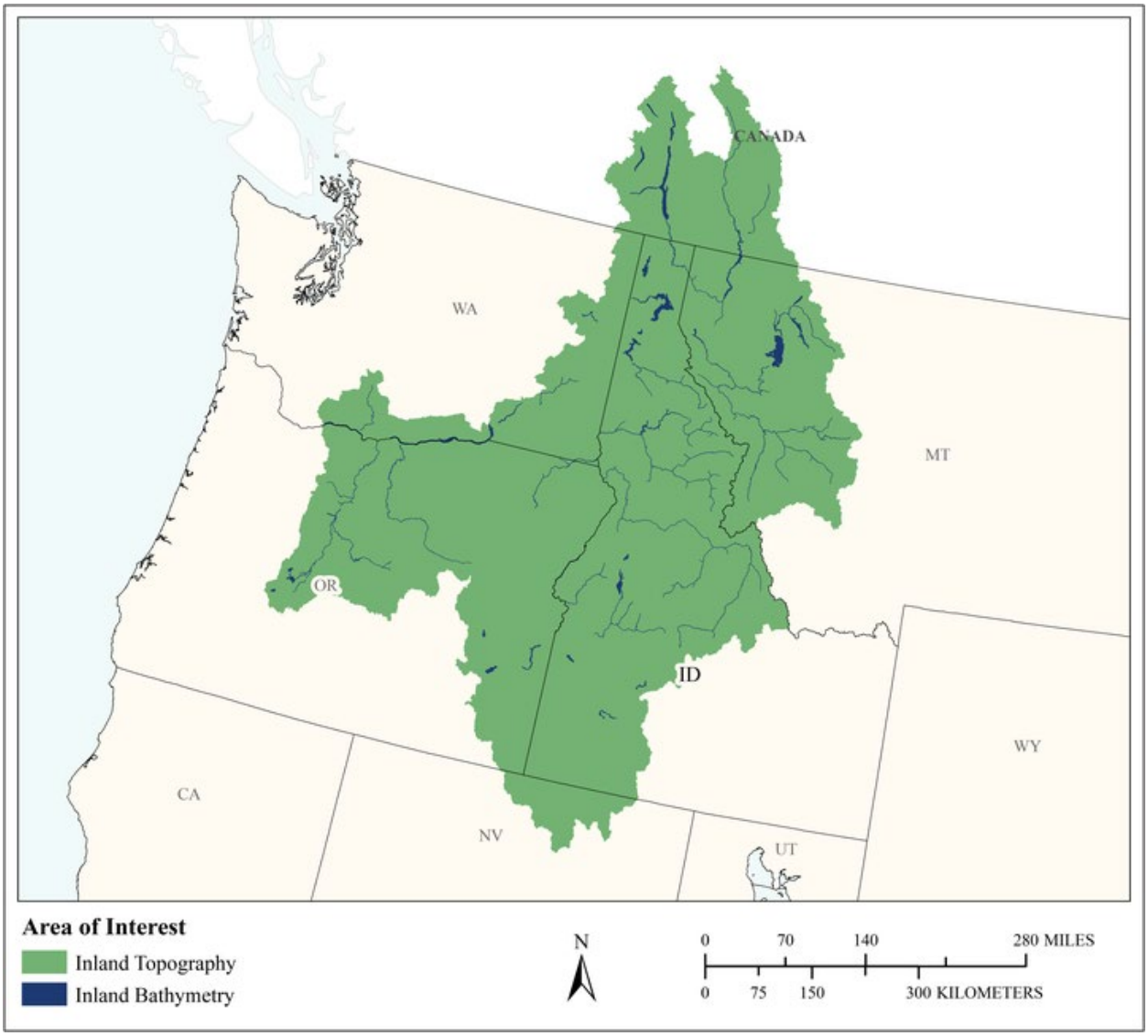
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$330,414									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$478,974									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Nez Perce Tribe Homeland Asset Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)	One or more Hydrologic Units (HUC4s)		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	The Nez Perce Tribe is a leader in our area working with raster and imagery data. We work with five counties in Idaho and three counties in Oregon and Washington. We maintain hunting and fishing rights within the Columbia basin, so our range is broad. Elevation data aid services provided by the following departments: Land Services, Fisheries, Forestry and Water Resource. We all contribute to emergency management and hazard mitigation. Our Water Resources department is certified to assess and assist in hazardous spills in our rivers and streams. Elevation data are needed for the following: Hazard mitigation for floods, fires, and landslides. Forest resource protection. Riverine fisheries management. Flood modeling for planning. Wildlife mitigation and monitoring of habitat. Utility resource management. Agriculture and rangeland management. Cultural protection and restoration. Note: This is several departments. BUs: 01, 02, 04, 05, 06, 07, 08, 09, 10, 14, 15, 17, 18, 23, 26, 28
MCA Title	Nez Perce Tribe Homeland Asset Management
MCA ID	21639
Organization Type	Tribal government
Organization Name	Nez Perce Tribe
Sub-Agency or Division	
Organization Mission	Natural resource management, utilities, fisheries restoration and land management. Emergency management and response.
Program Name	Natural Resources and Fisheries divisions with some housing and law enforcement.
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	BU 09 - Fisheries Management and Aquaculture
Tertiary Business Use	BU 14 - Cultural Resources Preservation and Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.

General Geographic Area and Size	
Description of smallest 3D features	We are looking at pump stations, meter boxes, and fire hydrants in one of our projects. Most of our work is within the small features, but we could do so much more with the survey level for small area projects. Small features for the entire area of forest with canopy structure is important. Underwater pipes and tanks for Water Resources Underground Storage Tank (UST). Fish redds, fish passage barriers. All for underwater features.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL1B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 40 cm	Less than 50 cm		
Acceptable Vertical Error	Up to 10 cm	Up to 20 cm		
How far onshore needed				
How far down the beach profile needed	To MHHW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required

Hydrologic Processing Required	Response
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have			Required	
Entire AOI under same environmental conditions	Required	Highly desirable			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Highly desirable	Highly desirable		
Edited/cube XYZ		Required		
Full waveform	Nice to have	Highly desirable		
Bathymetric Attributed Grid (BAG)		Required		
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required	Required		
Ground control/ground truthing	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Required		
Land use/land cover	Required	Highly desirable		
Wetlands	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Highly desirable	Required		
Landmark features	Highly desirable	Required		
Cultural resources	Required	Highly desirable		
Coastal and riverine structures	Highly desirable	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	USGS DEM date and quality unknown Lidar for some of the AOI 2016 Q1	We only have a small amount of bathymetry for the large lake and rivers. We got this from the Army Corp of Engineers. We would like to be able to locate dip ponds for firefighting resources.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI	Yes			
Open Topography				
NOAA nautical charts				
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Moderate		

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Cost savings/cost reduction	Major	Major		
Cost avoidance	Moderate	Major		
Increased revenues	Moderate	Minor		
Mission-driven performance improvements	Major	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Major		
Improved response or timeliness	Major	Major		
Improved customer experience	Moderate	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor		
Environmental	Major	Major		
Public safety, including life and property	Major	Major		

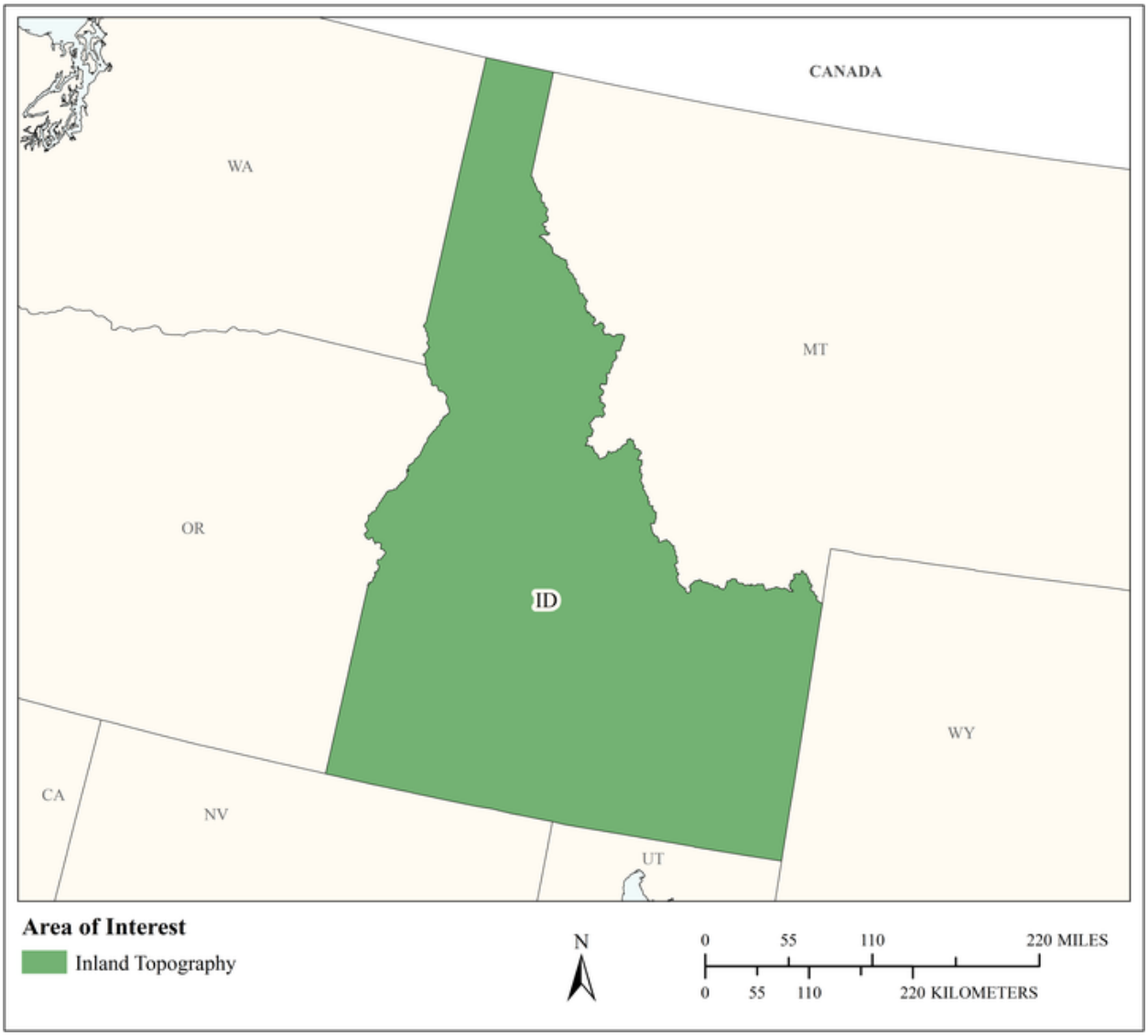
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$31,658	Major	Annual dollars saved/realized	$8,683						
Time savings description	We don't do permitting, we do boundary and parcel determination minimal change to this task. Better modeling will allow us to make decisions on focus areas, thus giving us more time on areas of need instead of assessment. With better data we would have less time correcting data. There will always be a need to manipulate data from several different sources. Currently we are modeling and correcting areas we know to be off and better data will save us time. Field inspections can be spaced out and repeated time lengthened.			Nothing to compare it to as we do not use anything at this time. Has to be better than us going out with a rod. Although a day or two on a lake would nice. Three days of field work would be saved each month until project completed. No permitting in the current project. We would be able to station staff in areas to help and monitor the level of the ponds in an emergency.								
Cost savings/cost reduction	Major	Annual dollars saved/realized	$175,000	Moderate	Unable to provide							
Cost savings/cost reduction description	We currently look for other funds and projects to get the data we need. Restoration projects for streams and wetlands can benefit. As will our agricultural production.			No product purchased currently. Purchase prices too high for project.								
Cost avoidance	Major	Annual dollars saved/realized	$3,750	Major	Annual dollars saved/realized	$44,000						
Cost avoidance description	Finding and correcting errors. For our current lidar data it takes our analyst several hours to process. Not applicable. With mitigation we can plan better with more accurate data.			No information on this question. We would have to develop a Q&A process. Average loss of property due to wildfires. Would save us processing time if we collected and had to process.								
Increased revenues	Major	Unable to provide		Major	Unable to provide							
Increased revenues description	Fisheries is working on a project to locate and protect fish redds, better data means more fish, more fish means more fishermen!.			Should be able to improve harvest by monitoring instream flows and stream carrying capacity.								
Mission-driven performance improvements	Major	Annual percent improvement	52%	Major	Annual percent improvement	100%						
Mission-driven performance improvements description	We will be able to provide better information at a faster rate to our decision makers. We can save time and thus work on more effective projects. It will just mean less time spent.			Since we are not providing anything right now it would be 100% improvement.								
Other operational benefits	Major	Unable to provide										
Other operational benefits description	Better communication between departments. Right now people gather data and having one dataset that is for the entire AOI we can work more efficiently together.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$6,030	Major	Unable to provide							
Value added to products or services description	We are constantly looking at economic development. Developing better flood maps with allow us to mitigate and evacuate faster and more effectively.											
Improved response or timeliness	Major	Annual dollars saved/realized	$24,120	Major	Annual dollars saved/realized	$20,000						

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Improved response or timeliness description	Our flood hazard maps are from the 1950's in some areas. Was not given an answer on how this will help with the EIS reviews. We will be able to place resources where needed. Making maps accessible to the public online will save our office alone hundreds of hours and phone calls.			Minimize loss from wildfires. We could provide faster fire suppression knowing where the ponds are and which buckets can draw from them.								
Improved customer experience	Major	Annual dollars saved/realized	$1,000	Major	Unable to provide							
Improved customer experience description	If our departments have confidence in the products they will work together. We will save on storage space and time. We can assure leadership that we are using the best data and giving them accurate information on which they base decisions on. Lots of possibilities.											
Other customer service benefits				Major	Unable to provide							
Other customer service benefits description				By having an idea of the capacity and location of holes we can spend our resources on those areas for fish protection. Fish health.								
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major								
Education or outreach description	Students embrace technology. We can provide some cool lessons for our local schools.											
Environmental	Major			Major								
Environmental description	Better data, better monitoring. We can manage our lands with more accuracy.											
Public safety, including life and property	Major			Major								
Public safety, including life and property description	Developing evacuation routes that don't go over areas that might subside by using better data.											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes	Yes		
Cross sections		Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Wildlife and Habitat Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation planning for wildlife refuges and marine sanctuaries. Conservation of critical habitats. Management of diverse migratory bird habitats, coral reef and coral communities, marine mammals, protected fish species, and trust resources.
MCA Title	Wildlife and Habitat Management
MCA ID	60132
Organization Type	State or U.S. Territorial government
Organization Name	State of Idaho
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			

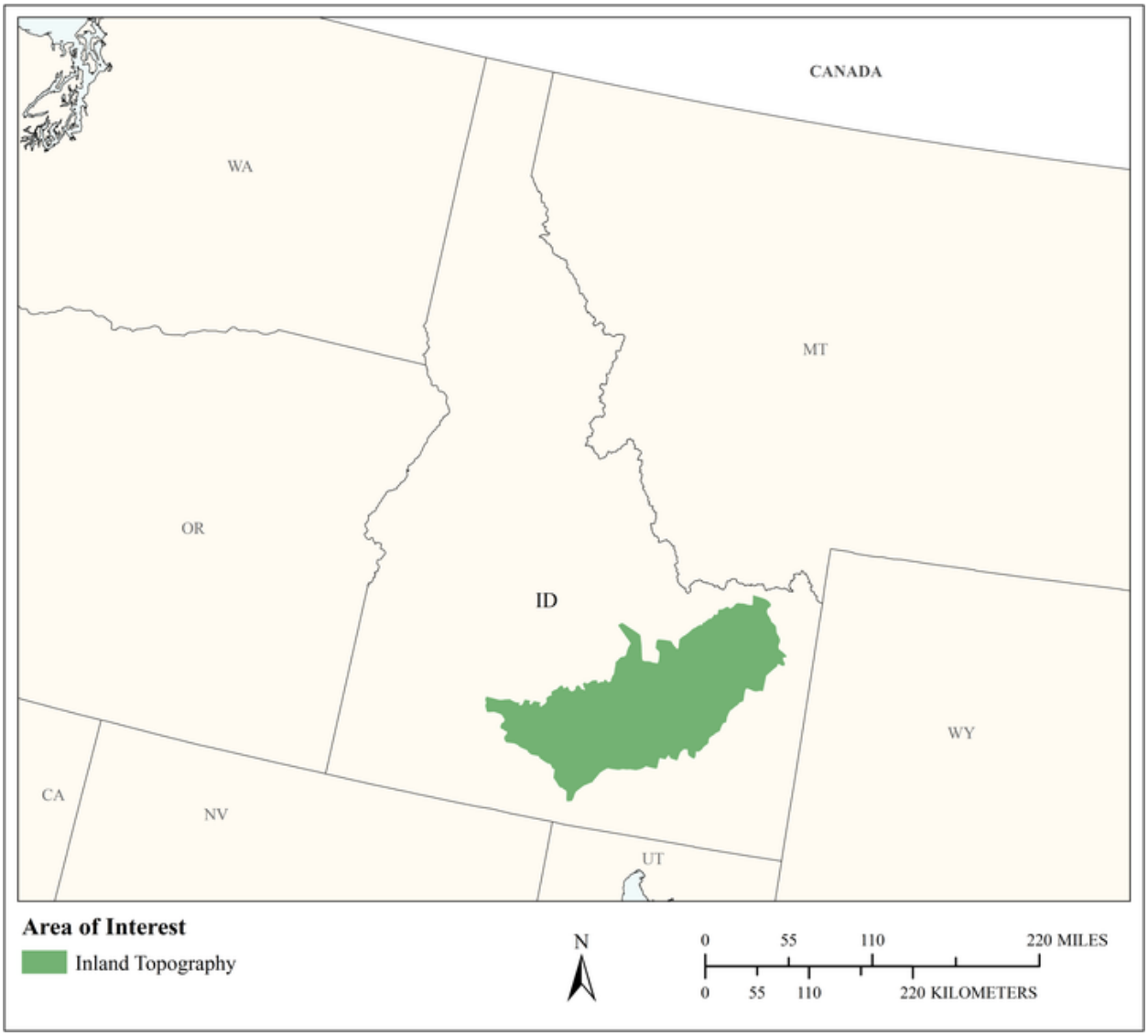
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Minor			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Moderate			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Minor	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$19,906									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$57,495									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Major											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Recharge Projects Located Within the Eastern Snake Plain Aquifer Groundwater Model Area



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Respondent provided own shapefile, KML, or geodatabase			
Sub Area Requirements	Eastern Snake Plain Aquifer			

MCA Description	Response
Mission Critical Activity	Comprehensive Aquifer Management Plans (specifically as pertains to the Eastern Snake Plain Aquifer. The objectives of Aquifer Management Plans are to: * Increase predictability for water users by managing for a reliable supply * Create alternatives to administrative water use curtailment * Manage overall demand for water within the aquifer * Increase recharge to the aquifer * Reduce withdrawals from the aquifer
MCA Title	Recharge Projects Located Within the Eastern Snake Plain Aquifer Groundwater Model Area
MCA ID	1305
Organization Type	State or U.S. Territorial government
Organization Name	Idaho Department of Water Resources
Sub-Agency or Division	
Organization Mission	To serve the citizens of Idaho by ensuring that water is conserved and available to sustain Idaho's economy, ecosystems, and resulting quality of life and by appropriating, regulating, and protecting the public waters of the State of Idaho, including waters flowing in their natural channels, all natural springs and lakes within the boundaries of the state, and ground waters of the state. Water law in Idaho is founded on the appropriation doctrine which is based on diversion and beneficial use.
Program Name	IDWR Hydrology Section and the Planning and Water Projects Bureau
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 23 - Urban and Regional Planning
Tertiary Business Use	BU 01 - Water Supply and Quality

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Canals low points in topography, concrete structures

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 60 cm			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Nice to have					
Other	Nice to have					
Other description	Collected without snow pack conditions					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have					
DEM for entire AOI needs to be seamless	Nice to have					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	10m NEDs to identify recharge basins and/or contours from DRGs initially; followed up with localized collections by drone, aircraft or field survey.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Idaho Lidar Consortium			

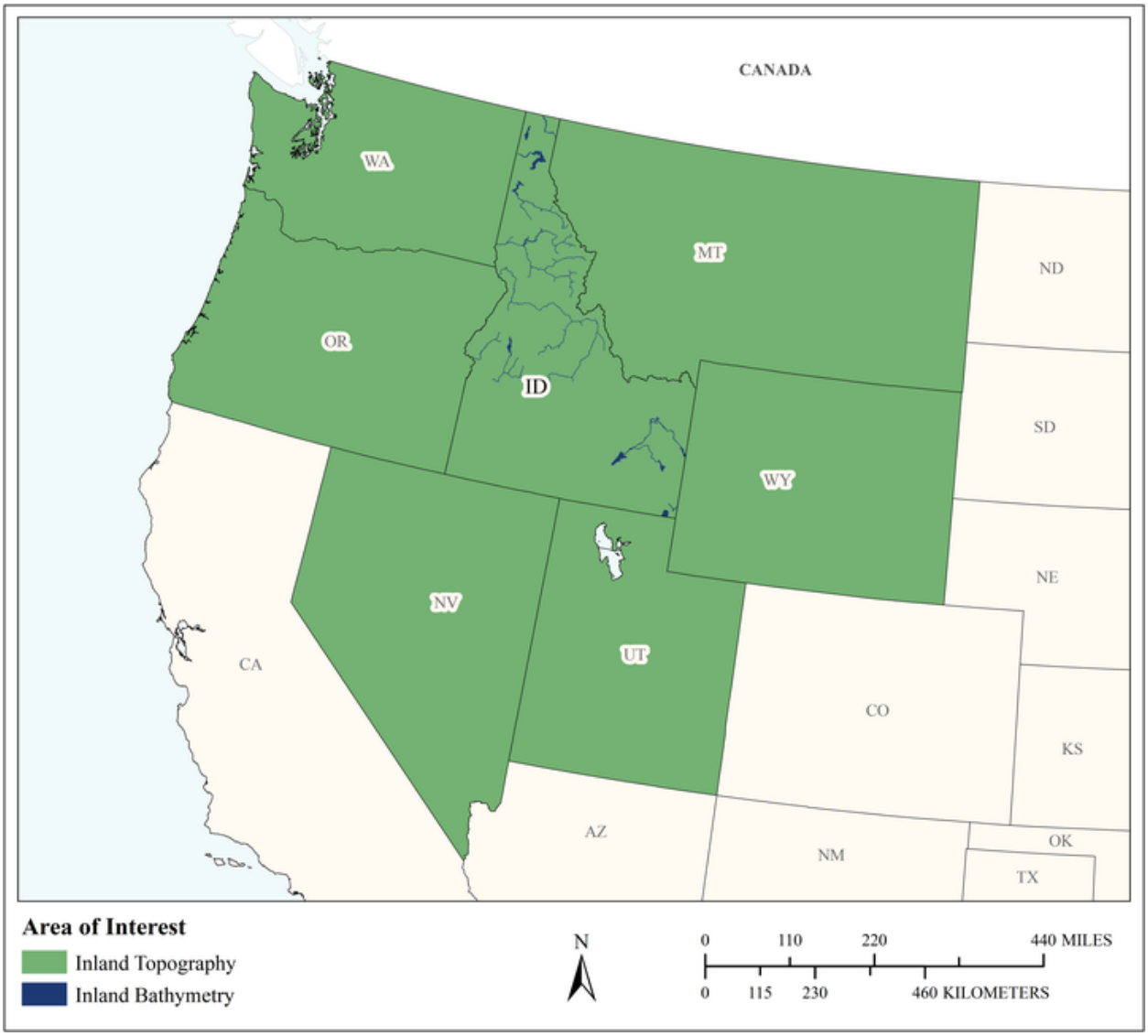
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Moderate			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$6,030									
Time savings description	Without 3D elevational data, we rely on 3-4 staff contributing at minimum 2 weeks of field time per basin.											
Cost savings/cost reduction	Major	Annual dollars saved/realized	$50,000									
Cost savings/cost reduction description	Previous projects ~45,000; future planned projects are expected to cost similarly. As many as 4 regions (Eastern Snake Plain, Treasure Valley, Spokane Valley, and Lewiston Orchards) are planned for future recharge projects.											
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved response or timeliness description	Flood. The Water Resource Board is our customer so when they have questions/suggestions for locating possible recharge projects, currently the work is contracted out to determine suitability and may take a minimum of 4 months to route contracts for field work and analysis. Having 3D data available on hand for analysis may shorten that time frame by 95%. End result of having elevational data is that the turnaround time from question to answer goes from approximately 4 months to 4 days. Particularly flooding events; flood/home insurance. Improved planning for breech in and around recharge projects to save lives and equipment and infrastructure.											
Improved customer experience	Major	Unable to provide										
Improved customer experience description	Documentation of upcoming and currently occurring land subsidence. Increased precision and accuracy (NED vs lidar) for determining successful recharge projects.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Environmental description	Both for water quality and availability											
Public safety, including life and property	Major											
Public safety, including life and property description	Flood hazard maps for rivers or recharge basins											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades				
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Geologic Mapping and Analysis



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Geologic mapping and analysis. Identification of geomorphologic units. Landslide hazard mapping and assessment. Earthquake and fault hazard mapping. Identification of tectonic geomorphologic features. Analysis of mineral resources. Analysis of oil and gas resources. Karst mapping, including springs and caves. Aquifer recharge.
MCA Title	Geologic Mapping and Analysis
MCA ID	21557
Organization Type	State or U.S. Territorial government
Organization Name	Idaho Geological Survey
Sub-Agency or Division	
Organization Mission	The Idaho Geological Survey is the lead state agency for the collection, interpretation, and dissemination of geologic and mineral data for Idaho. The Idaho Geological Survey provides timely and meaningful information to the public, industry, academia, and legislative decision makers by conducting geologic mapping, geohazard assessments that focus on earthquakes and landslides, mineral and energy resource assessments, groundwater and hydrology research, and educational and outreach opportunities.
Program Name	Geologic Mapping. Geologic Hazards. Geologic Resources (oil and gas, minerals, geothermal, groundwater).
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 11 - Geologic Resource Mining and Extraction
Tertiary Business Use	BU 13 - Oil and Gas Resources

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Subtle fault scarps. Landslide headscarps and fissures.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Nice to have
51 - 100 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B		
Update Frequency	6-10 years	>10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required			Not required	
Entire AOI under same environmental conditions	Not required	Highly desirable			Not required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Not required	Not required		
Classified point cloud	Highly desirable	Highly desirable		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Not required		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required	Required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Nice to have	Not required		
Wetlands	Not required	Not required		
Estuaries				
Inland surface water features	Nice to have	Nice to have		
Bridges/culverts	Not required	Not required		
Landmark features	Not required	Not required		
Cultural resources	Not required	Not required		
Coastal and riverine structures	Nice to have	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	10-m NED digital elevation model is available for the entire state of Idaho. Photogrammetrically derived topography is used for some 7.5 minute quadrangle maps. Sparse lidar data is available, covering ~10% of the state. Lidar data range in age from ~2003 to present, and Quality Level varies accordingly.	Currently only using seismic profiles in Bear Lake, which approximate lake bottom.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Idaho Lidar Consortium (https://www.idaholidar.org/)			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available		
Cost savings/cost reduction	Major	Inland bathy data not available		
Cost avoidance	Major	Inland bathy data not available		
Increased revenues	Minor	Inland bathy data not available		
Mission-driven performance improvements	Major	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available		
Improved response or timeliness	Moderate	Inland bathy data not available		
Improved customer experience	Moderate	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Inland bathy data not available		
Environmental	Major	Inland bathy data not available		
Public safety, including life and property	Major	Inland bathy data not available		

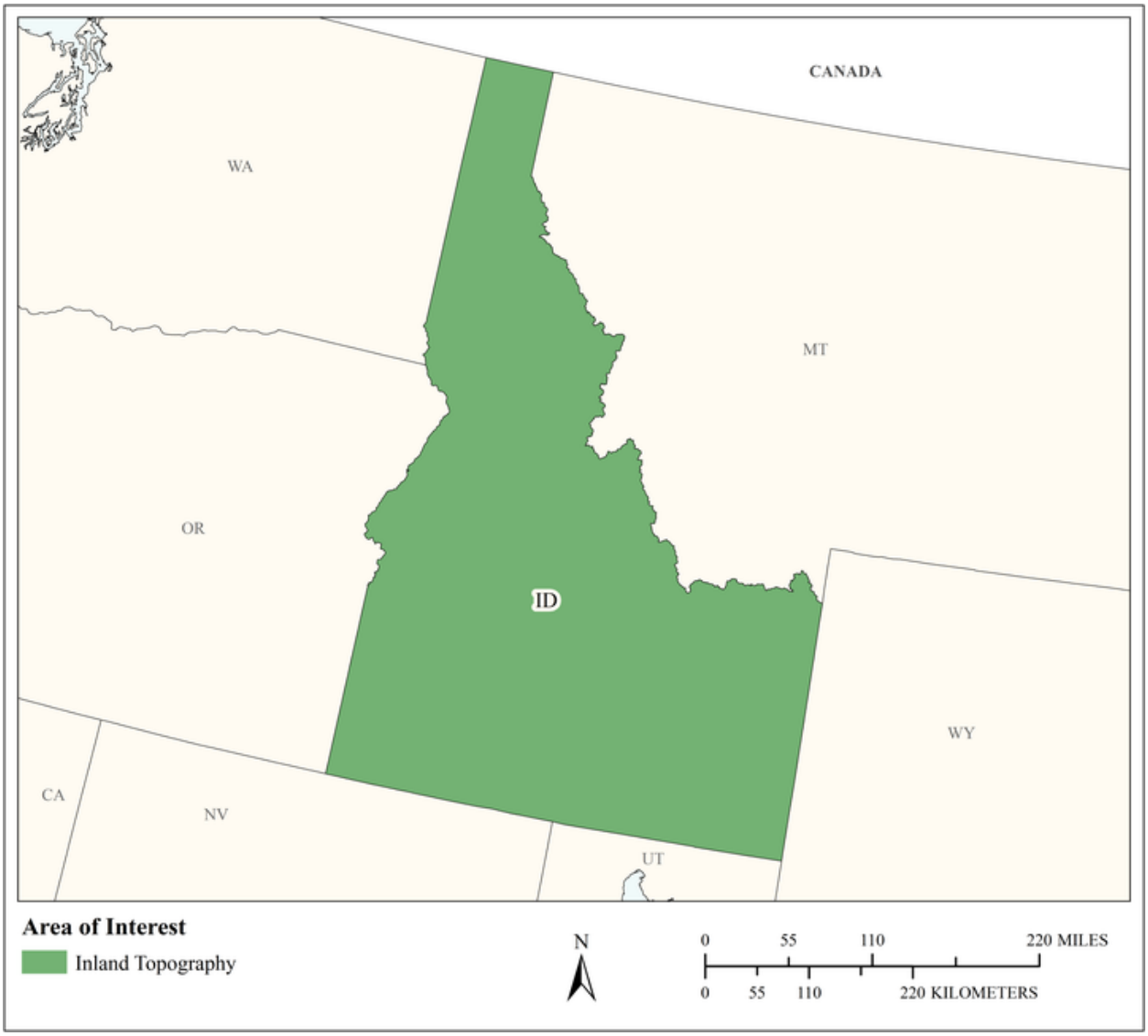
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Minor	Unable to provide							
Time savings description	Significant time saved by Geologic Mapping program. Better basemaps for cartography, and more thorough desktop mapping can be done before field visits. Time saved avoiding processing and manipulation of disparate lidar datasets.											
Cost savings/cost reduction	Major	Unable to provide		Minor	Unable to provide							
Cost savings/cost reduction description	Cost savings on almost every project that uses elevation data, including STATEMAP basemaps. Additional cost savings for hazard mapping in which elevation data would be collected with UAVs.											
Cost avoidance	Major	Unable to provide		Minor	Unable to provide							
Cost avoidance description	Significant effort saved in downloading, managing, processing disparate datasets. Lidar provides much better basemaps for hazard mapping, particularly landslide and active fault mapping. Landslide identification and characterization is greatly improved with lidar.			May help characterize seismic hazard in basins with large lakes covering active faults.								
Increased revenues	Major	Unable to provide		I don't know	Unable to provide							
Increased revenues description	Higher quality basemaps for cartographic publications and interactive online maps.											
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements description	Better lidar data will help IGS catalog hazards and prioritize further work, such as landslide mitigation recommendations or paleoseismic fault trenching. Especially valuable for geologic hazards program, which relies on high resolution topographic data to characterize hazards. The work of the geologic mapping and geologic hazard programs would be more effective.											
Future annual operational benefits added during validation		Annual dollars saved/ realized	$17,640,510									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	Major	Unable to provide		I don't know	Unable to provide							
Improved customer experience	Major	Unable to provide		I don't know	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$309,679									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			I don't know								

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Education or outreach description	Opportunities to conduct hazard training for smaller municipalities. Opportunities to continue IGS' teacher training workshops.			
Environmental	Major	I don't know		
Environmental description	Better understanding of mass movement sediment sources to water ways. Understanding landslide hazards along transportation corridors that carry hazardous materials.			
Public safety, including life and property	Major	I don't know		
Public safety, including life and property description	Overall better understanding of geologic hazards. New lidar data greatly facilitates updates/revisions of state landslide and fault databases.	May help character seismic hazard in basins with large lakes covering active faults.		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Renewable Energy Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Idaho Power. Alternate energy development – solar and wind. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Low head power potential for hydropower.
MCA Title	Renewable Energy Resources
MCA ID	60133
Organization Type	State or U.S. Territorial government
Organization Name	State of Idaho
Sub-Agency or Division	Idaho Power
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Not required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Minor			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor			

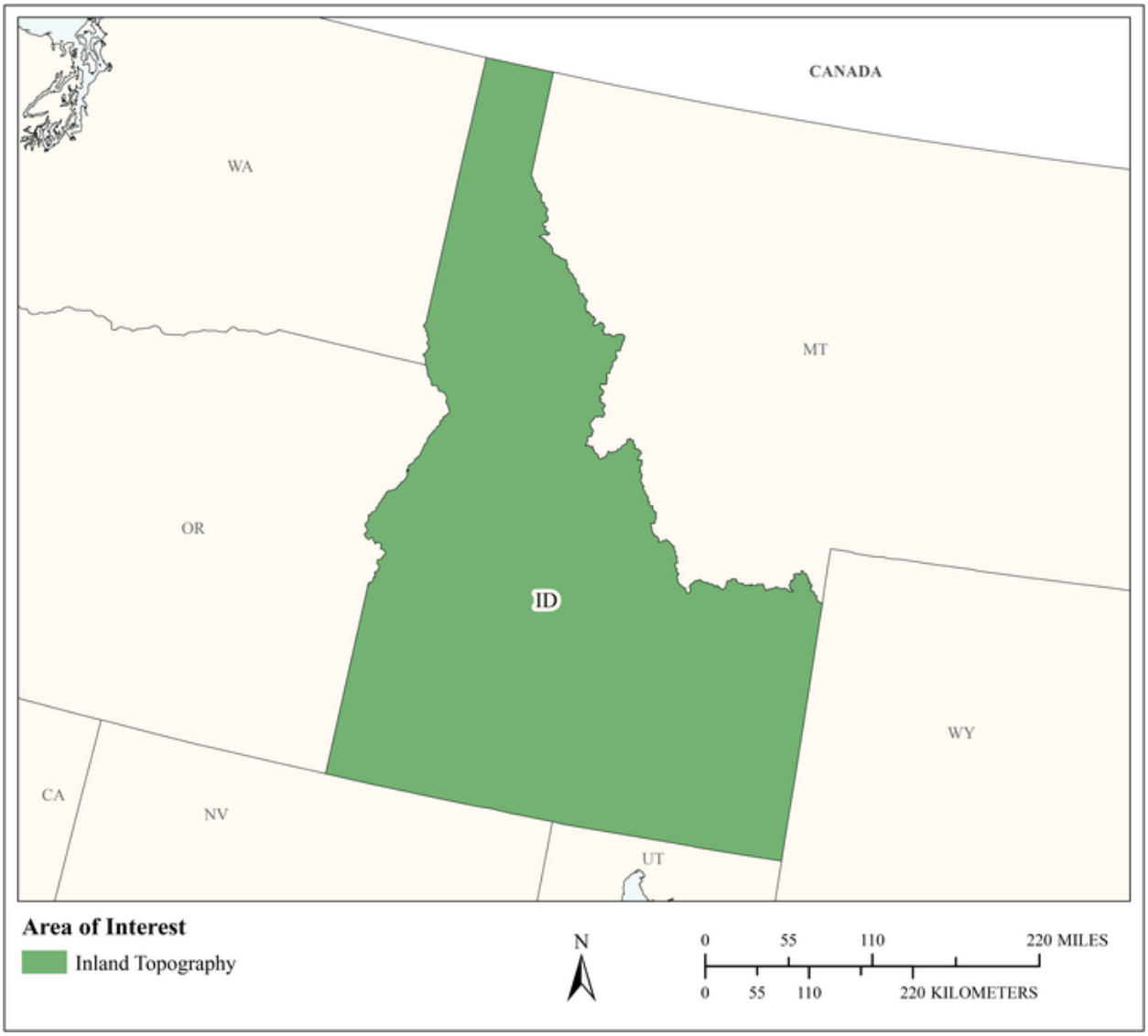
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	None											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Flood Risk Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Flood risk modeling and mapping of riverine and coastal areas. Dam/dike/levee safety analysis. Emergency management. Flood forecasts.
MCA Title	Flood Risk Management
MCA ID	60134
Organization Type	State or U.S. Territorial government
Organization Name	State of Idaho
Sub-Agency or Division	Idaho Department of Water Resources
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

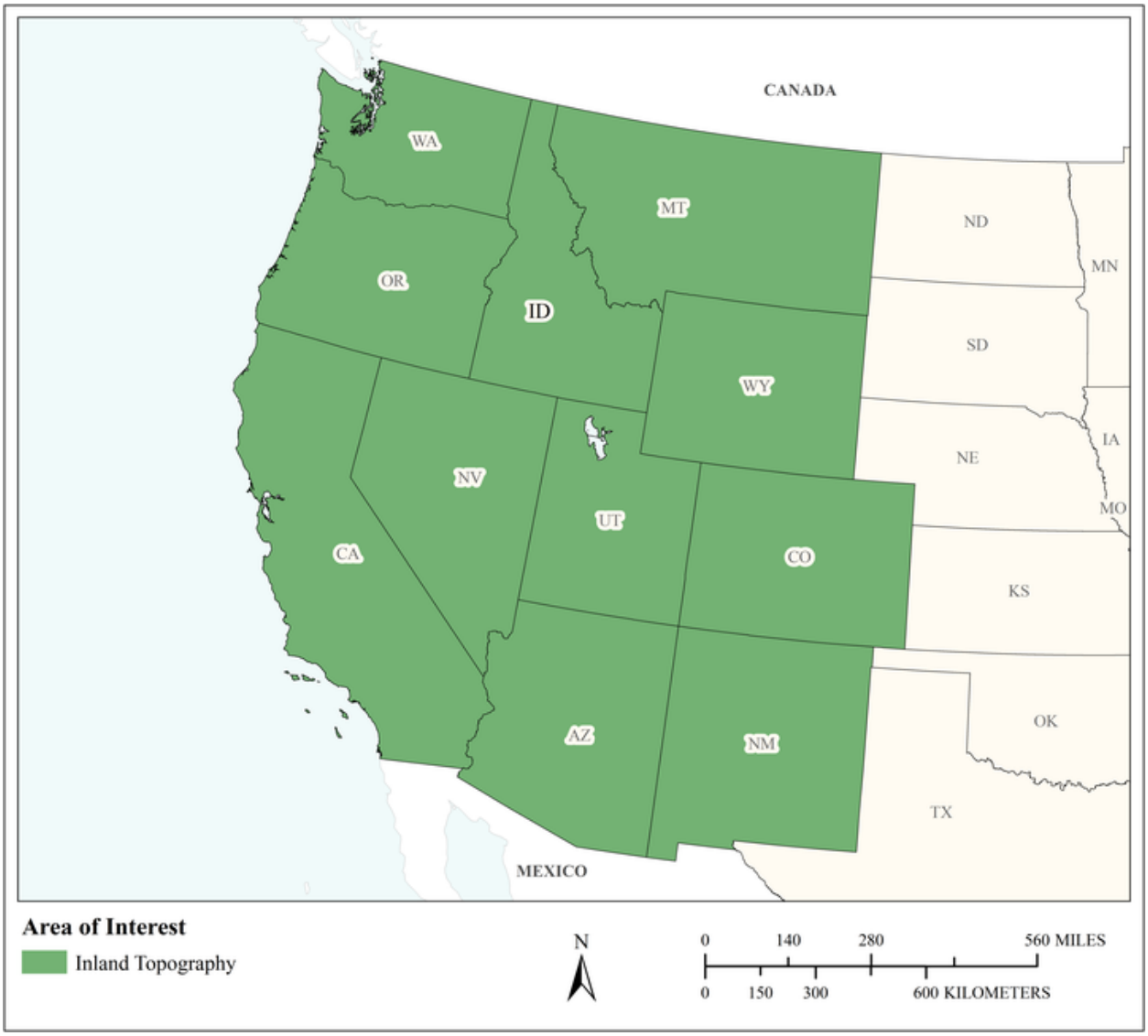
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$11,733,536									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$2,053,001									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Moderate											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Wildfire Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	RECOVER: support federal and state agencies in post-wildfire management and rehabilitation planning to include post-event debris flows. BU17 Wildfire management. For post-wildfire management, elevation data are needed to model potential debris flows. Elevation data would improve the modeling of debris flow likelihood, and provide additional support to Idaho and other states. The data are also needed for semi-arid ecosystem research, to include the transition areas between natural and cultural conditions.
MCA Title	Wildfire Management
MCA ID	1403
Organization Type	Academic or Not-for-Profit
Organization Name	Idaho State University
Sub-Agency or Division	
Organization Mission	Education and research. A primary focus of the geospatial research focuses on land cover change and the drivers of change, principally wildfire and invasive weeds, and their interactions. This includes modeling landscapes, habitat assessments, and post-fire events such as erosion and debris flows. Throughout this research program, topography is an extremely important variable. The mission of ISU's GIS Center is to facilitate sound decision making through the application of geospatial technologies.
Program Name	RECOVER
Total Annual Program Budget	
Primary Business Use	BU 17 - Wildfire Management, Planning, and Response
Secondary Business Use	BU 05 - Rangeland Management
Tertiary Business Use	BU 08 - Agriculture and Precision Farming

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	1-5 meters (square) in size.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	6-10 years			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 30 cm			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Nice to have			
Raw point cloud data	Not required			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Nice to have			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Not required			
Landmark features	Not required			
Cultural resources	Not required			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	NED- 10m x 10m imagery. LiDAR data in Idaho is too spotty to ever be of practical use.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Idaho LiDAR Consortium			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	I don't know			

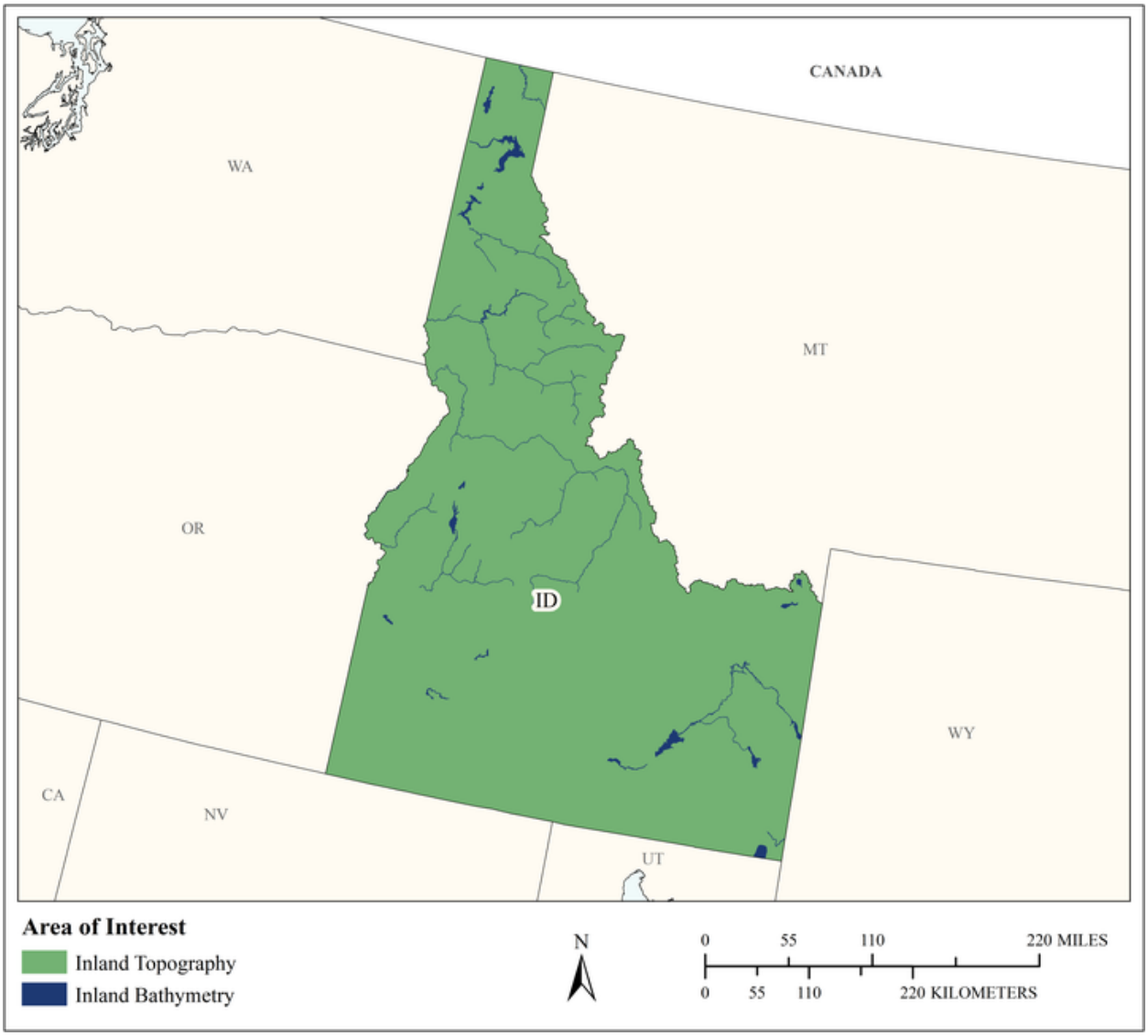
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Minor			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	I don't know	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$449,002									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	I don't know											
Public safety, including life and property	Minor											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Highway Design, Construction, and Related Activities



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Nice to have		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Highway design, construction, and related activities such as environmental mitigation and hydrology. Highway design requires survey grade lidar. The department has performed aerial lidar collections for routes in District 5 and District 6; other districts have not done this. These aerial lidar collects are being used for planning and preliminary design. Districts collect lidar independent of any statewide collections. Mobile lidar is planned for asset collection, along with a pavement photo log. Survey grade depth of water is needed for bridge projects as they come up. DOT needs to be able to identify water features in order to avoid them or construct culverts or bridges over them when necessary. As a mission critical part of those projects, we require hydraulics analysis and reports to model the expected flows as part of the capacity determination so that our culverts/structures are built with sufficient stream width and freeboard, with an appropriate safety factor. To the extent that the National LiDAR dataset can be captured at a vertical precision of +/- 0.1', and such LiDAR would accurately describe the dry stream channel, this would be a significant boon to the topographic requirements that feed into ITD's projects involving roads crossing water channels, and this would increase the speed with which our projects could be developed and constructed.
MCA Title	Highway Design, Construction, and Related Activities
MCA ID	22502
Organization Type	State or U.S. Territorial government
Organization Name	Idaho Transportation Department, Division of Highways, District 5
Sub-Agency or Division	
Organization Mission	The mission of the Idaho Transportation Department is to provide safety, mobility, and economic opportunity for the traveling public.
Program Name	Idaho's state transportation improvement program
Total Annual Program Budget	
Primary Business Use	BU 19 - Land Navigation and Safety
Secondary Business Use	BU 22 - Infrastructure and Construction Management
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Variable - our transportation district covers seven counties, but we also identify single objects such as signs and culverts.
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.

General Geographic Area and Size	
Description of smallest 3D features	Signposts and faces, guardrail, culverts, light poles, survey markers, highway delineators, vegetation types.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	Cross sections and/or transects meet needs		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI	Our primary need is along the state highway system.			
Acceptable Horizontal Error	Less than 20 cm	Less than 50 cm		
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial	Yes		

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross section/transect requirement	For highway design, survey-grade (centimeter-level) accuracy is required. Cross-section sampling density would need to be collected at a minimum of 50 feet, but would need to be denser depending on terrain. However, for other purposes, such as wetland/habitat delineation for environmental mitigation, lower-accuracy 3D data is acceptable. Survey-grade location data for highway design is collected on a project-by-project basis; ITD District 5 has also collected planning-grade 3D data (Lidar) along all of its routes for other purposes.	Depending on the terrain, a minimum of 50 feet would likely be required for the transect density.		

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Nice to have	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Nice to have			Nice to have	
DEM for entire AOI needs to be seamless	Highly desirable	Nice to have			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable		
DTM	Required	Required		
DEM	Nice to have	Nice to have		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Highly desirable	Highly desirable		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Not required		
Ground control/ground truthing	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Required	Required		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Nice to have	Nice to have		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Required	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Although we have used DEM data (downloaded from The National Map) for a few GIS analysis projects, our 3D data is typically collected at survey-grade using GPS survey equipment or LiDAR on a project-by-project basis. Planning-grade aerial Lidar was collected along all of ITD District 5's routes in Summer 2016.	Our current bathymetric data is survey-grade and collected on a project-by-project basis. These data are typically collected where highway bridges cross rivers, streams, and canals.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				

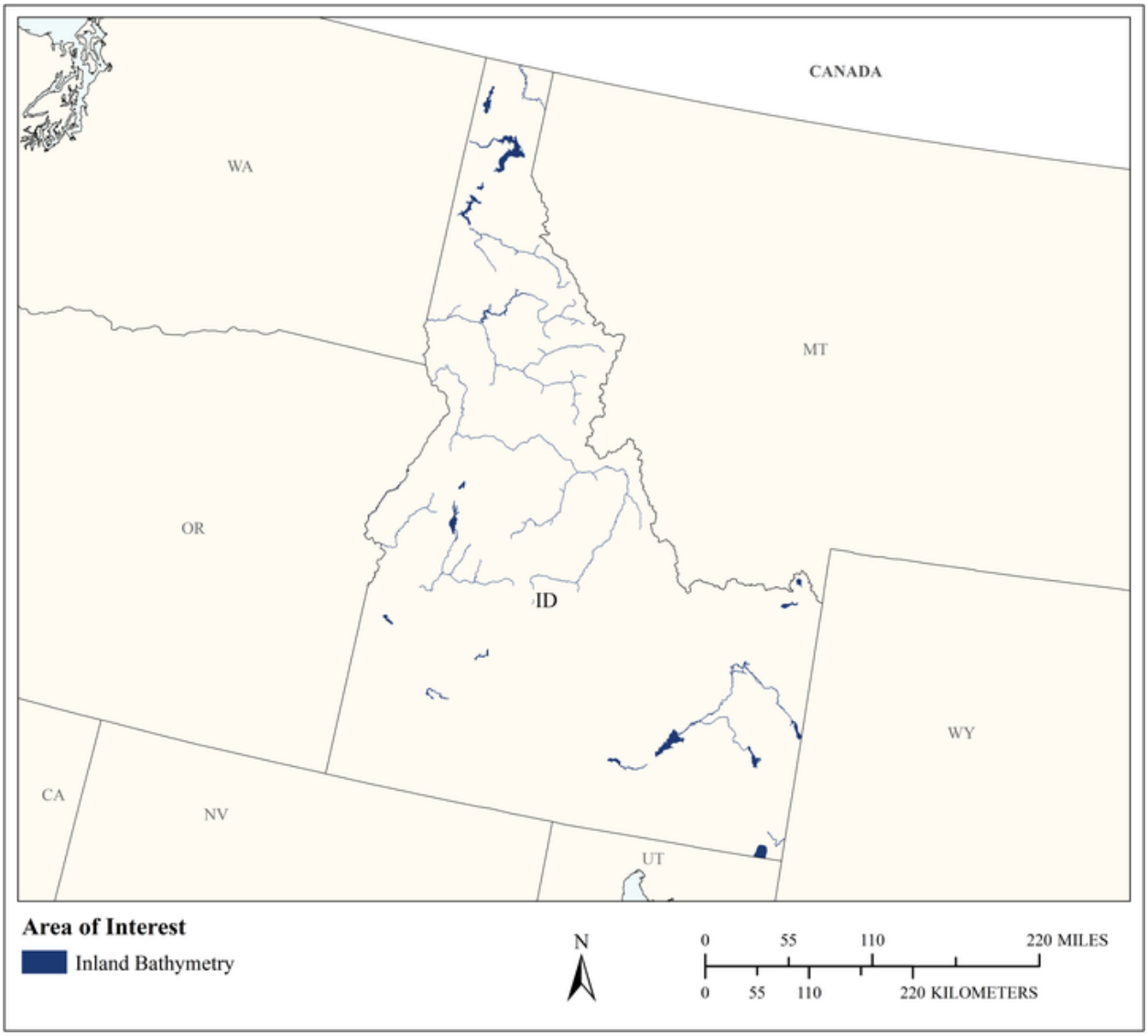
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State Repositories				
State repositories used				
Other	Yes	Yes		
Other description	Our survey-grade elevation data is typically collected on a project-by-project basis.	Our current bathymetric data and collected on a project-by-project basis.		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know	None		
Cost savings/cost reduction	I don't know	None		
Cost avoidance	I don't know	None		
Increased revenues	I don't know	None		
Mission-driven performance improvements	I don't know	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know	None		
Improved response or timeliness	I don't know	None		
Improved customer experience	I don't know	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	None		
Environmental	I don't know	None		
Public safety, including life and property	I don't know	None		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide							
Cost avoidance description	Slope and landslide data?.											
Increased revenues	Major	Unable to provide		Minor	Unable to provide							
Increased revenues description	If the data included highway vertical clearances at bridges and other structures including utility lines, it would be useful for truck routing.											
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide							
Improved response or timeliness	Moderate	Unable to provide		Moderate	Unable to provide							
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Minor								
Environmental	Major			Moderate								
Public safety, including life and property	Moderate			Minor								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Marine and Riverine Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type		Required		
Geographic Area Requirements		One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Port of Lewiston. Bathymetric measurements of submerged topography. Identification of hazards to navigation. Sediment management at ports. Movement of goods and vessels.
MCA Title	Marine and Riverine Navigation and Safety
MCA ID	60135
Organization Type	State or U.S. Territorial government
Organization Name	State of Idaho
Sub-Agency or Division	Port of Lewiston
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Nice to have
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order		QL0B		
Update Frequency		2-3 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error		Up to 2 meters		
Acceptable Vertical Error		Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season		Nice to have				
Entire AOI under same environmental conditions		Nice to have				
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless		Required				
DEM for entire AOI needs to be seamless		Required				
Amount of acceptable vertical manipulation to achieve spatial seamlessness		Up to double the required TVU at the 95% confidence level				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM		Highly desirable		
DTM		Highly desirable		
DEM		Required		
Raw point cloud data		Nice to have		
Classified point cloud		Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform		Not required		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening		Not required		
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery		Nice to have		
Ground control/ground truthing		Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery		Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data		Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates		Required		
Land use/land cover		Nice to have		
Wetlands		Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features		Required		
Bridges/culverts		Highly desirable		
Landmark features		Nice to have		
Cultural resources		Highly desirable		
Coastal and riverine structures		Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts		Yes		
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings		Major		
Cost savings/cost reduction		I don't know		
Cost avoidance		Major		
Increased revenues		None		
Mission-driven performance improvements		Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services		None		

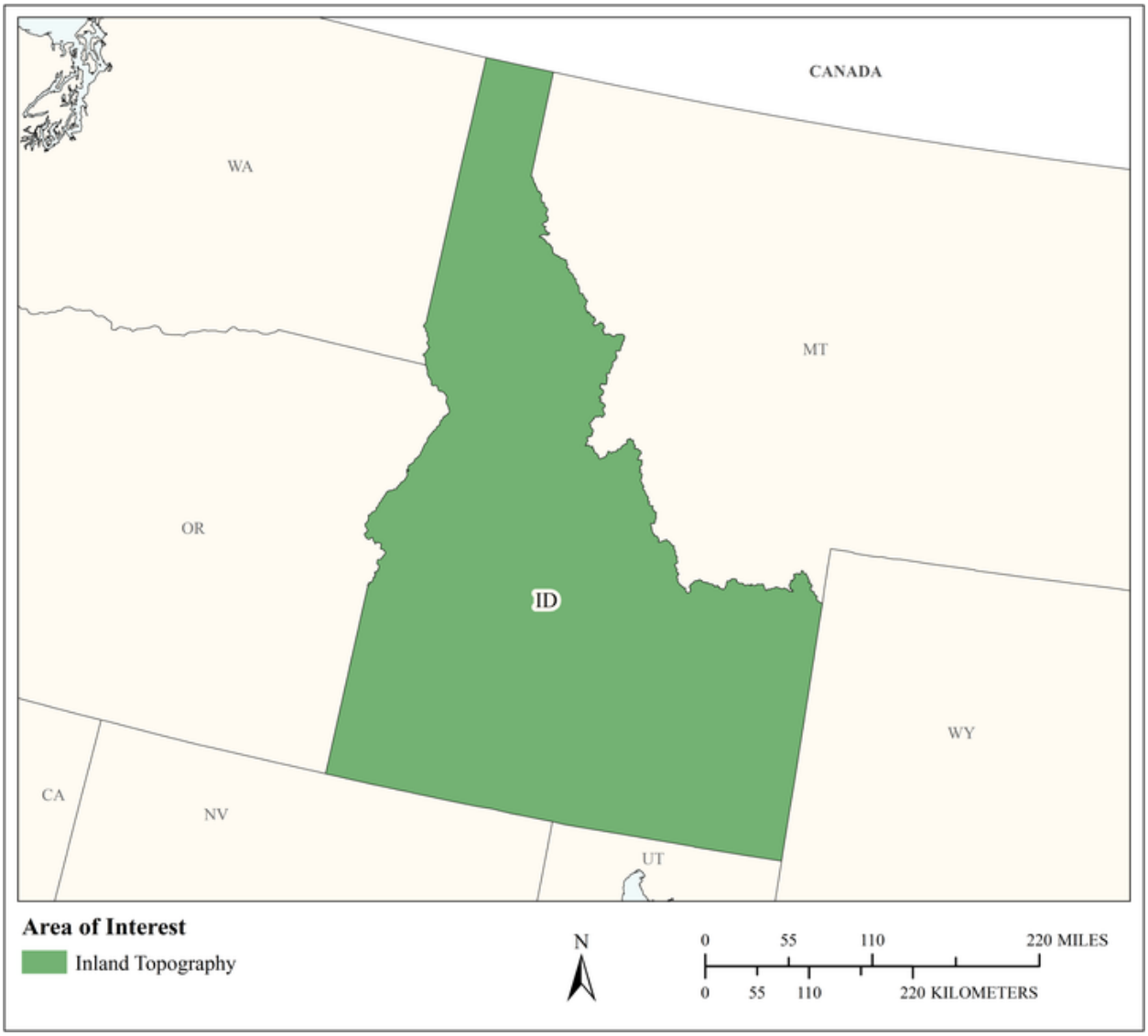
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness		None		
Improved customer experience		None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach		None		
Environmental		None		
Public safety, including life and property		None		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings				Major	Unable to provide							
Cost savings/cost reduction				Major	Unable to provide							
Cost avoidance				Moderate	Unable to provide							
Increased revenues				Moderate	Unable to provide							
Mission-driven performance improvements				Major	Unable to provide							
Future annual operational benefits added during validation					Annual dollars saved/ realized	$1,524,362						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services				Minor	Unable to provide							
Improved response or timeliness				Major	Unable to provide							
Improved customer experience				Moderate	Unable to provide							
Future annual customer service benefits added during validation					Annual dollars saved/ realized	$200,623						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach				Moderate								
Environmental				Moderate								
Public safety, including life and property				Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes		
Contours		Yes		
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints		Yes		
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Aviation Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of in-flight hazards and path obstructions. Aeronautical charting. Runway construction and repair.
MCA Title	Aviation Navigation and Safety
MCA ID	60136
Organization Type	State or U.S. Territorial government
Organization Name	State of Idaho
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 21 - Aviation Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes			
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Major			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

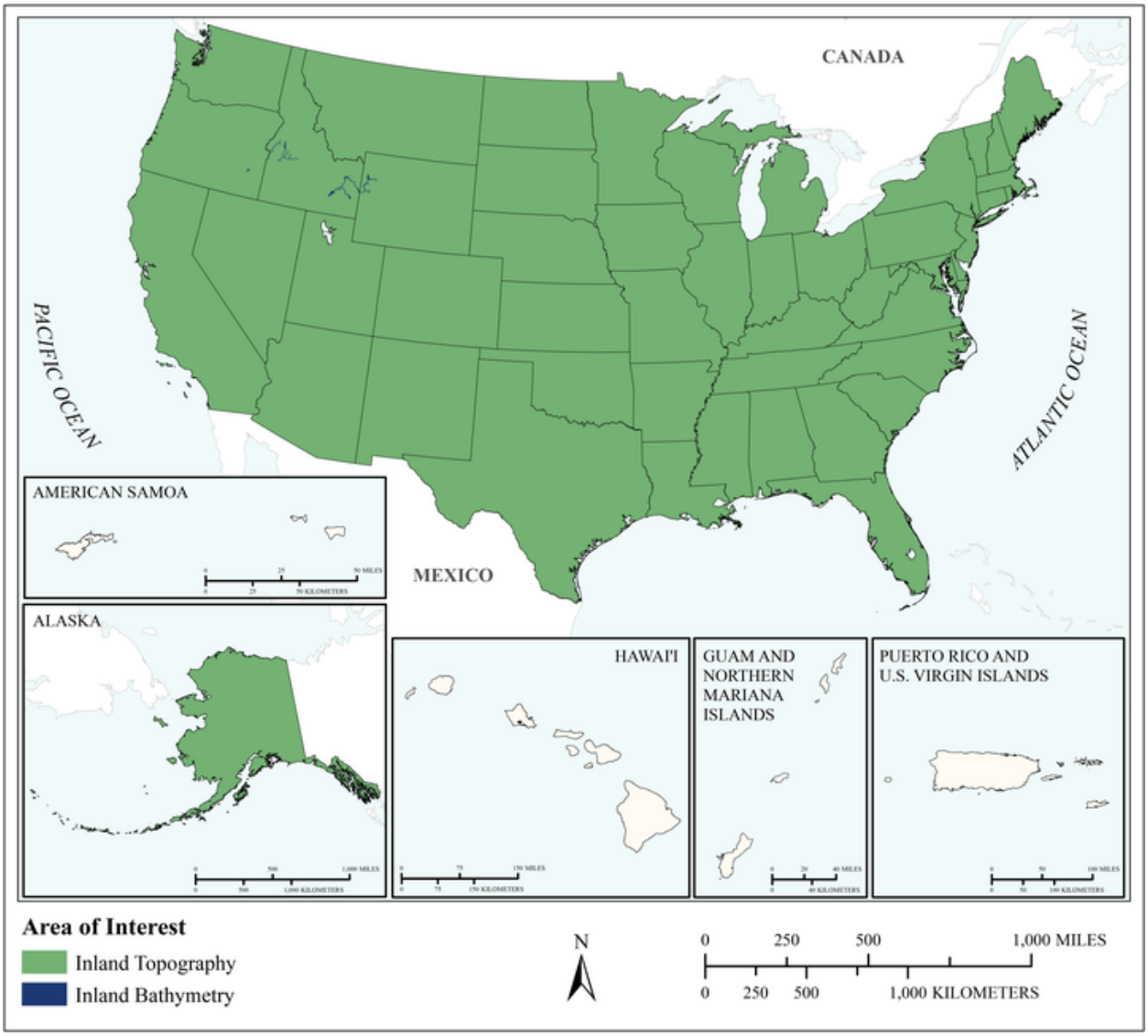
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$282,507									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$351,854									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Moderate											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Education, Training, and Outreach to Support Lifelong Learning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Nationwide, inland areas	One or more Hydrologic Units (HUC4s)		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Education, training, and outreach to support lifelong learning. Elevation data supports undergraduate and graduate research. The data are used for H&H modeling, hazard identification, and to study flooding and the flow of water.
MCA Title	Education, Training, and Outreach to Support Lifelong Learning
MCA ID	22118
Organization Type	Academic or Not-for-Profit
Organization Name	Boise State University
Sub-Agency or Division	
Organization Mission	Boise State University is a public, metropolitan research university providing leadership in academics, research and civic engagement. The university offers an array of undergraduate degrees and experiences that foster student success, lifelong learning, community engagement, innovation and creativity. Research, creative activity and graduate programs, including select doctoral degrees, advance new knowledge and benefit the community, the state and the nation. The university is an integral part of its metropolitan environment and is engaged in its economic vitality, policy issues, professional and continuing education programming, and cultural enrichment.
Program Name	Courses and degrees in Geosciences, Biological Sciences, Social Sciences, Engineering, and others that use lidar.
Total Annual Program Budget	
Primary Business Use	BU 26 - Education K12 and Beyond, Basic Research
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required
Other	Required
Other description	Canopy detail

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Grasses and shrubs that are ~20 cm in diameter and ~20 cm tall.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required

Inland Bathy Feature Size Requirements	Response
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Not required
51 - 100 ft	Not required
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Other	Required
Other description	Rivers
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Not required
5.1 – 10 acres	Not required
Greater than 10 acres	Not required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B		
Update Frequency	4-5 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Less than 50 cm		
Acceptable Vertical Error	Less than 5 cm	Up to 20 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement		20 cm vertical accuracy. No cross sections - we use continuous data		

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Required			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Highly desirable			Required	
DEM for entire AOI needs to be seamless	Nice to have	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have		
DTM	Nice to have	Nice to have		
DEM	Highly desirable	Nice to have		
Raw point cloud data	Required	Required		
Classified point cloud	Required	Required		
Edited/cube XYZ		Required		
Full waveform	Required	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required	Highly desirable		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required	Nice to have		
Land use/land cover	Nice to have	Nice to have		
Wetlands	Nice to have	Nice to have		
Estuaries				
Inland surface water features	Nice to have	Nice to have		
Bridges/culverts	Not required	Not required		
Landmark features	Nice to have	Highly desirable		
Cultural resources	Nice to have	Not required		
Coastal and riverine structures	Not required	Not required		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We currently use QL0 and QL1 data that is collected by commercial companies and government resources (NASA). We use full-waveform data, as well as point clouds with ~6 returns. Intensity is an important feature of the datasets.	Green lidar of Boise River		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast		Yes		
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
State Repositories	Yes			
State repositories used	www.idaholidar.org			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None	None		
Cost savings/cost reduction	None	None		
Cost avoidance	None	None		
Increased revenues	Major	None		
Mission-driven performance improvements	Major	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None		
Improved response or timeliness	None	None		
Improved customer experience	Major	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major		
Environmental	Major	Major		
Public safety, including life and property	Major	Major		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$15,980	Minor	Annual dollars saved/realized	$302						
Cost savings/cost reduction	Major	Annual dollars saved/realized	$60,000	Minor	Annual dollars saved/realized	$60,000						
Cost avoidance	Minor	Annual dollars saved/realized	$5,000	None								
Increased revenues	Major	Annual dollars saved/realized	$60,000	None								
Mission-driven performance improvements	Major	Annual percent improvement	10%	None								
Other operational benefits	Major	Annual dollars saved/realized	$10,000,000									
Other operational benefits description	Research Opportunities for Students and Their Training for Future Jobs.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$300,000	None								
Improved response or timeliness	Major	Annual dollars saved/realized	$1,206	None								
Improved customer experience	Major	Annual dollars saved/realized	$3,618	None								
Other customer service benefits	Major	Annual dollars saved/realized	$500,000									
Other customer service benefits description	Student recruitment.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Major			Major								
Public safety, including life and property	Major			Major								
Other	Connection with the community											
Other benefits	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

Illinois

The State of Illinois has about 58,000 square miles of land in total, including agricultural crop lands, the Shawnee National forest, tallgrass prairie remnants, cities and municipalities, and is bounded by major water bodies including the Mississippi River, the Ohio River, the Wabash River, and also 63 miles of coastal Lake Michigan shoreline north and south of the City of Chicago. The state's coastal jurisdiction extends across a portion of the lake, covering approximately 1,500 square miles of lake and lake bottom.

Illinois relies on elevation data -- topographic and bathymetric – for a wide variety of planning purposes by local, state, and federal agencies. Products derived from lidar data have proven to be an efficient and accurate tool for a wide variety of applications including:

- watershed analyses;
- wetland identification;
- delineating highly erodible land to plan for conservation practices;
- floodplain mapping and regulation;
- conducting levee analyses;
- planning for dam removal;
- mapping river forecasts used in flood emergency response;
- identifying geological landforms and archaeological features;
- enabling research pertaining to critical minerals deposits;
- addressing coastal hazards;
- supporting economic development and recreation;
- stormwater management;
- coastal shoreline erosion;
- near shore habitat restoration; and
- water quality.

Current status of elevation data for Illinois

Elevation and bathymetric data are collected programmatically through the Illinois Height Modernization Program (ILHMP) and on a project by project basis related to the Lake Michigan coastal area. The focus of ILHMP is on statewide lidar coverage, typically county by county. Along the Illinois Lake Michigan coast, specific project areas are mapped with small Unoccupied Aerial Systems (sUAS) using Structure from Motion photogrammetry to achieve better than 5-cm resolution elevation data. Offshore from the same targets, bathymetric data are collected with single-beam and multibeam sonar that achieve better than 5-cm resolution. Acoustic backscatter data are also collected coincidently with multibeam bathymetric data. The coastal data acquisition is driven by needs defined by the Illinois Department of Natural Resources Coastal Management Program Section 309 Strategic Plan, and project requirements defined by deliverables under the Great Lakes Restoration Initiative, NOAA Office for Coastal Management Projects of Special Merit, NOAA SeaGrant Program, and U.S. Army Corps of Engineers Regional Sediment Management Program.

The Illinois State Geological Survey (ISGS) has been working cooperatively with federal agencies on various components of mapping the coastal area. The ISGS co-hosted the 2017 Coastal Mapping Summit in Chicago, Illinois to assess the needs of Great Lakes-wide elevation and bathymetric data. Working in conjunction with the Illinois Department of Natural Resources Coastal Management Program, the ISGS has cooperated with federal partners on projects that include application of the CMECS classification of

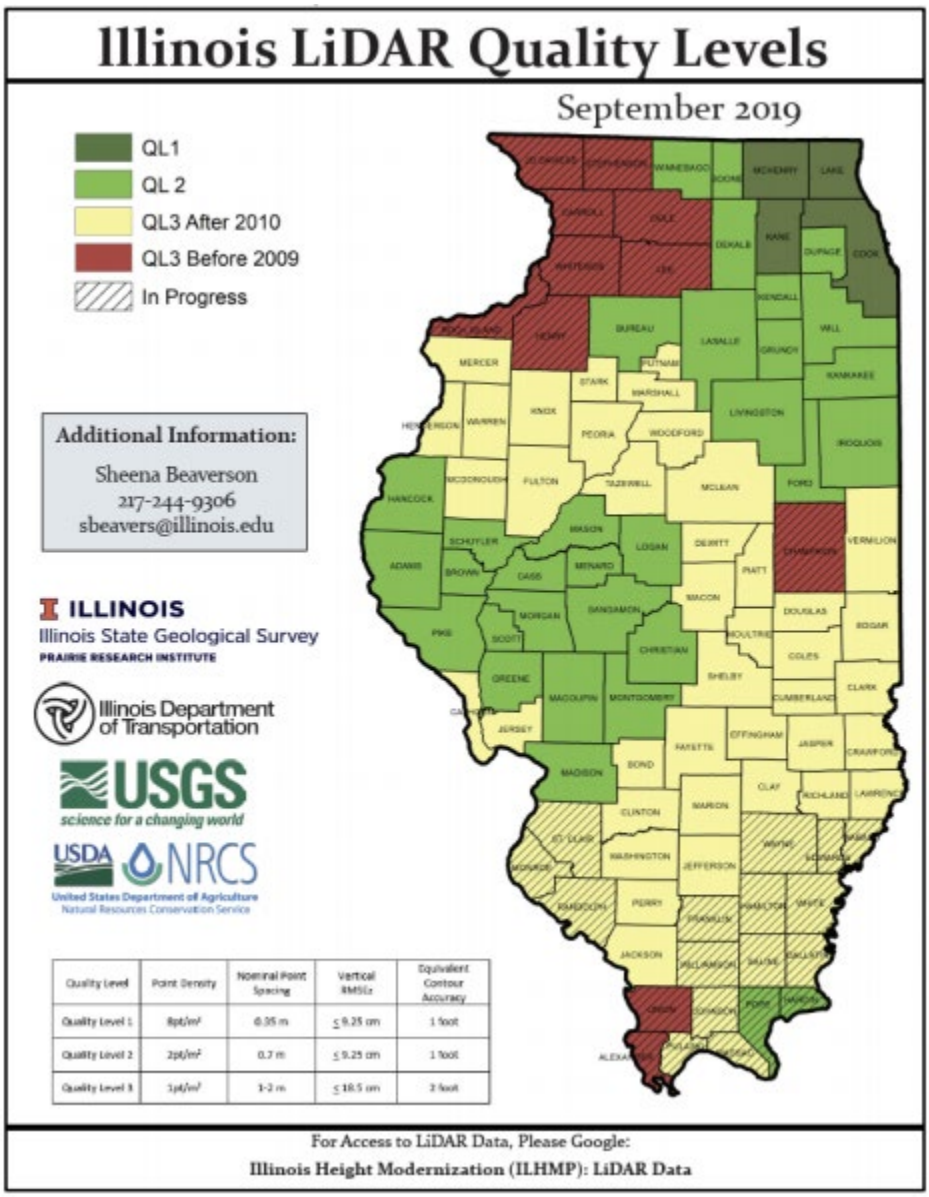
the Lake Michigan bottom and application of JALBTCX topo/bathymetric lidar for feature identification. The JALBTCX topo/bathymetric data are critical to lake bottom habitat classification and analysis of lake bottom and shoreline change. The Great Lakes are in a period of high lake level which amplifies the significance of current cycle of JALBTCX acquisition. Future multibeam sonar data collection will continue in targeted areas for the purpose of lake bottom change analysis, and also to add resolution or fill-in gaps in JALBTCX data.

The purpose of the ILHMP is to improve access to elevation information for Illinois by providing a repository for high-resolution elevation lidar data and installing an extensive network of surveying benchmarks (https://pubs.usgs.gov/of/2014/1167/pdf/ofr2014-1167_beaverson_illinois_height_modernization.pdf).

ILHMP has established data sharing agreements to archive and distribute elevation data for all Illinois counties. Data have been acquired using lidar technology in compliance with different contract specifications. Data are offered as originally delivered LAS tiles or as the derivative product of DEM/DTM or DSM (https://clearinghouse.isgs.illinois.edu/data/elevation/illinois-height-modernization-ilhmp-lidar-data).

Illinois achieved statewide coverage of lidar data in 2019 with USGS 3D Elevation Program (3DEP) quality-level resolutions ranging from Quality Level 1 (QL1) to QL3. The 102 county collections are roughly comprised of 5% of data at QL1, 30% at QL2, and 65% at QL3; acquisition dates range from 2008 to 2018. An FY19 USGS 3DEP grant will refresh data for nine counties that have QL3 data from 2008 and 2009 in the Fall of 2019, representing about 5% of Illinois. Illinois has a draft lidar strategic plan developed in May 2019 and that can be referenced at this link: https://clearinghouse.isgs.illinois.edu/lidar/Illinois_LiDAR_Plan_October_2019_working_draft.pdf

An aggressive four-year proposal to reacquire all counties that have QL3 data has been developed. At the present time, no state funding is available to apply to this effort. However, funding from the Natural Resources Conservation Service and the USGS will surpass the goals laid out for year one, federal fiscal year 2020, with acquisition of 19 counties in southern Illinois.



Quality Level	Point Density	Nominal Point Spacing	Vertical RMSEz	Equivalent Contour Accuracy
Quality Level 1	8pt/m²	0.35 m	≤ 9.25 cm	1 foot
Quality Level 2	2pt/m²	0.7 m	≤ 9.25 cm	1 foot
Quality Level 3	1pt/m²	1-2 m	≤ 18.5 cm	2 foot

Figure 1. Illinois Lidar Quality Levels

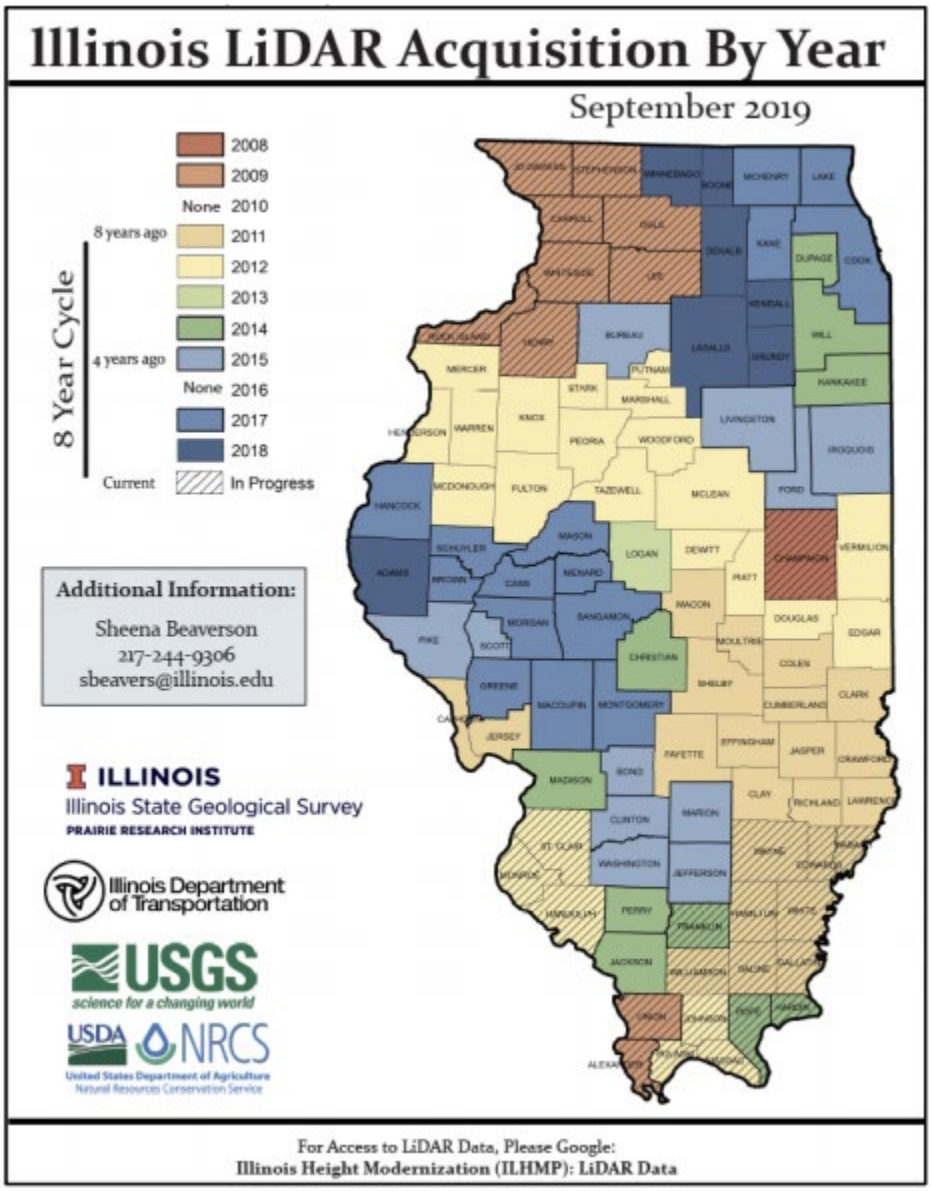


Figure 2. Illinois Lidar Acquisition by Year

Importance of elevation data to Illinois

Elevation and bathymetric data are needed for a wide range of uses that range from science application to public safety. Most uses have an underlying economic basis. At times of high lake levels in the Great Lakes, the latter is an urgent issue as it relates to infrastructure vulnerability and risk. Traditionally elevation and bathymetric data were once considered static, but the resolution attained from topographic, topo-bathymetric, and bathymetric methods enable change analysis that can be linked to earth surfaces processes driven by weather and climate. Change analysis is critical in areas that are prone to geologic and coastal hazards, which also links to the need for hydrodynamic data.

A number of specific applications have direct impact on the economic health and well-being of Illinois citizens. A few of these include the following: Infrastructure development includes highway engineering and design. Hazard mitigation includes riverine flood prediction and coastal inundation related Great Lakes level fluctuation. Agricultural uses include run off and erosion control. Geologic and geomorphic

mapping include sinkhole mapping and analysis of structural trends, such as identification of faults. Geologic hazard identification includes area prone to mining subsidence and shoreline erosion along the Lake Michigan coast. Pattern and feature recognition in areas of cultural significance and historic value allows for identification and monitoring of archaeological features. These sites include sites occupied by indigenous people as well as offshore sites that record the Great Lakes transportation history through shipwrecks. The gains and losses of inland and coastal habitat can be measured with lidar, and enhanced significantly in targeted areas with sUAS. These types of applications provide insight into the impacts of climate change as measured by the responses of ecosystem life. Lakebed downcutting in Lake Michigan that threatens coastal infrastructure, including water intake facilities that serve millions of people, is revealed by repeated high-resolution bathymetric surveys. Importantly the rate of change is linked to coincident environmental data that measures waves, currents, and other weather events.

Illinois has a Showcase of LiDAR Data Applications (https://www.isgs.illinois.edu/ilhmp/showcase) that documents real-world uses of Illinois lidar data. Projects address highway engineering, flood prediction, agricultural land management, mining subsidence, monitoring archaeological features, locating sinkholes, and applied geologic science. These showcase examples are: Mapping Natural and Cultural Features For Ecological Restoration, Water Resource Analysis and Flood Prediction, Agricultural Drainage Problems, Updating Digital Flood Insurance Rate Maps and More, Detection of Old Longwall Coal Mine Boundaries, Geologic Mapping in Ogle County, Monitoring Illinois Prehistoric Burial Mounds, Characterizing Karst Terrane in Illinois, Detecting Karst Features in Forested Terrain, Ice-walled Lake Plains in Illinois, and Morphology of Dune Complexes.

Use of elevation data along the Illinois Lake Michigan coast is illustrated in two ArcGIS Story Maps: Illinois Beach State Park: A Dynamic Shoreline and A Vanishing Coast

High-level summary of elevation data requirements

Statewide coordinated lidar requirements and requirements for focused elevation and bathymetric data collection along the Illinois Lake Michigan coast differ. Project targeted elevation and bathymetric data collected along the Lake Michigan coast is specifically used to detect lake bottom and shoreline change and habitat loss or gain. For example, sediment volume calculations for local beach areas require centimeter scale accuracy. These analyses contribute to U.S. Army Corps of Engineers Regional Sediment Management Program as well as planning for infrastructure protection or improvements and sand nourishment along public beaches. Regional topo-bathymetric lidar acquired through JALBTCX would benefit from similar mainstream lidar requirements, particularly as it relates to beach nourishment and littoral displacement of sand to offshore areas. The cycle of harbor maintenance, such as Waukegan Harbor, exceeds the cycle of JALBTCX data acquisition. Yet understanding the gain and loss from up-shore beach segments is needed to understand sand volume that potentially infills the harbor approach channel.

Illinois mainstream lidar data specification preferences defined by the ILHMP Steering Committee are (https://clearinghouse.isgs.illinois.edu/lidar/Illinois_LiDAR_Plan_October_2019_working_draft.pdf):

- Adhere to current USGS Base Specifications as the absolute minimum;
- Include classification of low/med/high vegetation and buildings classes;
- Always generate hydrologic breaklines and a hydro-enforced DEM;
- Acquire one complete county, at minimum; multi-county areas preferred;
- Process uniform county data collections, regardless of localized buy-up projects;
- Expand any AOI to include complete, rather than partial, counties;
- Delineate new projects near recent project areas to create contemporary data regions;

- Illinois prefers QL2 data with breaklines and added classes over QL2+ or QL1 buy-ups; and
- Request that funding partners fully process and publish all acquired data.

Respondents to this survey in general indicated a need for QL1 inland topography and QL0B inland bathymetry updated every 4-5 years and QL1B nearshore and Order 1 offshore bathymetry updated every 2-3 years.

High-level summary of benefits that would come from higher resolution elevation data

The need to understand the long-term ecosystem and economic impact of shoreline and lake bottom change is acute. Annual investment in harbor maintenance as a direct result of sand infilling is hampered by a lack of understanding the conditions under which sand moves. Developed shorelines experience accelerated erosion at points of shoreline structures which results in large shoreline protection projects that cost millions of dollars. Continued support of JALBTCX with resolution similar to mainstream lidar products is needed. In addition, more frequent JALBTCX collection events in off cycle years along prioritized shoreline segments where infrastructure and habitat values are threatened would be beneficial. Targeted application of centimeter scale sonar and sUAS will continue to provide key monitoring benchmarks along the Great Lakes shoreline.

QL3 lidar data collections, especially those county collections acquired before current federal data specifications were developed, cannot support data applications essential for planning purposes by local, state, and federal agencies. Such data applications include mapping river forecasts used in flood emergency response for public safety, floodplain mapping and regulation, environmental and agricultural conservation planning and design, farm bill program implementation, delineating building footprints, and identifying geological landforms and resources like critical minerals deposits. Additionally, parcel mapping and flood zone delineation requirements are stated in the Illinois NextGeneration 911 Data Standards. Data above QL3 are needed to support this activity. Illinois supports the goal of the USGS 3D Elevation Program to complete acquisition of QL2 or better lidar data for the continental United States.

Additional Comments

A key recommendation for any future national elevation data program would be to supply states with reliable funding for staff to act as lidar data liaisons, reviewers, and stewards. Federal funding that supports acquisition and processing of new data collections is inadequate. Without reliable, minimal staffing in all states, the benefits of nationwide QL2 lidar data will not be realized; data will not be easily accessible and widely disseminated.

Topo-bathymetric and bathymetric data collection in the Great Lakes region is far behind the nation as a whole. The Great Lakes have served the nation for more than two centuries as a critical supply line for transportation of the nation's economic resources. The Lakes serve as national flyways for migratory birds and will ultimately be early indicators of how climate change impacts all life. The need for better quality bathymetry to understand shoreline and lake bottom change is critical to our ability to live along Lake coasts and to protect and maintain what critical habitat remains. Importantly, detailed topo-bathymetric (lidar) and bathymetric (sonar) data collected for change analysis or regional sediment budgets must be linked to the nations hydrodynamic data collection network. That is, understanding offshore bathymetric change requires knowing how and why change occurs. Therefore, support of coastal elevation and bathymetric data collection also needs additional support for the NOAA Buoy Network, GLOS, and other systems that provide information on Great Lakes waves, currents, wind velocity and direction, and other environmental data.

Outreach

Illinois Geospatial Data Clearinghouse, Illinois Height Modernization (ILHMP):

https://clearinghouse.isgs.illinois.edu/data/elevation/illinois-height-modernization-ilhmp-lidar-data

Download lidar data through a Web Application Viewer

https://univofillinois.maps.arcgis.com/apps/webappviewer/index.html?id=44eb65c92c944f3e8b231eb1e2814f4d

The State of Illinois has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

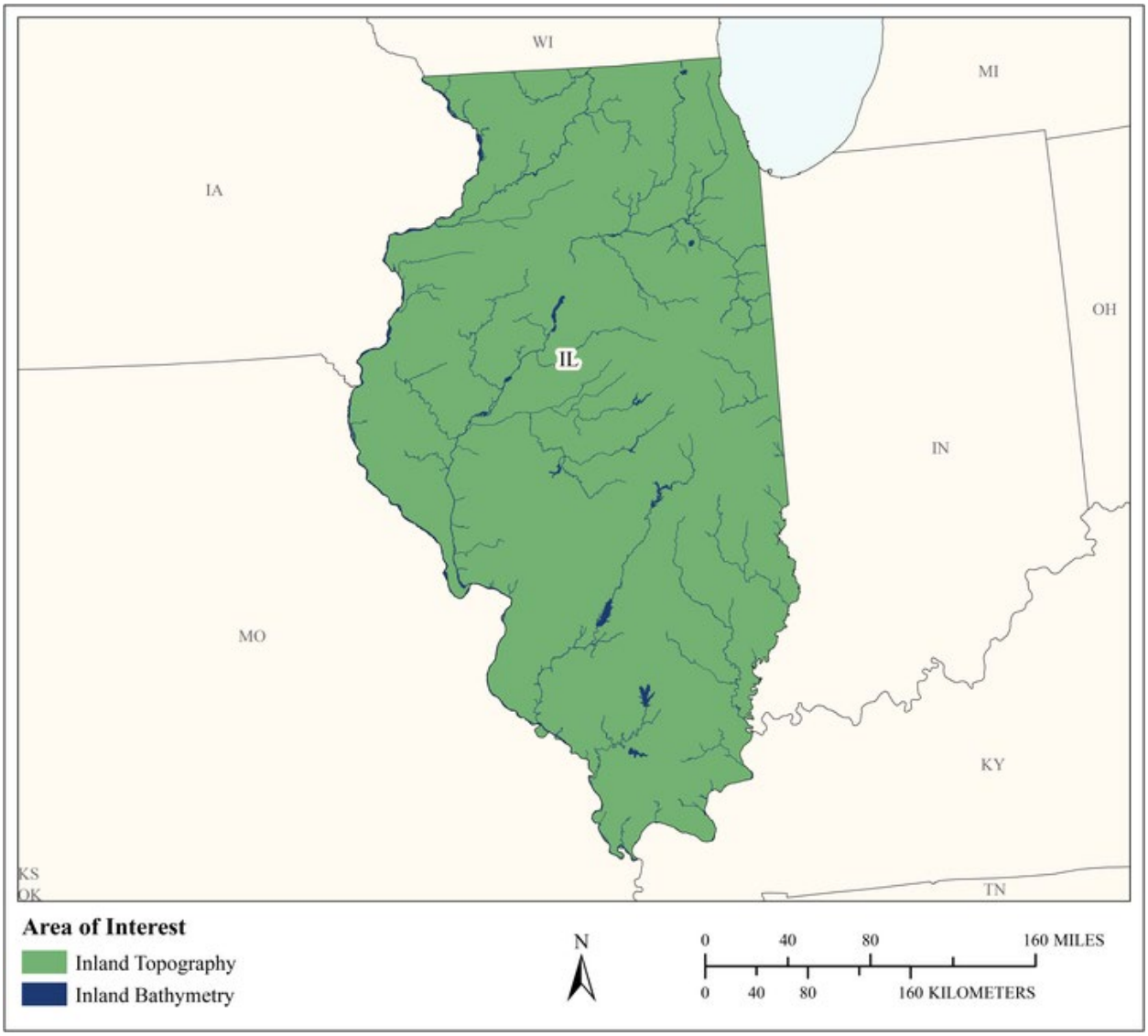
MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 02 – Riverine Ecosystem Management	State of Illinois	60137	Riverine Ecosystem Management	Inland Topo	QL1 HD	6-10 years	$86,237	$8,613	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$45,906	$3,237	Major	Major	Major
BU 03 – Coastal Zone Management	Illinois State Geological Survey	22116	Lake Michigan Coastal Mapping	Nearshore Bathy	QL0B	Annually	Unable to quantify	Unable to quantify	Major	Moderate	Moderate
				Offshore Bathy	Special Order	Annually	Unable to quantify	Unable to quantify	Moderate	Moderate	Major
BU 04 – Forest Resource Management	State of Illinois	60138	Forest Resources Management	Inland Topo	QL1	2-3 years	$222,761	$322,919	Major	Major	Major
BU 06 – Natural Resource Management	State of Illinois	60139	Natural Resources Conservation	Inland Topo	QL1 HD	4-5 years	$2,209,859	$8,115,278	Major	Major	Major
				Inland Bathy	QL0B	6-10 years	$299,521	$13,483	Major	Major	Major
				Nearshore Bathy	QL1B	6-10 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate
				Offshore Bathy	Cross sections and/or transects meet needs	4-5 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
BU 08 – Agriculture	State of Illinois	60140	Agriculture and Precision Farming	Inland Topo	QL2	2-3 years	$65,230	$51,712	Major	Major	Minor
BU 09 – Fisheries Management and Aquaculture	Illinois Department of Natural Resources, Office of Water Resources	21666	Volumetric Analysis of Interior Lakes	Inland Bathy	QL0B	>10 years	$17,158	$6,783	None	None	None
BU 10 – Geologic Assessment	Illinois State Geological Survey, at the Prairie Research Institute at the University of Illinois at Urbana-Champaign	21638	Lidar Acquisition for Statewide Needs	Inland Topo	QL2+	6-10 years	$750,000	Unable to quantify	Moderate	Minor	Minor
				Nearshore Bathy	QL0B	6-10 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 10 – Geologic Assessment	Illinois State Geological survey	21727	Geologic Mapping	Inland Topo	Cross sections and/or transects meet needs	4-5 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	QL0B	Annually	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Offshore Bathy	Order 1	Annually	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 12 – Renewable Energy Resources	State of Illinois	60141	Renewable Energy Resources	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	None
BU 14 – Cultural Resource Management	State of Illinois	60142	Cultural Resources Preservation and Management	Inland Topo	QL1	4-5 years	$10,326	$9,028	Minor	Minor	Minor
BU 15 – Flood Risk Management	Illinois Department of Natural Resources, Office of Water Resources	1127	River Flood Inundation Mapping Based on Event Frequency and Gage Stage Levels	Inland Topo	QL2	2-3 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Major
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	None	None	Minor
BU 15 – Flood Risk Management	Illinois State Water Survey	21597	Flood Risk Assessment and Mapping	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	Minor	Minor	Minor
				Inland Bathy	QL1B	6-10 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 15 – Flood Risk Management	Illinois Department of Natural Resources, Office of Water Resources	21641	Hydrologic and Hydraulic Modeling for Floodplain Management	Inland Topo	(a) QL0 (b) QL2	4-5 years	Unable to quantify	Unable to quantify	None	None	I don't know
				Inland Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	None	None	Major
BU 15 – Flood Risk Management	Illinois Department of Natural Resources, Office of Water Resources	22265	Enforcement and Permitting of Construction in Flood Zones and Floodways	Inland Topo	QL1	>10 years	$603	Unable to quantify	I don't know	I don't know	I don't know
				Inland Bathy	QL0B	>10 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 15 – Flood Risk Management	Lake County, Illinois	22352	Flood Inundation Mapping	Inland Topo	(a) QL1 HD (b) QL2	6-10 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 16 – Sea Level Rise and Subsidence	State of Illinois	60143	Sea Level Rise and Subsidence	Inland Topo	QL1 HD	4-5 years	$2,966,211	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Minor
				Offshore Bathy	Order 2	6-10 years	Unable to quantify	Unable to quantify	Major	Major	Moderate
BU 18 – Homeland Security	Illinois State Police	1175	Disaster Planning and Response	Inland Topo	QL1 HD	Event driven	Unable to quantify	Unable to quantify	I don't know	None	Major
				Inland Bathy	Cross sections and/or transects meet needs	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	Moderate
BU 18 – Homeland Security	Illinois Department of Natural Resources, Office of Water Resources	21652	Flood Surveillance and Coordination with State Emergency Operations Center	Inland Topo	(a) QL0 (b) QL2	4-5 years	Unable to quantify	Unable to quantify	None	None	Major
				Inland Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	None	None	Major
BU 19 – Land Navigation	State of Illinois	60144	Land Navigation and Safety	Inland Topo	QL0	2-3 years	$729,863	$58,940	Minor	Major	Major
				Inland Bathy	QL0B	2-3 years	$31,131	$322	Minor	Moderate	Moderate
BU 20 – Marine and Riverine Navigation	State of Illinois	60145	Marine and Riverine Navigation and Safety	Inland Bathy	QL0B	2-3 years	$1,027,707	$135,258	Moderate	Moderate	Moderate
				Nearshore Bathy	QL0B	2-3 years	$85,262	$2,886	Minor	Major	Major
				Offshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 21 – Aviation Navigation	State of Illinois	60146	Aviation Navigation and Safety	Inland Topo	QL1 HD	Annually	$190,463	$237,215	Minor	Moderate	Moderate
BU 22 – Infrastructure Management	Illinois Department of Natural Resources, Office of Water Resources	21603	Hydrologic and Hydraulic Analysis of Rivers for Flood Damage Reduction Assessment	Inland Topo	(a) QL0 (b) QL2	4-5 years	Unable to quantify	Unable to quantify	None	None	Moderate
				Inland Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	None	None	Moderate
BU 22 – Infrastructure Management	Illinois Department of Natural Resources, Office of Water Resources	21665	Dam Inspections	Inland Topo	QL0	4-5 years	$27,500	Unable to quantify	None	None	Major

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 23 – Urban and Regional Planning	City of St. Charles, Illinois	21593	City Land Management	Inland Topo	QL0 HD	4-5 years	$49,467	$1,956	Moderate	Moderate	Moderate
				Inland Bathy	I don't know	6-10 years	$1,055	Unable to quantify	Moderate	Moderate	Major
BU 25 – Real Estate, Banking, and Insurance	Illinois Department of Natural Resources, Office of Water Resources	21663	Classification of Structures for Flood Insurance and Buy Out	Inland Topo	(a) QL0 (b) QL2	4-5 years	Unable to quantify	Unable to quantify	None	None	I don't know
BU 27 – Recreation	State of Illinois	60147	Recreation	Inland Topo	QL1	4-5 years	$12,928	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	4-5 years	$7,785	Unable to quantify	Major	Major	Moderate
				Nearshore Bathy	QL0B	4-5 years	$14,394	Unable to quantify	Major	Major	Moderate
				Offshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 30 – Maritime and Land Boundary Management	State of Illinois	60148	Maritime and Land Boundary Management	Inland Topo	QL1	6-10 years	$63,398	$243,073	Moderate	Minor	None
				Inland Bathy	QL2B	6-10 years	$47,578	Unable to quantify	Major	Major	Moderate
				Nearshore Bathy	QL0B	2-3 years	$25,549	Unable to quantify	Moderate	Major	Moderate
				Offshore Bathy	I don't know	2-3 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate

MCA Title: Riverine Ecosystem Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Stream channel analysis and mapping. Stream bank erosion analysis. Aquatic and terrestrial species habitat management. Environmental management.
MCA Title	Riverine Ecosystem Management
MCA ID	60137
Organization Type	State or U.S. Territorial government
Organization Name	State of Illinois
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B		
Update Frequency	6-10 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Required			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Required	Highly desirable		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Highly desirable	Nice to have		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Moderate	Minor		
Cost avoidance	Moderate	None		
Increased revenues	None	None		
Mission-driven performance improvements	Major	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		

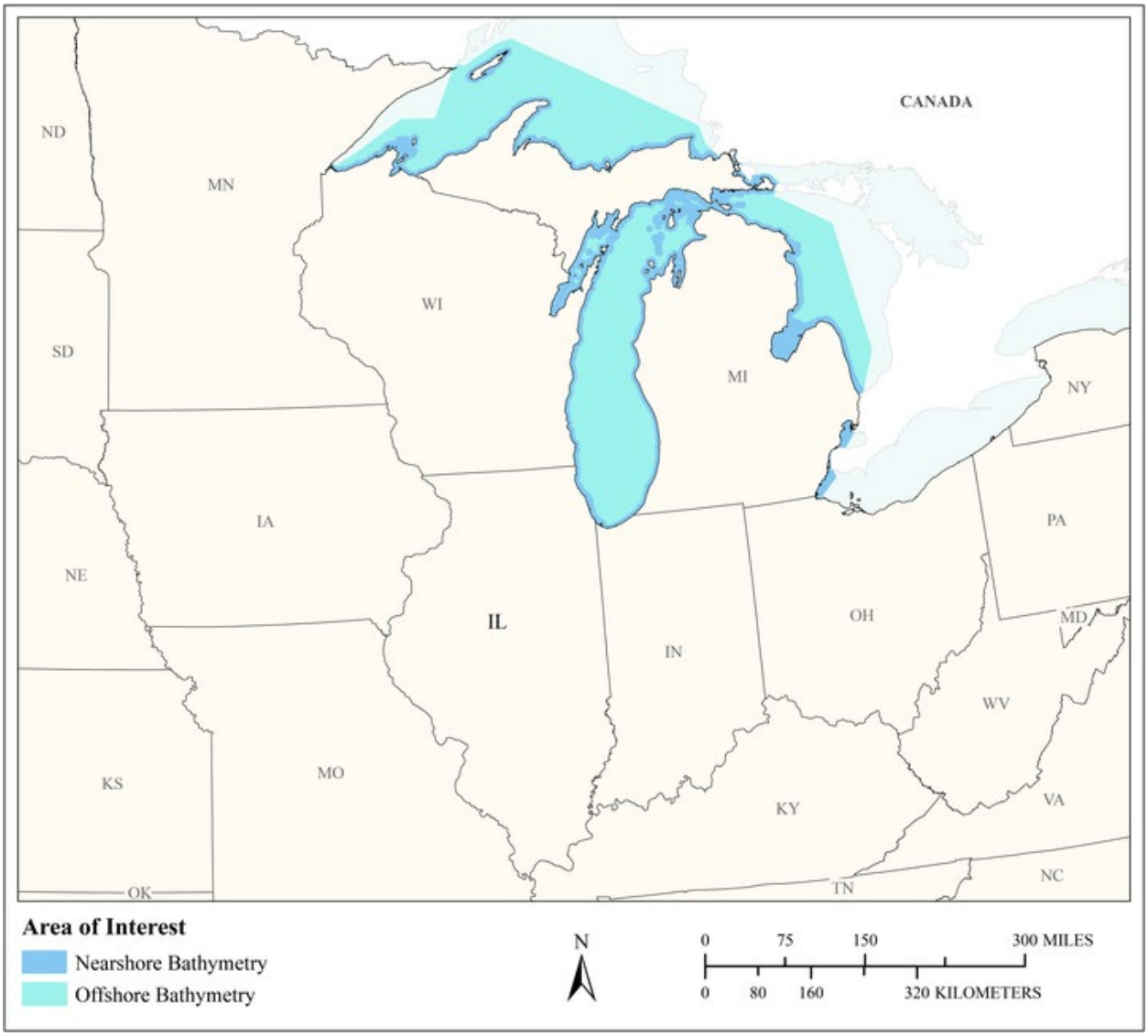
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Moderate		
Improved customer experience	Major	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate		
Environmental	Major	Major		
Public safety, including life and property	Major	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$86,237		Annual dollars saved/ realized	$45,906						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$8,613		Annual dollars saved/ realized	$3,237						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Major			Major								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Lake Michigan Coastal Mapping



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type			Required	Required
Geographic Area Requirements			Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Coastal hazard mitigation; coastal process research. Elevation data are needed for analysis of littoral habitat, nearshore habitat impacts, sedimentation, carbon sequestration in coastal wetlands, wetlands protection, and physical modeling of coastal areas. Nearshore geology is also needed for sedimentation. Multi-beam, single beam, and topobathy, and imagery are all collected to support these activities. Data collection is funded through the Great Lakes Restoration Initiative
MCA Title	Lake Michigan Coastal Mapping
MCA ID	22116
Organization Type	State or U.S. Territorial government
Organization Name	Illinois State Geological Survey
Sub-Agency or Division	
Organization Mission	Applied Research
Program Name	Great Lakes Coastal Geology Research Group. We have funded research and monitoring projects that provide technical assistance to IL Coastal Zone Management Program, USACE, NOAA, local stakeholders, etc.
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Tertiary Business Use	BU 07 - Wildlife and Habitat Management

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	Lake bottom surface

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order			QL0B	Special Order
Update Frequency			Annually	Annually
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error			Up to 1 meter	Up to 1 meter

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Vertical Error			Up to 20 cm	Less than 1 meter
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed			Below MLLW	
Tide correction requirement			No requirement for tide correction	No requirement for tide correction
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season			Highly desirable	Highly desirable		Highly desirable
Entire AOI under same environmental conditions			Highly desirable	Highly desirable		Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless			Nice to have	Nice to have		Nice to have
DEM for entire AOI needs to be seamless			Nice to have	Nice to have		Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM			Required	Required
DTM			Required	Required
DEM			Required	Required
Raw point cloud data			Required	Required
Classified point cloud			Highly desirable	
Edited/cube XYZ			Highly desirable	Highly desirable
Full waveform			Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)			Nice to have	Nice to have
Breaklines required for standard hydro-flattening				
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Nice to have
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery			Required	Highly desirable
Ground control/ground truthing			Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery			Highly desirable	Highly desirable
Underwater videography			Nice to have	Highly desirable
Bottom texture			Nice to have	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Nice to have	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data			Highly desirable	Highly desirable
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Nice to have	Not required
Sea ice conditions			Nice to have	Highly desirable
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Not required	Highly desirable
Routes			Not required	Nice to have
Offshore cadastral			Not required	Not required
Lease areas			Not required	Not required
Fixed obstructions			Not required	Highly desirable
Floating observation/navigation systems			Nice to have	Highly desirable
Shorelines – current, historic, change rates			Required	
Land use/land cover			Highly desirable	Highly desirable
Wetlands			Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features			Not required	
Bridges/culverts				
Landmark features			Nice to have	
Cultural resources			Nice to have	
Coastal and riverine structures			Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used			JALBTCX data; data we collect with our single beam and MBES systems. Also TDEM surveys via helicopter	JALBTCX data; data we collect with our single beam and MBES systems.
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	Yes
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings			None	Moderate
Cost savings/cost reduction			None	Minor
Cost avoidance			None	Minor
Increased revenues			None	None

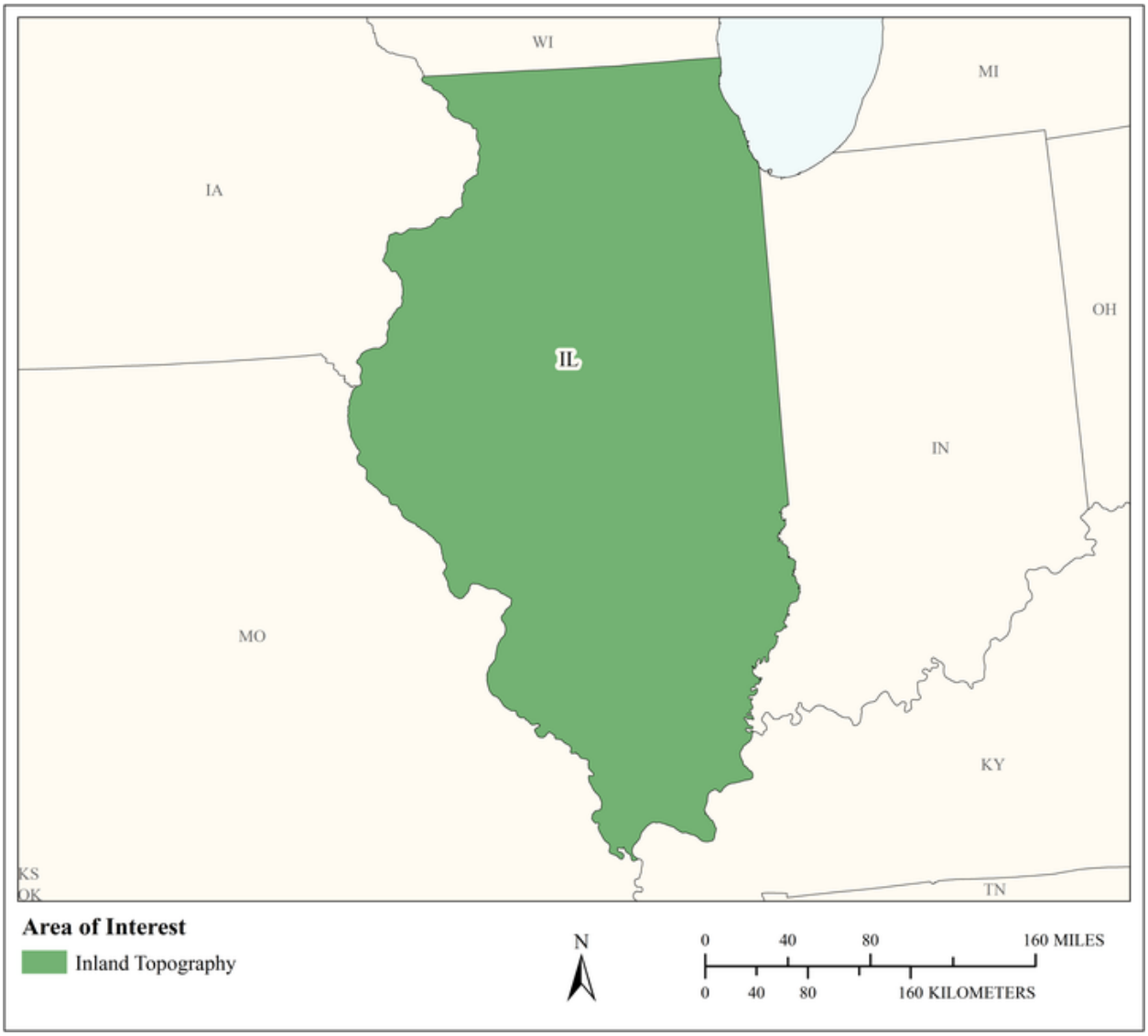
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Mission-driven performance improvements			None	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services			None	Moderate
Improved response or timeliness			None	None
Improved customer experience			None	None
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach			Minor	Moderate
Environmental			Moderate	Moderate
Public safety, including life and property			None	Moderate
Other Current Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other			Major	
Other description			Using it for our research/data collection planning	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings							Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction							Major	Unable to provide		Moderate	Unable to provide	
Cost avoidance							Major	Unable to provide		Moderate	Unable to provide	
Increased revenues							None			None		
Mission-driven performance improvements							Major	Unable to provide		Major	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services							Minor	Unable to provide		None		
Improved response or timeliness							Moderate	Unable to provide		Major	Unable to provide	
Improved customer experience							Minor	Unable to provide		Minor	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach							Major			Moderate		
Environmental							Moderate			Moderate		
Public safety, including life and property							Moderate			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	Yes
Contours			Yes	Yes
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections			Yes	Yes
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	1
Update frequency	3

MCA Title: Forest Resources Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Forest health assessment. Determination of standing inventory of forest resources. Prescribed burn planning. Analysis of carbon stocks for trade. Harvest systems planning.
MCA Title	Forest Resources Management
MCA ID	60138
Organization Type	State or U.S. Territorial government
Organization Name	State of Illinois
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Highly desirable			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

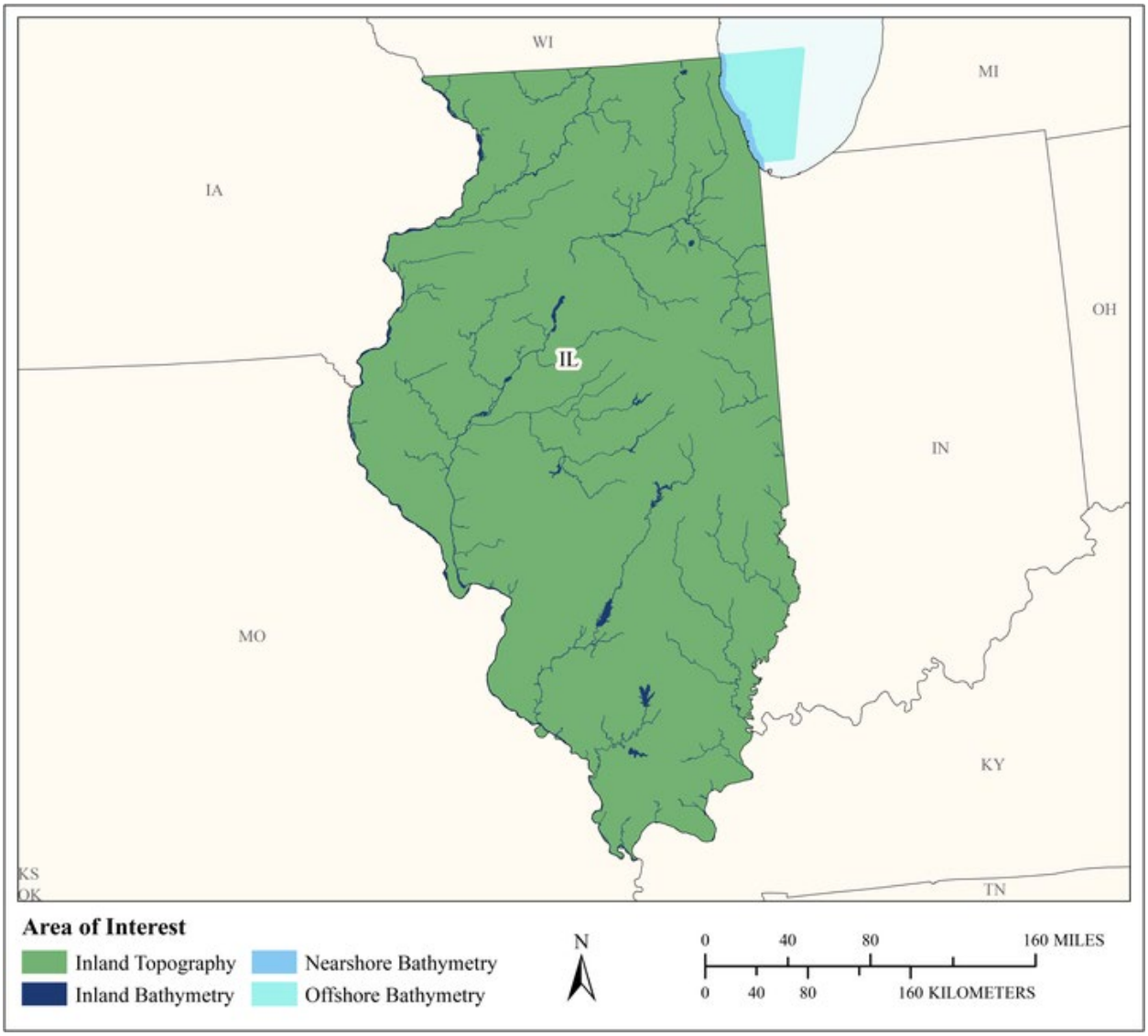
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$222,761									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$322,919									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Natural Resources Conservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation engineering. Soils and wetlands mapping and characterization. Modeling of biological and ecological systems. Erosion control. Rainfall penetration studies, impervious surfaces. Assessment of blue carbon stocks.
MCA Title	Natural Resources Conservation
MCA ID	60139
Organization Type	State or U.S. Territorial government
Organization Name	State of Illinois
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B	QL1B	Cross sections and/or transects meet needs
Update Frequency	4-5 years	6-10 years	6-10 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				Yes
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Highly desirable	Required	Required	Required	Required
Entire AOI under same environmental conditions	Required	Required	Required	Required	Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Required	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Required	Required	Required	Required
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Highly desirable	Required	Highly desirable
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Nice to have	Highly desirable
Ground control/ground truthing	Required	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Nice to have	Required
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Highly desirable
Underwater videography			Nice to have	Highly desirable
Bottom texture			Nice to have	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Highly desirable	Highly desirable
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Nice to have	Highly desirable
Habitat distribution and classification			Required	Highly desirable
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Highly desirable
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates	Highly desirable	Required	Highly desirable	
Land use/land cover	Required	Required	Highly desirable	Nice to have
Wetlands	Required	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Highly desirable
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Nice to have	Highly desirable	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	Major
Cost savings/cost reduction	Major	Major	Minor	Major
Cost avoidance	Major	Moderate	Minor	I don't know
Increased revenues	Minor	Minor	None	I don't know
Mission-driven performance improvements	Major	Major	Moderate	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Moderate	Major

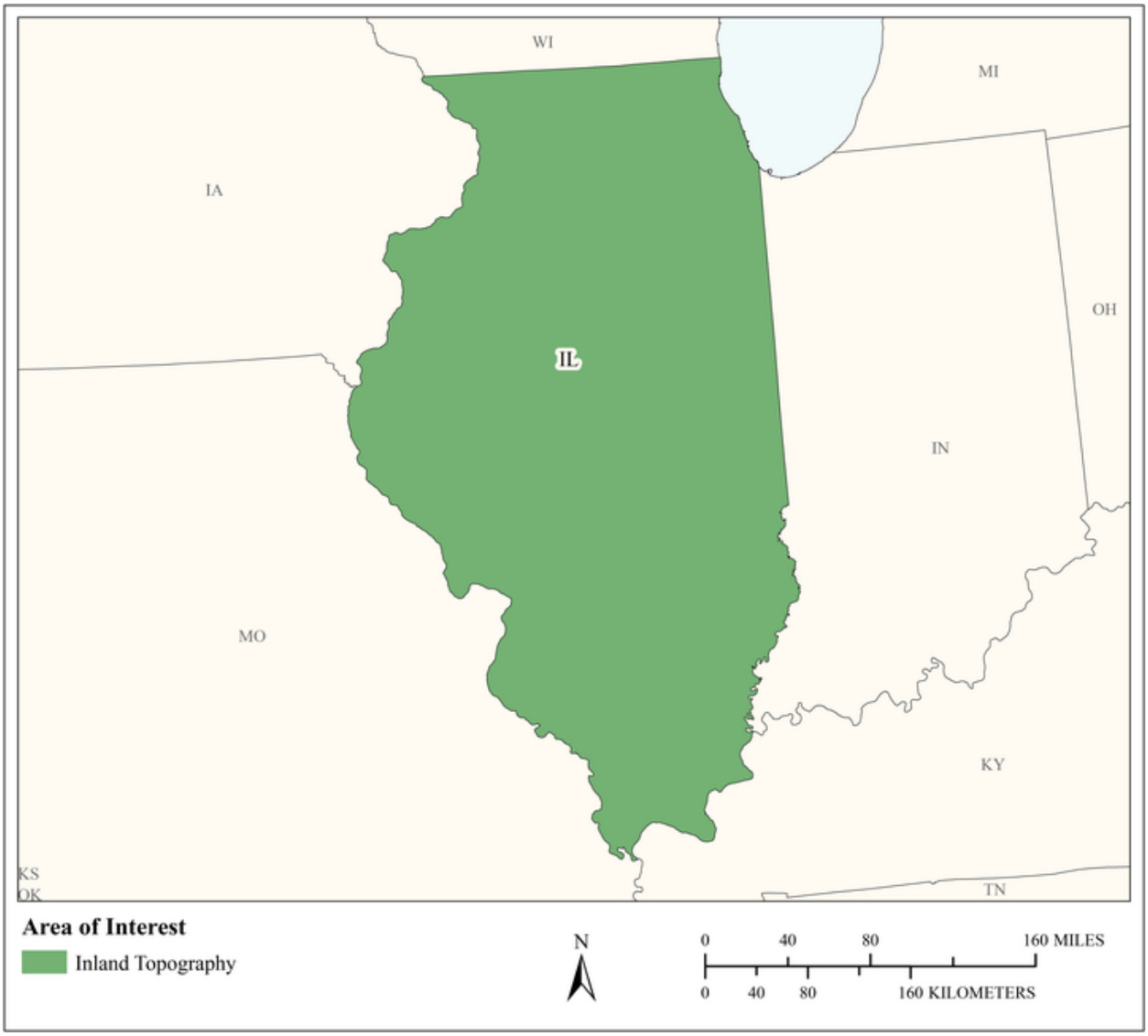
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major	Moderate	Major
Improved customer experience	Major	Moderate	Minor	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Moderate	Major
Environmental	Major	Major	Major	Major
Public safety, including life and property	Major	Moderate	Moderate	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		None			Moderate	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,209,859		Annual dollars saved/ realized	$299,521						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$8,115,278		Annual dollars saved/ realized	$13,483						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate			Moderate		
Environmental	Major			Major			Major			Major		
Public safety, including life and property	Major			Major			Moderate			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Agriculture and Precision Farming



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Farm pond design. Irrigation system design. Detailed site analysis to support precision farming. Analysis of farm sedimentation and runoff. Calibration of fertilizer application, fertilizer management, and irrigation planning. Optimized terraforming.
MCA Title	Agriculture and Precision Farming
MCA ID	60140
Organization Type	State or U.S. Territorial government
Organization Name	State of Illinois
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 08 - Agriculture and Precision Farming
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

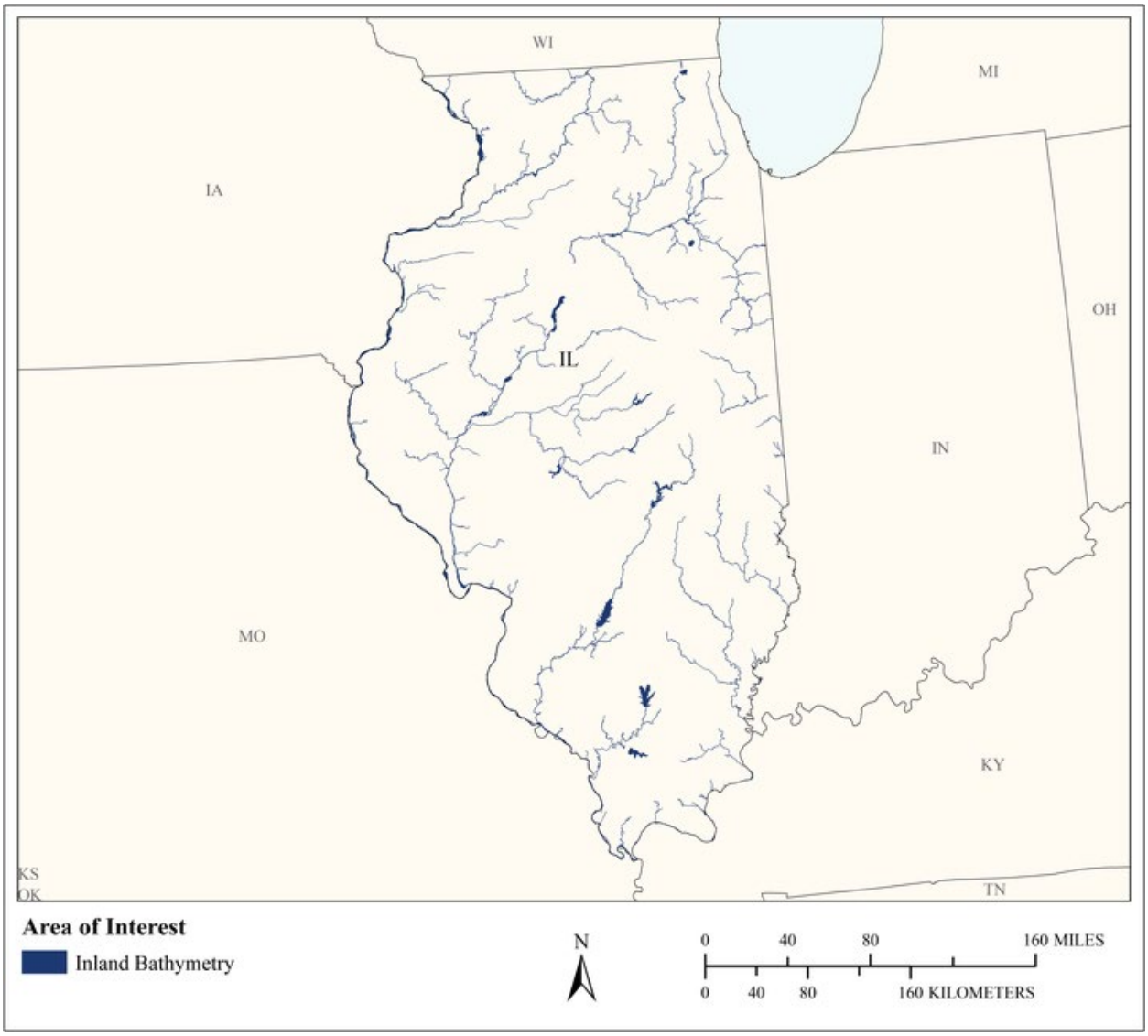
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$65,230									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$51,712									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Minor											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Volumetric Analysis of Interior Lakes



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type		Required		
Geographic Area Requirements		One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Volumetric analysis of interior lakes. The OWR Water Supply and Planning is involved in studies and coordination to assure that adequate and reliable supplies of clean water are available where needed. Part of this involves evaluating current water supply capacities. Therefore, volumes of water supply lakes are evaluated using bathymetry. OWR also supports other parts of IDNR that need lake volume data for aquaculture and fishing support. The same bathymetry analysis is used for some non-water-supply lakes to satisfy these needs. Bottom contour maps are also produced from the bathymetry data.
MCA Title	Volumetric Analysis of Interior Lakes
MCA ID	21666
Organization Type	State or U.S. Territorial government
Organization Name	Illinois Department of Natural Resources, Office of Water Resources
Sub-Agency or Division	
Organization Mission	The Division of Capital Programs administers the Urban Flooding Mitigation program, water supply planning including water withdrawals from Federal reservoirs, stream gaging, and operation and maintenance of state facilities including Stratton Lock and Dam and Sinnissippi Dam. The Division of Capital Programs is the Technical Liaison to the Illinois Emergency Management Agency and provides daily briefings on flood conditions of monitored streams throughout the state and its boundary waters during and following a flood or other disaster The Division of Regulatory Programs administers regulatory programs over construction in the floodways of rivers, lakes, and streams; construction in the shore waters of Lake Michigan; construction and operation of dams; construction in public bodies of water; and diversion of water from Lake Michigan. Resource Management inspects dams, gives permits, coordinates the National Flood Insurance Program and regulates floodplains.
Program Name	Division of Capital Programs Water Supply Planning
Total Annual Program Budget	
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	BU 01 - Water Supply and Quality
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Not required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)

General Geographic Area and Size	
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Bottom surface of lakes. It is helpful to define old creek beds and submerged road cuts and etc. that predated the dam construction.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Not required
51 - 100 ft	Not required
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order		QL0B		
Update Frequency		>10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error		Up to 1 meter		
Acceptable Vertical Error		Less than 10 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season		Highly desirable				
Entire AOI under same environmental conditions		Required				
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless		Not required				
DEM for entire AOI needs to be seamless		Required				
Amount of acceptable vertical manipulation to achieve spatial seamlessness		Up to double the required TVU at the 95% confidence level				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM		Nice to have		
DTM		Required		
DEM		Highly desirable		
Raw point cloud data		Not required		
Classified point cloud		Not required		
Edited/cube XYZ		Nice to have		
Full waveform		Not required		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening		Required		
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery		Nice to have		
Ground control/ground truthing		Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery		Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data		Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates		Required		
Land use/land cover		Not required		
Wetlands		Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features		Required		
Bridges/culverts		Highly desirable		
Landmark features		Highly desirable		
Cultural resources		Not required		
Coastal and riverine structures		Not required		
Overhead structures				
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used		Collected by our survey crew. Varies in quality and collection date.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other		Yes		
Other description		Self-collected		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings		None		
Cost savings/cost reduction		None		
Cost avoidance		None		
Increased revenues		None		

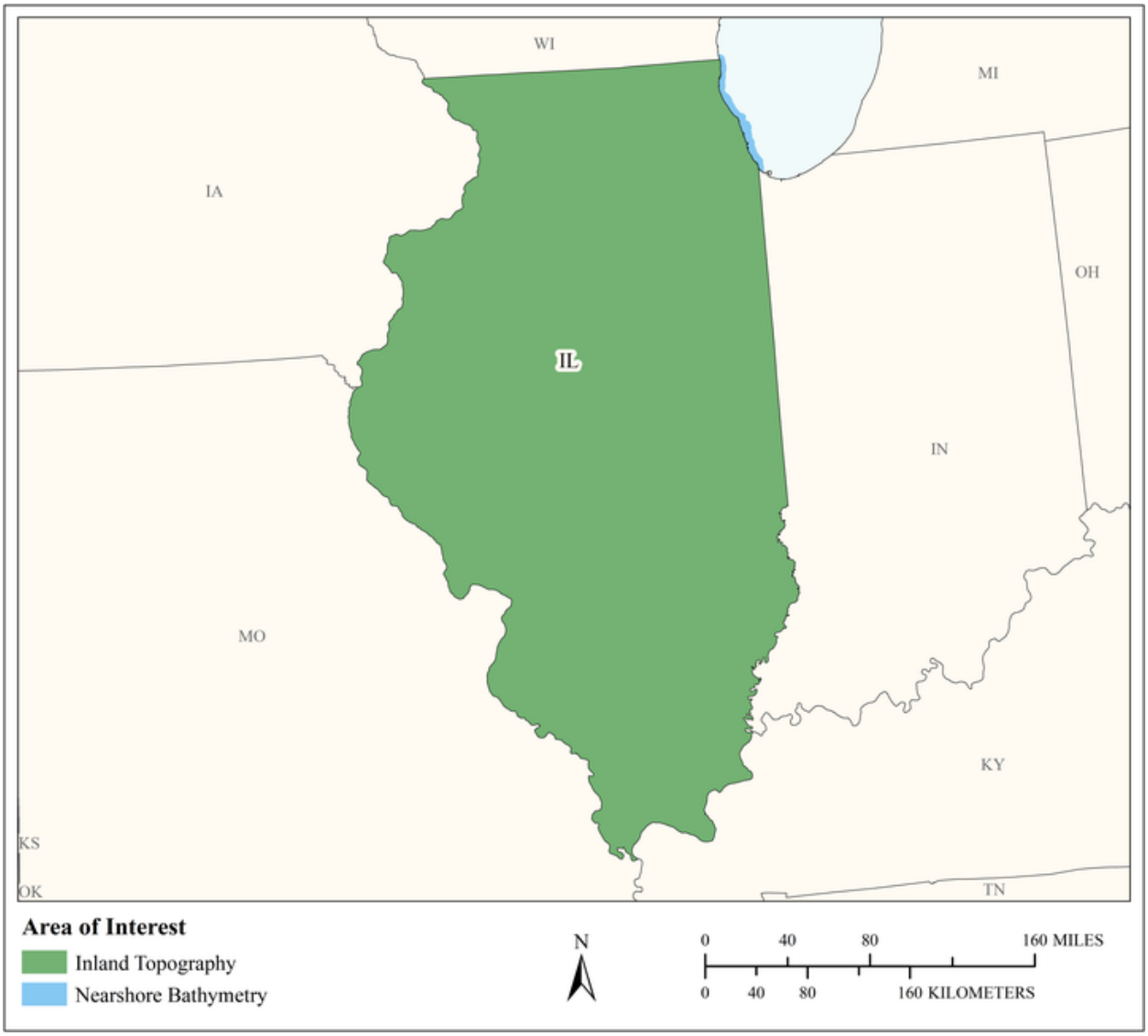
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Mission-driven performance improvements		None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services		Moderate		
Improved response or timeliness		Major		
Improved customer experience		Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach		None		
Environmental		None		
Public safety, including life and property		None		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings				Major	Annual dollars saved/realized	$6,784						
Time savings description				Hours saved for field data collection.								
Cost savings/cost reduction				Major	Annual dollars saved/realized	$10,375						
Cost savings/cost reduction description				Crew time of 225 hours ($35/rh) plus $2500 hotel/stay costs.								
Cost avoidance				Minor	Unable to provide							
Increased revenues				I don't know	Unable to provide							
Mission-driven performance improvements				Minor	Unable to provide							
Other operational benefits				Moderate	Unable to provide							
Other operational benefits description				Varies, but more products without sending a crew.								
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services				None								
Improved response or timeliness				Moderate	Unable to provide							
Improved customer experience				None								
Other customer service benefits				Moderate	Annual dollars saved/realized	$6,784						
Other customer service benefits description				Hours saved by not needing survey crew.								
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach				None								
Environmental				None								
Public safety, including life and property				None								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes		
Contours		Yes		
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Lidar Acquisition for Statewide Needs



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Geologic mapping and analysis. At the ISGS, about 200 scientists and technical support staff conduct basic and applied research in geology, compile geologic maps, and gather and manage the state's geological data to provide information to industry, governmental agencies and the public about the geology and mineral resources of Illinois. Lidar acquisition for statewide needs.
MCA Title	Lidar Acquisition for Statewide Needs
MCA ID	21638
Organization Type	State or U.S. Territorial government
Organization Name	Illinois State Geological Survey, at the Prairie Research Institute at the University of Illinois at Urbana-Champaign
Sub-Agency or Division	
Organization Mission	The Prairie Research Institute's mission is to steward Illinois' natural and cultural resources by providing objective and timely research, data, and expertise to decision makers and stakeholders.
Program Name	The Illinois State Geological Survey; one of 5 agencies under the Prairie Research Institute. Our Mission is to provide the citizens and institutions of Illinois with earth science research and information that are accurate, objective, and relevant to our State's environmental quality, economic prosperity, and public safety. Our Vision is to build upon our stature as a premier state geological survey by upholding the highest standards for scientific research, service to our constituents, and professionalism in all our activities. To serve as the North American model for multi-disciplinary geological survey research in the twenty-first century.
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Sinkholes, dunes, fault lines, slope breaks.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2+		QL0B	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Update Frequency	6-10 years		6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter		Up to 1 meter	
Acceptable Vertical Error	Up to 30 cm		Up to 30 cm	
How far onshore needed			1 kilometer inland	
How far down the beach profile needed	Not applicable		To MHW	
Tide correction requirement			No requirement for tide correction	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have		Highly desirable			Nice to have
Entire AOI under same environmental conditions	Highly desirable		Highly desirable			Highly desirable
Other	Highly desirable					
Other description	Other (sub-areas larger in size ex: multiple counties):					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Highly desirable			Highly desirable
DEM for entire AOI needs to be seamless	Required		Highly desirable			Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable		Highly desirable	
DTM	Highly desirable		Highly desirable	
DEM	Highly desirable		Highly desirable	
Raw point cloud data	Highly desirable		Nice to have	
Classified point cloud	Required		Highly desirable	
Edited/cube XYZ			Not required	
Full waveform	Nice to have		Not required	
Bathymetric Attributed Grid (BAG)			Nice to have	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have		Nice to have	
Ground control/ground truthing	Required		Highly desirable	
Other	Highly desirable			
Other description	Fully classified point cloud - not just bare earth or USGS Base Spec			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Highly desirable		Highly desirable	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Highly desirable		Highly desirable	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Not required	
Routes			Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Highly desirable		Highly desirable	
Land use/land cover	Highly desirable		Highly desirable	
Wetlands	Highly desirable		Highly desirable	
Estuaries			Highly desirable	
Inland surface water features	Highly desirable		Highly desirable	
Bridges/culverts	Nice to have			
Landmark features	Highly desirable		Highly desirable	
Cultural resources	Highly desirable		Highly desirable	
Coastal and riverine structures	Highly desirable		Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	The state of Illinois will achieve first-time, statewide LiDAR data coverage by the end of 2018, with county collections spanning from 2008 through 2018. Of the 102 Illinois counties, 4 counties will have QL1 data. For the remainder of the state about 1/3 of the counties are QL2 or QL2+ and 2/3 are QL3.		Nearshore data collected by other agencies for the Lake Michigan shoreline near Chicago, IL.	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	

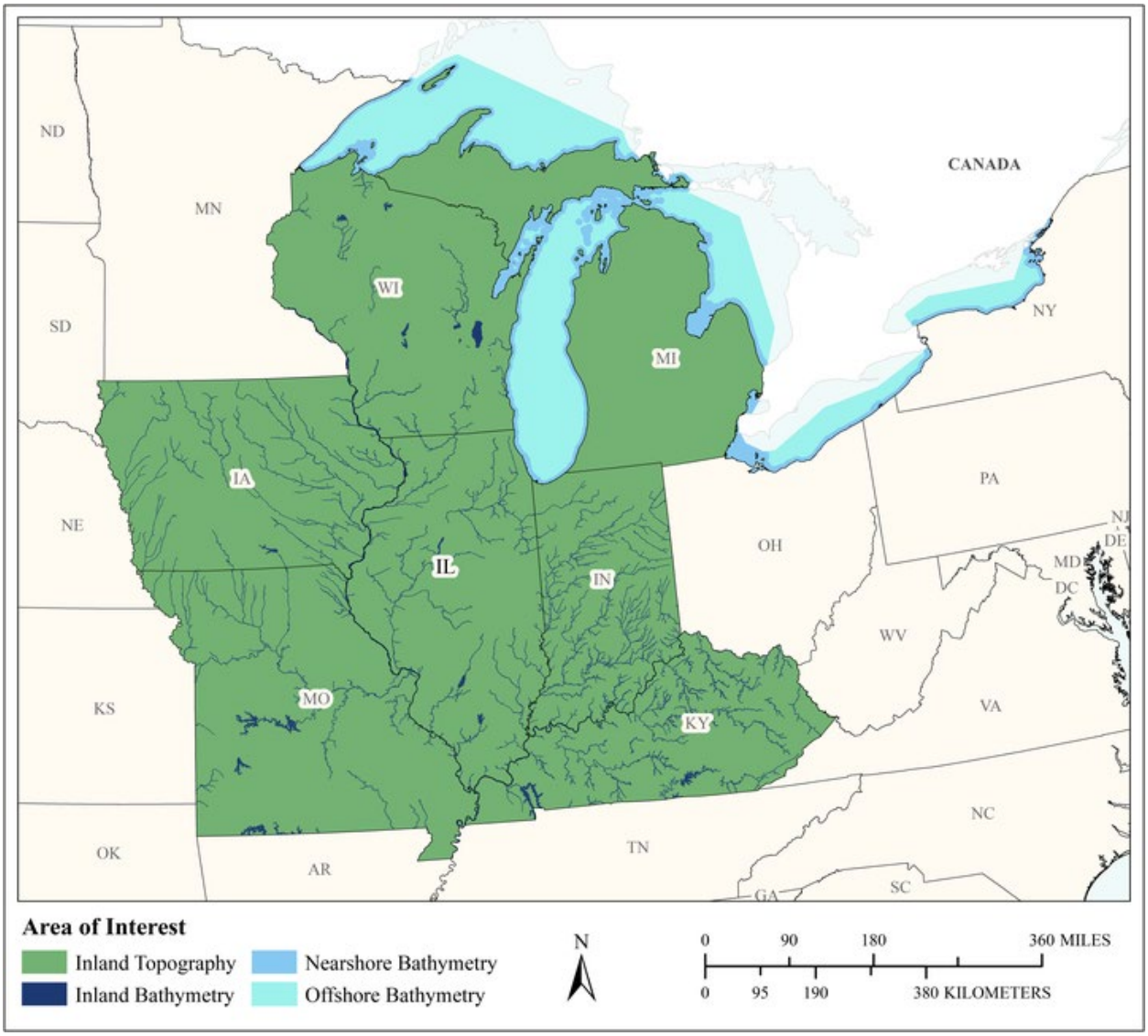
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Illinois			
Other			Yes	
Other description			As can be found	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Moderate	
Cost savings/cost reduction	Major		Moderate	
Cost avoidance	Moderate		Moderate	
Increased revenues	Minor		Minor	
Mission-driven performance improvements	Moderate		Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate		Minor	
Improved response or timeliness	Major		Minor	
Improved customer experience	Moderate		Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major		Minor	
Environmental	Major		Moderate	
Public safety, including life and property	Moderate		Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide					I don't know	Unable to provide				
Cost savings/cost reduction	Moderate	Annual dollars saved/realized	$500,000				I don't know	Unable to provide				
Cost savings/cost reduction description	Hundreds of thousands of dollars.											
Cost avoidance	Major	Annual dollars saved/realized	$250,000				I don't know	Unable to provide				
Cost avoidance description	Hundreds of thousands of dollars; we don't have this expertise.											
Increased revenues	Minor	Unable to provide					I don't know	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide					I don't know	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide					I don't know	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide					I don't know	Unable to provide				
Improved customer experience	Major	Unable to provide					I don't know	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate						I don't know					
Education or outreach description	Continued program funding from other federal, state, local agencies											
Environmental	Minor						I don't know					
Public safety, including life and property	Minor						I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades	Yes			
Slope maps			Yes	
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic Mapping



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Highly desirable	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Custom description	Custom description
Sub Area Requirements			The Great Lakes	The Great Lakes

MCA Description	Response
Mission Critical Activity	Geologic Mapping. Elevation of the earth's surface is needed to create geologic maps. The surface will indicate the glacial materials and glacial processes that formed the surface.
MCA Title	Geologic Mapping
MCA ID	21727
Organization Type	State or U.S. Territorial government
Organization Name	Illinois State Geological survey
Sub-Agency or Division	
Organization Mission	To provide the citizens and institutions of Illinois with earth science research and information that are accurate, objective, and relevant to our State's environmental quality, economic prosperity, and public safety.
Program Name	National Cooperative Geologic Mapping Program
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 13 - Oil and Gas Resources
Tertiary Business Use	BU 03 - Coastal Zone Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Nearshore sand lenses for bathymetry. Topographic features needed for surface geologic mapping (landslide hazard, sinkholes). Building features for public safety.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	Cross sections and/or transects meet needs	QL0B	QL0B	Order 1
Update Frequency	4-5 years	2-3 years	Annually	Annually
Event type(s)				
Quality Level and/or update frequency variability across AOI			Great Lakes	
Acceptable Horizontal Error	Less than 20 cm	Less than 50 cm	Less than 50 cm	Less than 50 cm
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm	Less than 10 cm	Less than 1 meter
How far onshore needed			To the fall line	
How far down the beach profile needed	Not applicable		Below MLLW	
Tide correction requirement			No requirement for tide correction	No requirement for tide correction
Cross sections and/or transects meet needs	Yes			
Cross section/transect requirement	Depends on area; requirements are variable			

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Required	Required	Required	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Required	Required	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required	Required	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Highly desirable	Highly desirable	Highly desirable
Raw point cloud data	Required	Highly desirable	Highly desirable	Highly desirable
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Highly desirable	Highly desirable	Highly desirable
Full waveform	Required	Highly desirable	Highly desirable	Highly desirable
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery	Required	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Required	Highly desirable	Highly desirable
Underwater videography			Highly desirable	Highly desirable
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Required	Required	Highly desirable	Highly desirable
Water column properties - Physical			Highly desirable	Highly desirable
Water column properties - Chemical			Highly desirable	Highly desirable
Water column properties - Biological			Highly desirable	Highly desirable
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Highly desirable	Highly desirable
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Highly desirable	Highly desirable
Routes			Highly desirable	Highly desirable
Offshore cadastral			Highly desirable	Highly desirable
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Required	Required	Highly desirable	Highly desirable
Wetlands	Required	Required	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Required	Required	Highly desirable	
Cultural resources	Required	Required	Highly desirable	
Coastal and riverine structures	Required	Required	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Mix of QL1-QL3 LiDAR data	Best available	JALBTCX data; data we collect with our single beam and MBES systems. Also TDEM surveys via helicopter	JALBTCX data; data we collect with our single beam and MBES systems.
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast		Yes	Yes	Yes
NCEI		Yes	Yes	Yes
Open Topography				
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts		Yes	Yes	Yes
USGS Inland Waters server		Yes		
USGS data series		Yes		
Marine Minerals Program GIS			Yes	Yes
State Repositories	Yes			
State repositories used	Illinois Geospatial Data Clearinghouse.			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	I don't know	I don't know	I don't know
Cost savings/cost reduction	Major	I don't know	I don't know	I don't know
Cost avoidance	Major	I don't know	I don't know	I don't know

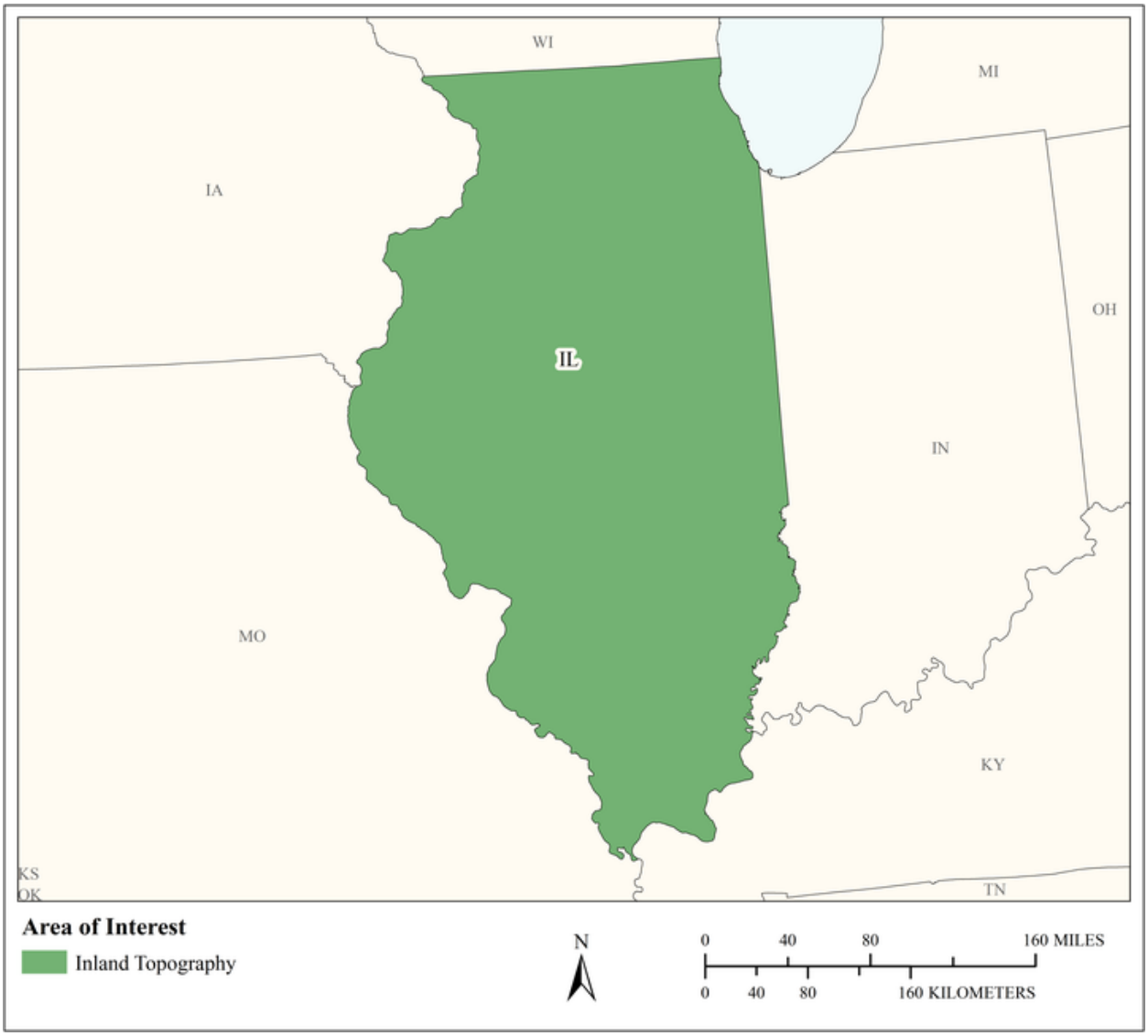
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Increased revenues	Major	I don't know	I don't know	I don't know
Mission-driven performance improvements	Major	I don't know	I don't know	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	I don't know	I don't know	I don't know
Improved response or timeliness	Major	I don't know	I don't know	I don't know
Improved customer experience	Major	I don't know	I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	I don't know	I don't know	I don't know
Environmental	Major	I don't know	I don't know	I don't know
Public safety, including life and property	Major	I don't know	I don't know	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance description	Not applicable to our program.											
Increased revenues	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues description	Not applicable to our program.											
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			I don't know			I don't know			I don't know		
Environmental	Moderate			I don't know			I don't know			I don't know		
Public safety, including life and property	Moderate			I don't know			I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades	Yes			
Slope maps		Yes	Yes	
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Renewable Energy Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Alternate energy development – solar, tidal, wind, wave, and ocean current. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Low head power potential for hydropower.
MCA Title	Renewable Energy Resources
MCA ID	60141
Organization Type	State or U.S. Territorial government
Organization Name	State of Illinois
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Not required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Minor			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor			

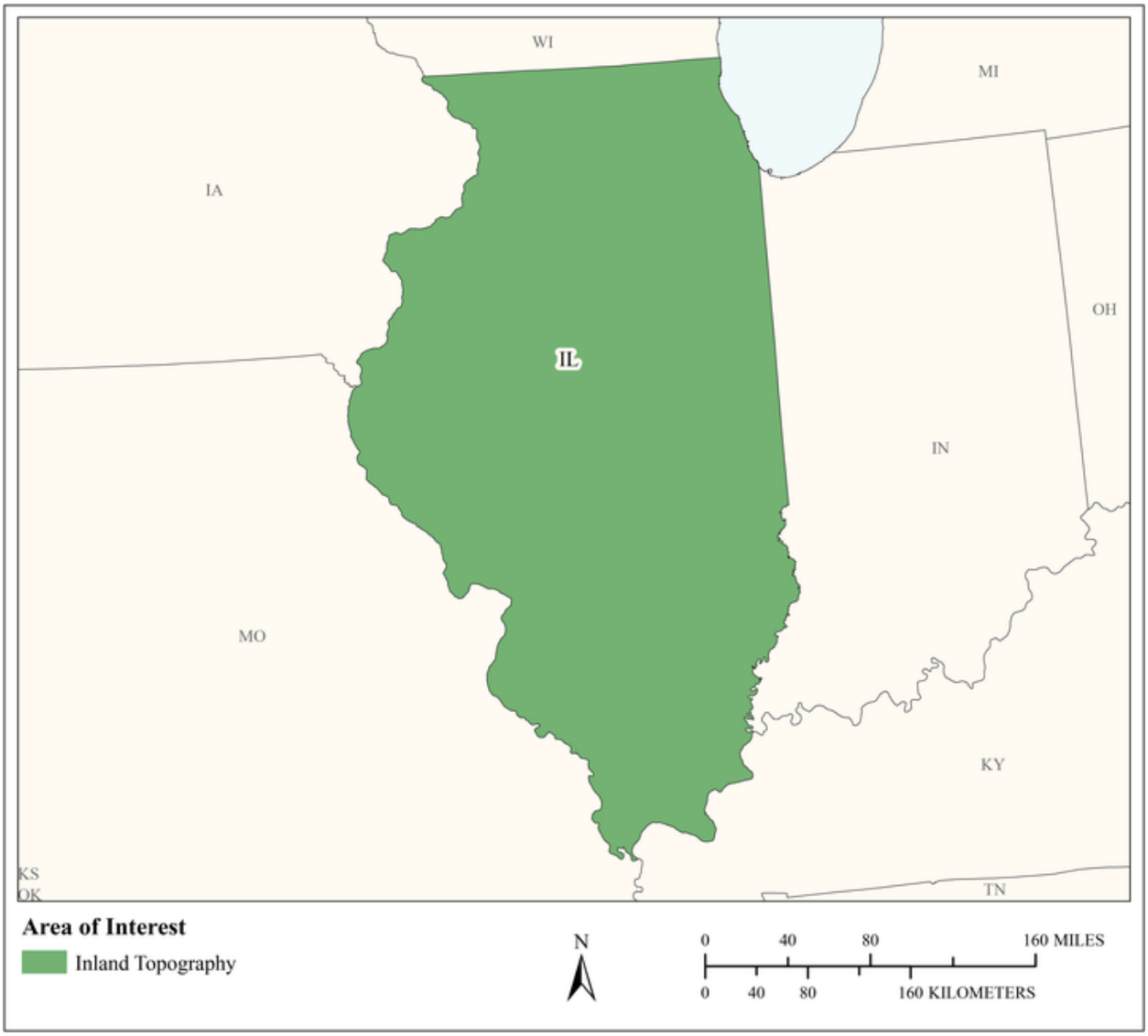
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Minor			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	None											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Cultural Resources Preservation and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Discovery and analysis of underwater archaeological and historical cultural sites. Site protection and preservation planning. Discovery and analysis of Native American and other historical cultural sites and subsistence activities.
MCA Title	Cultural Resources Preservation and Management
MCA ID	60142
Organization Type	State or U.S. Territorial government
Organization Name	State of Illinois
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Nice to have					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have					
DEM for entire AOI needs to be seamless	Nice to have					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Moderate			
Cost avoidance	Minor			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			

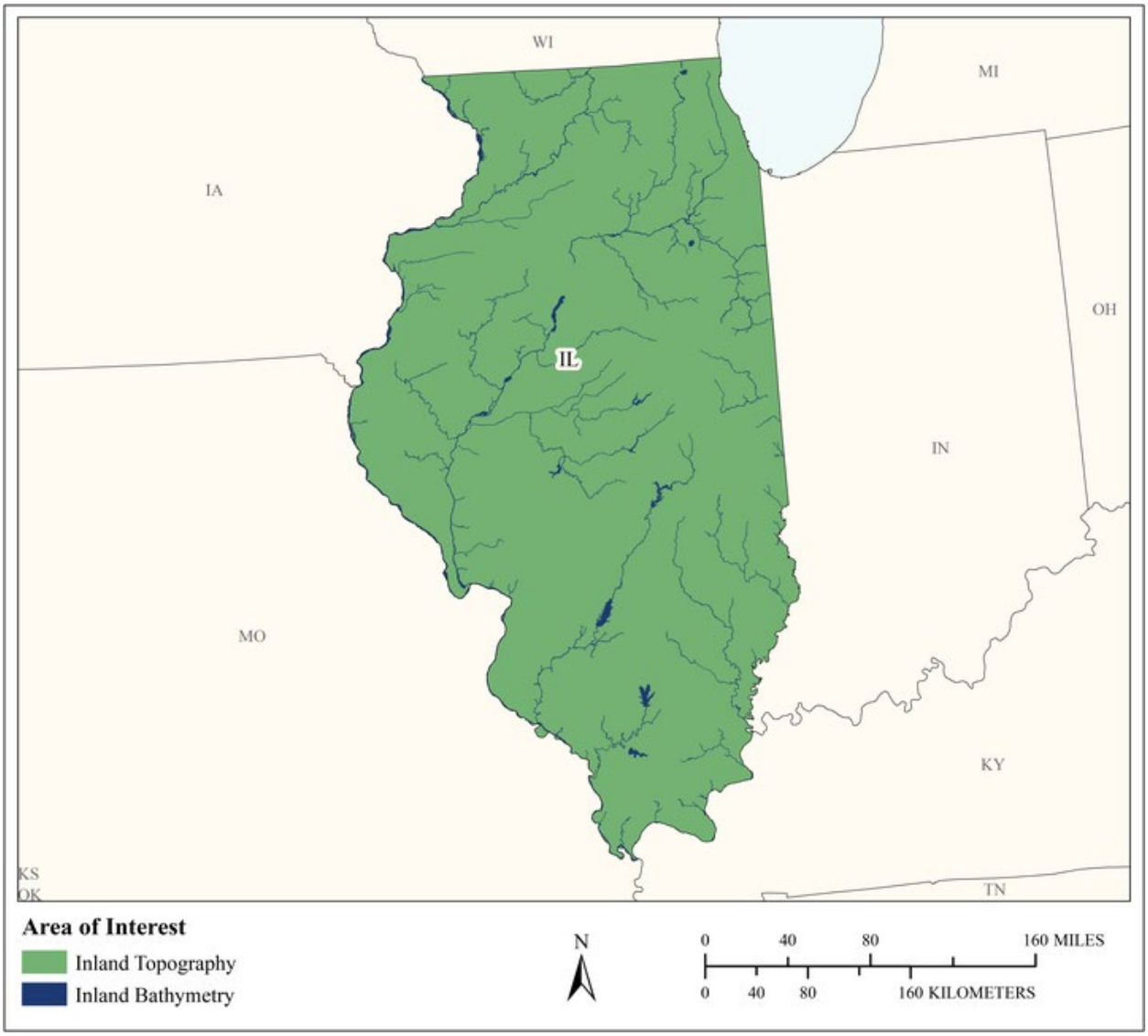
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Cost savings/cost reduction	Minor	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Moderate	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$10,326									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$9,028									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	Minor											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: River Flood Inundation Mapping Based on Event Frequency and Gage Stage Levels



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	River flood inundation mapping based on event frequency and gage stage levels. The great concern during any flooding event is how high the flood waters will get and what will be inundated. The National Weather Service provides a great forecasting service predicting the stage level of river gages. That tells how high the water level will be at a gage. OWR provides web based interactive maps that show the inundation associated with selected river gage stage levels. When a stage level is selected the map shows the extent of the flood waters and is colored to indicate the depth of the inundation. These maps are useful in quickly indicating what the disaster managers will have to deal with. They can see if it will still be possible for emergency vehicles to drive through certain areas, if the flood levels might be managed with sandbags and how bad the damage will be for critical facilities and other structures. The web maps are also useful for future planning and in sorting out claims and issues from past events. In order to build these interactive web maps, a catalog of inundation profiles must be constructed. Elevation data and bathymetry are used in modeling the surrounding river levels relative to the gage levels. These models may be done by OWR but are more commonly done by the US Army Corps of Engineers and the Illinois State Water Survey. Bare earth elevation data is then used by OWR to construct water extent and depth profiles from the model data.
MCA Title	River Flood Inundation Mapping Based on Event Frequency and Gage Stage Levels
MCA ID	1127
Organization Type	State or U.S. Territorial government
Organization Name	Illinois Department of Natural Resources, Office of Water Resources
Sub-Agency or Division	
Organization Mission	The Office of Water Resources is the lead state agency for water resources planning, navigation, floodplain management, the National Flood Insurance Program, water supply, drought, and interstate organizations on water resources. Interagency duties include the state water plan, drought response, flood emergency situation reports, and the comprehensive review of Illinois water use law. The primary capital activity of the office is in the area of urban flood damage reduction. The office assists units of local government with urban flood damage reduction projects through planning, design, construction, and financial assistance. The urban program also features the acquisition of flood prone homes and businesses.
Program Name	Division of Capital Programs Engineering Studies Section & Survey and Mapping Section
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Not required

What Needs to be Measured in 3D	Response
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Building footprints. We also need the first floor elevations to do damage assessments and analysis.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Not required
5.1 – 10 acres	Not required
Greater than 10 acres	Not required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B		
Update Frequency	2-3 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI	Stream valleys, stream valleys by importance. Flood prone areas only require QL2 every 2-3 years.			
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	Less than 50 cm		
Acceptable Vertical Error	Less than 5 cm	Up to 40 cm		

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial	Partial		
Cross section/transect requirement	2" vertical and measurements every 5 ft., cross sections across streams. 2" vertical accuracy and minimum 5' spacing	Cross sections are needed across rivers to predict inundation for given events and gauge stages. These same cross sections are used for the modeling study and cross sections are needed for feeder streams to support the initial modeling study. Inundation levels are predicted for gauge levels to the 0.5 foot level increment. The bathymetry needs to be less than 0.5 feet vertical and at least 5 foot intervals.		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Not required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	I don't know			Individual delivered	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable		
DTM	Required	Required		
DEM	Required	Highly desirable		
Raw point cloud data	Nice to have	Not required		
Classified point cloud	Required	Nice to have		
Edited/cube XYZ		Not required		
Full waveform	Highly desirable	Not required		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Highly desirable		
Ground control/ground truthing	Nice to have	Not required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required	Required		
Land use/land cover	Nice to have	Not required		
Wetlands	Highly desirable	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Required		
Bridges/culverts	Highly desirable	Nice to have		
Landmark features	Required	Highly desirable		
Cultural resources	Nice to have	Not required		
Coastal and riverine structures	Highly desirable	Not required		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	LiDAR data from state/county/city cooperative collection http://clearinghouse.isgs.illinois.edu/data/elevation/illinois-height-modernization-ilhmp-lidar-data	We have a survey team that acquires bathymetry. We also use bathymetry data from other sources such as USACE.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	http://clearinghouse.isgs.illinois.edu/data/elevation/illinois-height-modernization-ilhmp-lidar-data			

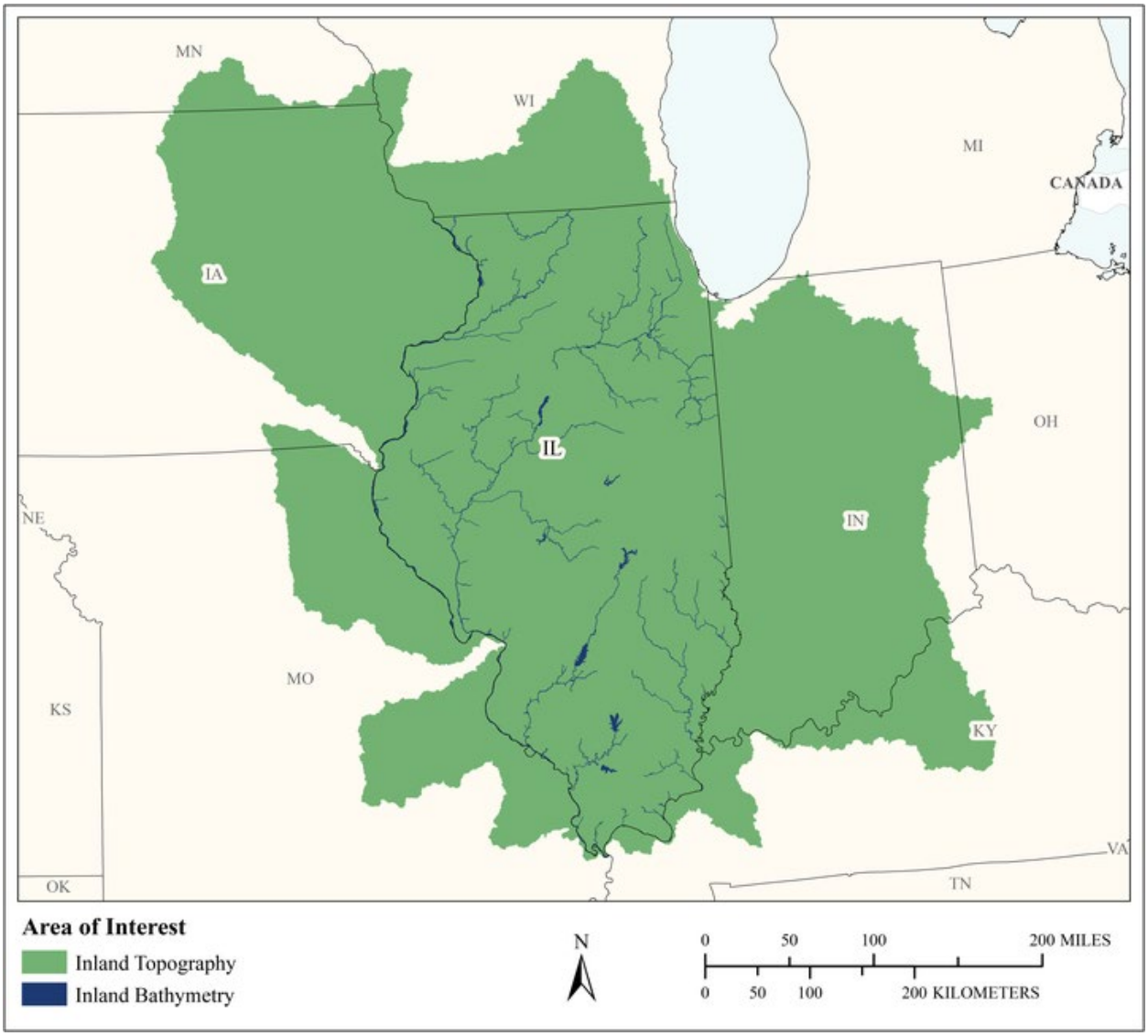
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other	Yes	Yes		
Other description	USACE	Individual transfer, USACE, And self-collected		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available		
Cost savings/cost reduction	Major	Inland bathy data not available		
Cost avoidance	Major	Inland bathy data not available		
Increased revenues	None	Inland bathy data not available		
Mission-driven performance improvements	Moderate	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available		
Improved response or timeliness	Moderate	Inland bathy data not available		
Improved customer experience	Major	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Inland bathy data not available		
Environmental	Minor	Inland bathy data not available		
Public safety, including life and property	Moderate	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Minor	Unable to provide							
Cost savings/cost reduction	I don't know	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Moderate	Unable to provide		None								
Increased revenues	I don't know	Unable to provide		None								
Mission-driven performance improvements	Major	Unable to provide		Minor	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Minor	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide							
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide							
Other customer service benefits				Minor	Unable to provide							
Other customer service benefits description				More complete and accurate maps.								
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			None								
Education or outreach description	Illustrating threats to assist in disaster mitigation											
Environmental	Moderate			None								
Environmental description	Avoiding environmental damage from floods											
Public safety, including life and property	Major			Minor								
Public safety, including life and property description	Better information provided for flood fighting.			More efficient response to flooding from more accurate maps								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes			
Hillshades	Yes			
Slope maps				
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Flood Risk Assessment and Mapping



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Flood risk assessment and mapping
MCA Title	Flood Risk Assessment and Mapping
MCA ID	21597
Organization Type	State or U.S. Territorial government
Organization Name	Illinois State Water Survey
Sub-Agency or Division	
Organization Mission	The Illinois State Water Survey has been a leader in the study of water resources for more than a century. Our research and service programs provide citizens, industries, and government agencies at all levels with timely, science-based information and analysis necessary to manage our water resources wisely for economic development and a sustainable environment.
Program Name	FEMA CTP
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Small features, buildings, flood control structures

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Nice to have

Inland Bathy Feature Size Requirements	Response
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B		
Update Frequency	4-5 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial	Partial		
Cross section/transect requirement	Engineering accuracy - 50 cm vertical accuracy at 50'-100' spacing and at significant elevation changes and/or structures	Engineering accuracy - 50 cm vertical accuracy at 50'-100' spacing and at significant elevation changes and/or structures		

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Nice to have	Nice to have			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Nice to have			Nice to have	
DEM for entire AOI needs to be seamless	Highly desirable	Nice to have			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Required	Highly desirable		
DEM	Highly desirable	Required		
Raw point cloud data	Not required	Not required		
Classified point cloud	Nice to have	Nice to have		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Not required	Not required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Nice to have		
Land use/land cover	Nice to have	Nice to have		
Wetlands	Not required	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have	Required		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have		
Cultural resources	Not required	Not required		
Coastal and riverine structures	Highly desirable	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	County data. Information available at the Illinois Geospatial Clearinghouse	Collected by OWR surveyors or obtained from USACE		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	ISGS	ISGS		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	Major	Minor		
Increased revenues	Minor	Minor		
Mission-driven performance improvements	Major	Minor		

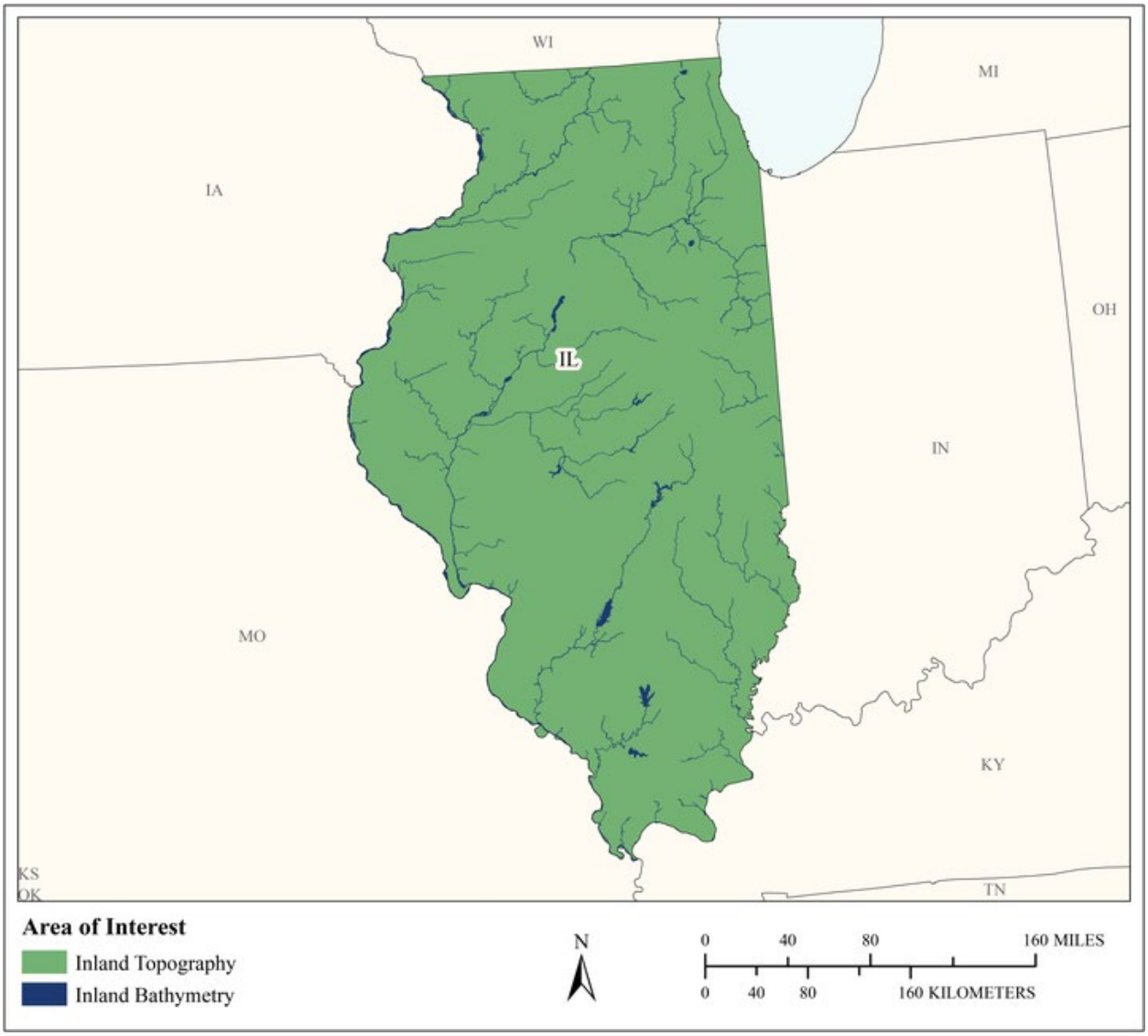
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		
Improved response or timeliness	Minor	Minor		
Improved customer experience	Moderate	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor		
Environmental	Minor	Minor		
Public safety, including life and property	Minor	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Minor	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction	Minor	Unable to provide		I don't know	Unable to provide							
Cost avoidance	Minor	Unable to provide		I don't know	Unable to provide							
Increased revenues	Minor	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Minor	Unable to provide		I don't know	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	Moderate	Unable to provide		I don't know	Unable to provide							
Improved customer experience	Minor	Unable to provide		I don't know	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			I don't know								
Environmental	Minor			I don't know								
Public safety, including life and property	Minor			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Hydrologic and Hydraulic Modeling for Floodplain Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Area split by varying quality level or update frequency	One or more states, territories, or counties		
Sub Area Requirements	Illinois			

MCA Description	Response
Mission Critical Activity	Hydrologic and Hydraulic modeling of rivers for Floodplain Management. OWR Engineering Studies uses elevation and bathymetric data for models to support mitigation plan development. Flood Mitigation Planning uses the model results and elevation data when developing mitigation plans to obtain optimal solutions for investment.
MCA Title	Hydrologic and Hydraulic Modeling for Floodplain Management
MCA ID	21641
Organization Type	State or U.S. Territorial government
Organization Name	Illinois Department of Natural Resources, Office of Water Resources
Sub-Agency or Division	
Organization Mission	The Office of Water Resources is the lead state agency for water resources planning, navigation, floodplain management, the National Flood Insurance Program, water supply, drought, and interstate organizations on water resources. Interagency duties include the state water plan, drought response, flood emergency situation reports, and the comprehensive review of Illinois water use law. The primary capital activity of the office is in the area of urban flood damage reduction. The office assists units of local government with urban flood damage reduction projects through planning, design, construction, and financial assistance. The urban program also features the acquisition of flood prone homes and businesses
Program Name	Division of Capital Programs Engineering Studies and Division of Resource Management Flood Mitigation Planning
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 22 - Infrastructure and Construction Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Not required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Levees, flow structures

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Required

Inland Bathy Feature Size Requirements	Response
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	(a) QL0 (b) QL2	QL0B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI	Floodplains only need QL0. Rest can be QL2.			
Acceptable Horizontal Error	Up to 30 cm	Up to 1 meter		
Acceptable Vertical Error	Up to 1 meter	Less than 10 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Not required			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level			Up to double the required TVU at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Nice to have		
DTM	Required	Required		
DEM	Required	Highly desirable		
Raw point cloud data	Not required	Not required		
Classified point cloud	Required	Required		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Not required		
Ground control/ground truthing	Nice to have	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required	Required		
Land use/land cover	Nice to have	Nice to have		
Wetlands	Nice to have	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Required	Required		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Not required	Not required		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	County data. Information available at the Illinois Geospatial Clearinghouse	Collected by OWR surveyors or obtained from USACE		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Illinois Geospatial Data Clearinghouse			
Other		Yes		
Other description		In house collection		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Major		

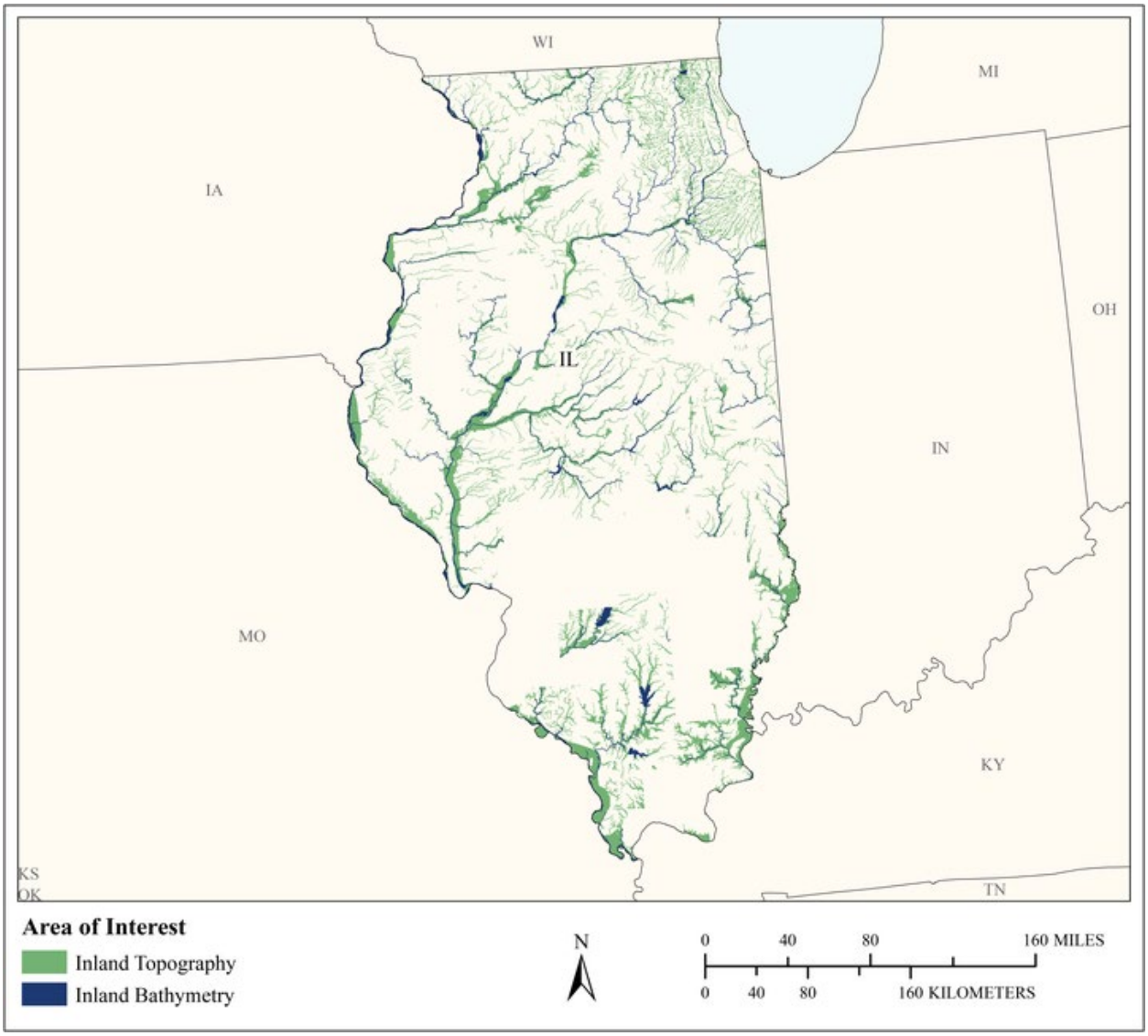
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	None	Major		
Mission-driven performance improvements	Major	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None	None		
Improved response or timeliness	Major	None		
Improved customer experience	Moderate	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	None		
Environmental	None	None		
Public safety, including life and property	I don't know	None		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide							
Increased revenues	None			None								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Other operational benefits	Major	Unable to provide		Major	Unable to provide							
Other operational benefits description	Available without delay.			Avoid time and cost of collection.								
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide							
Other customer service benefits	Major	Unable to provide										
Other customer service benefits description	Faster project completion.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			None								
Environmental	None			None								
Public safety, including life and property	I don't know			Major								
Public safety, including life and property description				Better flood area determinations								
Other	Faster project reviews			Smoother regulatory operation								
Other benefits	Major			Major								
Other description				Having more studies completed								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps		Yes		
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Enforcement and Permitting of Construction in Flood Zones and Floodways



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Custom description	Custom description		
Sub Area Requirements	Illinois Special Flood Hazard Areas	Illinois Special Flood Hazard Areas		

MCA Description	Response
Mission Critical Activity	Enforcement and permitting of construction in floodways. OWR Regulatory programs conducts enforcement actions for violations of Floodway rules. They also issue permits for construction to assure compliance with the flood regulations. Elevation data is crucial in evaluation of apparent violations and the criteria for issuing permits.
MCA Title	Enforcement and Permitting of Construction in Flood Zones and Floodways
MCA ID	22265
Organization Type	State or U.S. Territorial government
Organization Name	Illinois Department of Natural Resources, Office of Water Resources
Sub-Agency or Division	
Organization Mission	The Office of Water Resources is the lead state agency for water resources planning, navigation, floodplain management, the National Flood Insurance Program, water supply, drought, and interstate organizations on water resources. Interagency duties include the state water plan, drought response, flood emergency situation reports, and the comprehensive review of Illinois water use law. The primary capital activity of the office is in the area of urban flood damage reduction. The office assists units of local government with urban flood damage reduction projects through planning, design, construction, and financial assistance. The urban program also features the acquisition of flood prone homes and businesses.
Program Name	Division of Resource Management Regulatory Programs
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Any construction or earth moving in a floodway.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Not required
5.1 – 10 acres	Not required
Greater than 10 acres	Not required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B		
Update Frequency	>10 years	>10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter		
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial	Partial		
Cross section/transect requirement	Cross sections of the floodplains will work. The spacing is dependent on the nature of the floodplain. The more characteristics change require tighter spacing. ~200-1000'	0.2 ft accuracy ~5 ft spacing		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Nice to have			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level			Up to double the required TVU at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Not required	Not required		
Classified point cloud	Required	Required		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Nice to have		
Ground control/ground truthing	Nice to have	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required	Required		
Land use/land cover	Nice to have	Nice to have		
Wetlands	Nice to have	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have	Nice to have		
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Nice to have	Highly desirable		
Cultural resources	Not required	Nice to have		
Coastal and riverine structures	Not required	Not required		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	County LiDAR data. Particulars can be found on the Illinois Geospatial Data Clearinghouse.	Collected by our survey crew. Dates vary greatly.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Illinois Geospatial Data Clearinghouse. Most data is delivered directly to us and not downloaded.			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor		
Cost savings/cost reduction	Major	None		

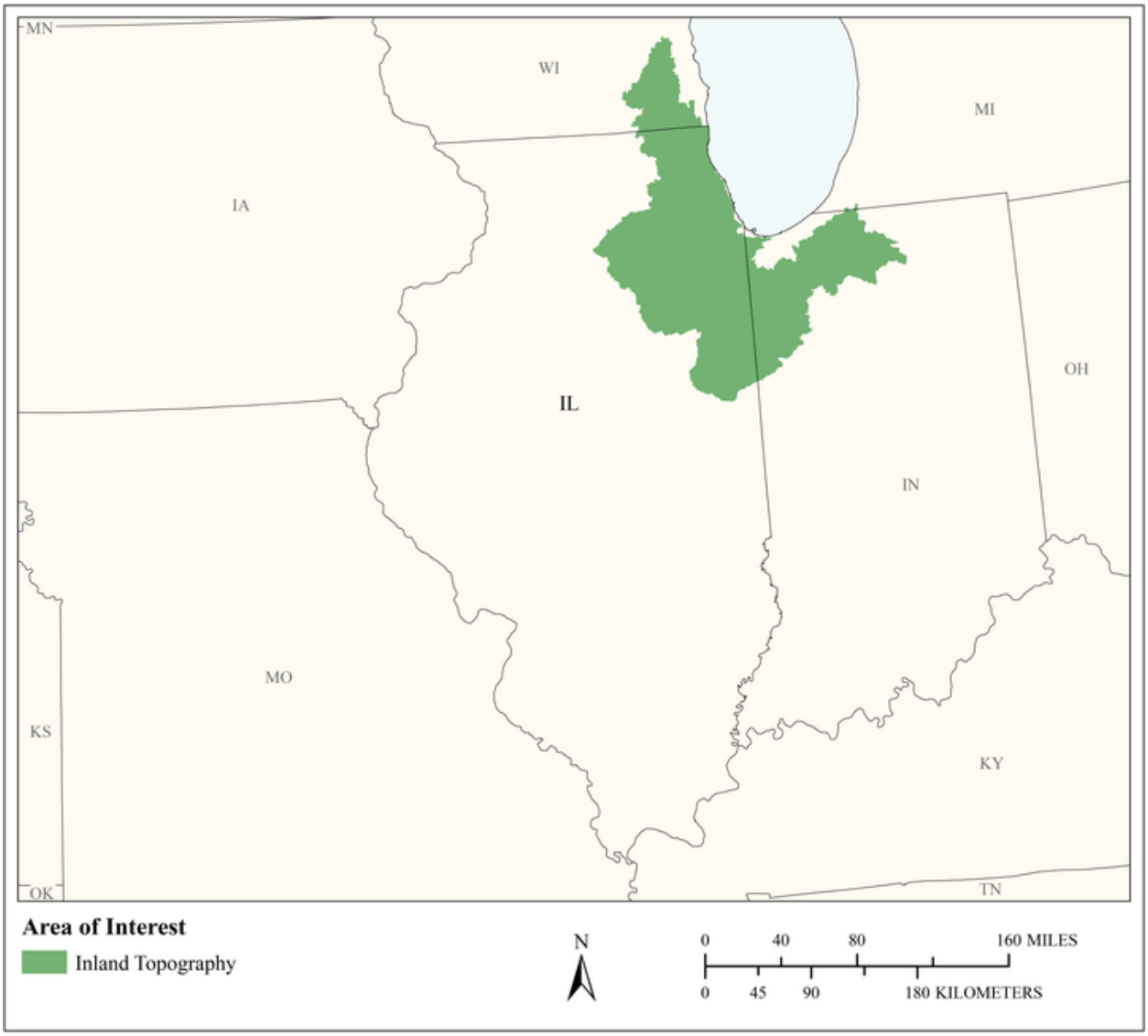
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost avoidance	Major	None		
Increased revenues	None	I don't know		
Mission-driven performance improvements	Moderate	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	I don't know		
Improved response or timeliness	Moderate	None		
Improved customer experience	Moderate	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	I don't know		
Environmental	None	I don't know		
Public safety, including life and property	Moderate	I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Minor	Annual dollars saved/realized	$603	Minor	Unable to provide							
Cost savings/cost reduction	None			I don't know	Unable to provide							
Cost avoidance	None			None								
Increased revenues	None			None								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Other operational benefits				Minor	Unable to provide							
Other operational benefits description				More effiecent processing.								
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		None								
Value added to products or services description	Allows us to compare ground elevations against previous elevations when permits are required.											
Improved response or timeliness	I don't know	Unable to provide		None								
Improved response or timeliness description	Ability to quickly advise when an apparent violation has occurred.											
Improved customer experience	None			I don't know	Unable to provide							
Other customer service benefits	I don't know	Unable to provide		I don't know	Unable to provide							
Other customer service benefits description	Definitive and quick responses to regulatory questions.			Better interaction between regulators and community.								
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know								
Environmental	I don't know			I don't know								
Public safety, including life and property	I don't know			I don't know								
Other	Smoother implementation of regulations			Improved efficiency								
Other benefits	I don't know			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Flood Inundation Mapping



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Area split by varying quality level or update frequency			
Sub Area Requirements	HUC 0712			

MCA Description	Response
Mission Critical Activity	Flood inundation mapping.
MCA Title	Flood Inundation Mapping
MCA ID	22352
Organization Type	Regional, County, City, or other local government
Organization Name	Lake County, Illinois
Sub-Agency or Division	
Organization Mission	Deliver exceptional, financially sustainable services that promote a safe and healthy community while enhancing economic vitality
Program Name	Floodplain Buyout Project
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Buildings, culverts, physical and manmade features that would impact the natural flow of water

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	(a) QL1 HD (b) QL2			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI	Frequency requirements would be for Lake County, IL only, the other areas could be at a lower quality level, QL2			
Acceptable Horizontal Error	Less than 20 cm			
Acceptable Vertical Error	Less than 5 cm			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed				
How far down the beach profile needed	To MHW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Highly desirable
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Not required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Not required			
Wetlands				
Estuaries				
Inland surface water features				
Bridges/culverts				
Landmark features				
Cultural resources				
Coastal and riverine structures				
Overhead structures				
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	3DEP QL2			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Illinois Geospatial Data Clearinghouse.			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know			
Cost savings/cost reduction	I don't know			
Cost avoidance	I don't know			

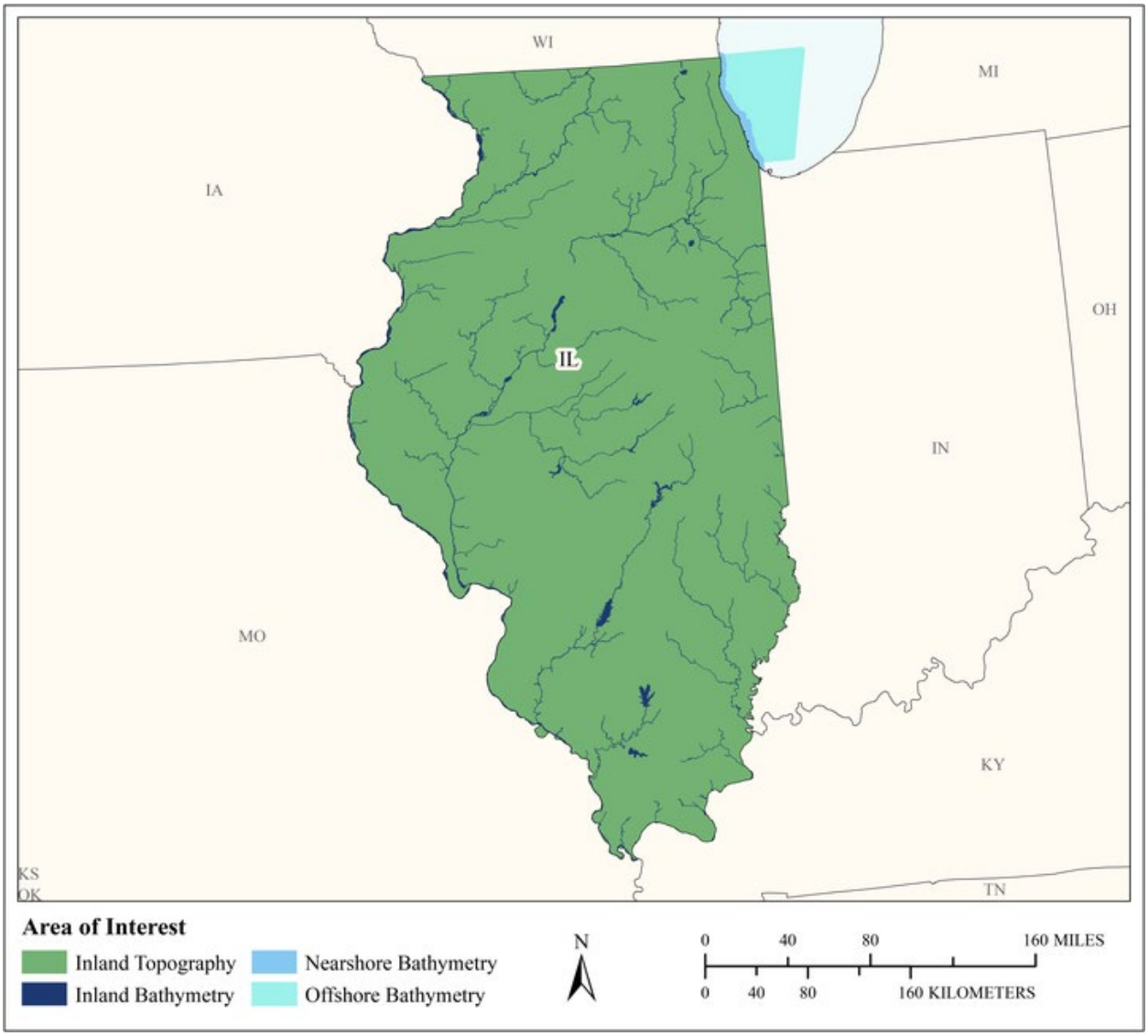
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	I don't know			
Mission-driven performance improvements	I don't know			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know			
Improved response or timeliness	I don't know			
Improved customer experience	I don't know			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know			
Environmental	I don't know			
Public safety, including life and property	I don't know			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide										
Cost savings/cost reduction	I don't know	Unable to provide										
Cost avoidance	I don't know	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	I don't know	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide										
Improved response or timeliness	I don't know	Unable to provide										
Improved customer experience	I don't know	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Sea Level Rise and Subsidence



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Modeling and mapping the effects of sea level rise or subsidence. Population and economic vulnerability assessments. Coastal inundation and infrastructure assessment.
MCA Title	Sea Level Rise and Subsidence
MCA ID	60143
Organization Type	State or U.S. Territorial government
Organization Name	State of Illinois
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 16 - Sea Level Rise and Subsidence
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL1B	QL2B	Order 2
Update Frequency	4-5 years	4-5 years	2-3 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	Up to 20 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	Up to 2 meters
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Required	Required	Highly desirable	Highly desirable	Required
Entire AOI under same environmental conditions	Highly desirable	Required	Required	Highly desirable	Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Required	Required	Highly desirable	Required
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have	Highly desirable	Highly desirable
DTM	Required	Required	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Highly desirable	Nice to have	Nice to have
Classified point cloud	Required	Nice to have	Highly desirable	
Edited/cube XYZ		Not required	Not required	Not required
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Not required	Not required	Not required
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	Required
Tide Predictions			Required	Required
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Required
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Highly desirable	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Required
Nautical and/or navigation charts			Highly desirable	Required
Acoustic imagery of the seafloor			Nice to have	Not required
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Not required	Not required
Bottom texture			Not required	Not required
Bottom type			Nice to have	Nice to have
Submerged features			Nice to have	Not required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Not required
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Not required
Water column properties - Biological			Not required	Not required
Currents			Nice to have	Nice to have
Tide/wave heights			Required	Required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Required
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Not required	Not required
Lease areas			Not required	Not required
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Required	Required	Highly desirable	Highly desirable
Wetlands	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Required	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes	Yes	Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Major	Major
Cost savings/cost reduction	Major	Major	Major	Major
Cost avoidance	Major	Major	Major	Major
Increased revenues	None	Minor	Minor	None
Mission-driven performance improvements	Major	Major	Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	Major

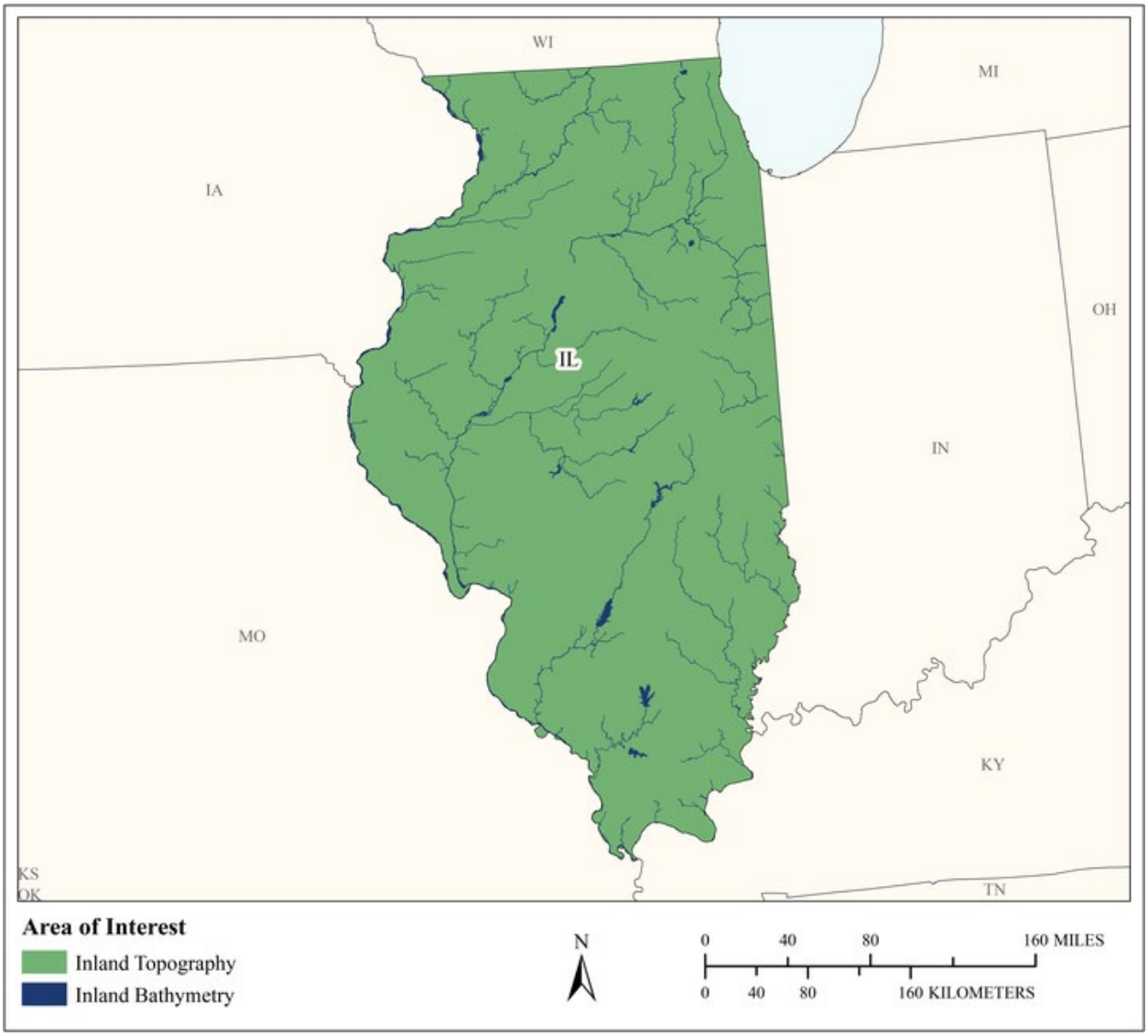
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Minor	Major	Major
Improved customer experience	Moderate	Moderate	Major	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Major	Moderate
Environmental	Moderate	Moderate	Major	Major
Public safety, including life and property	Major	Moderate	Major	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Increased revenues	Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,966,211									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Major			Major		
Environmental	Moderate			Major			Major			Major		
Public safety, including life and property	Moderate			Major			Minor			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		Yes
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Disaster Planning and Response



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Line-of-sight analysis in urban and rural areas, Disaster response, Critical infrastructure protection, Special event planning, Criminal investigations
MCA Title	Disaster Planning and Response
MCA ID	1175
Organization Type	State or U.S. Territorial government
Organization Name	Illinois State Police
Sub-Agency or Division	
Organization Mission	Intelligence Division of the Illinois State Police
Program Name	Geospatial Intelligence for ISP
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Nice to have
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	The highest detail possible to help create realistic models of areas of interest

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	Cross sections and/or transects meet needs		
Update Frequency	Event driven only – Data need to coincide with a specific event.	2-3 years		
Event type(s)	An incident requiring a police response.			
Quality Level and/or update frequency variability across AOI	Dependent on the event/operation			
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need		
Acceptable Vertical Error	I don't know	I don't know		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs		Yes		
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Nice to have			Not required	
Entire AOI under same environmental conditions	Not required	Nice to have			Not required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Nice to have			Nice to have	
DEM for entire AOI needs to be seamless	Nice to have	Nice to have			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have		
DTM	Nice to have	Nice to have		
DEM	Highly desirable	Nice to have		
Raw point cloud data	Highly desirable	Nice to have		
Classified point cloud	Highly desirable	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Not required	Not required		
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Not required		
Ground control/ground truthing	Nice to have	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required	Not required		
Land use/land cover	Nice to have	Nice to have		
Wetlands	Not required	Not required		
Estuaries				
Inland surface water features	Nice to have	Nice to have		
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Highly desirable	Nice to have		
Cultural resources	Highly desirable	Nice to have		
Coastal and riverine structures	Nice to have	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Illinois State Geological Survey hosted data	Illinois State Geological Survey hosted data		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	Illinois State Geological Survey hosted data	Illinois State Geological Survey hosted data		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	I don't know		
Cost savings/cost reduction	Major	I don't know		

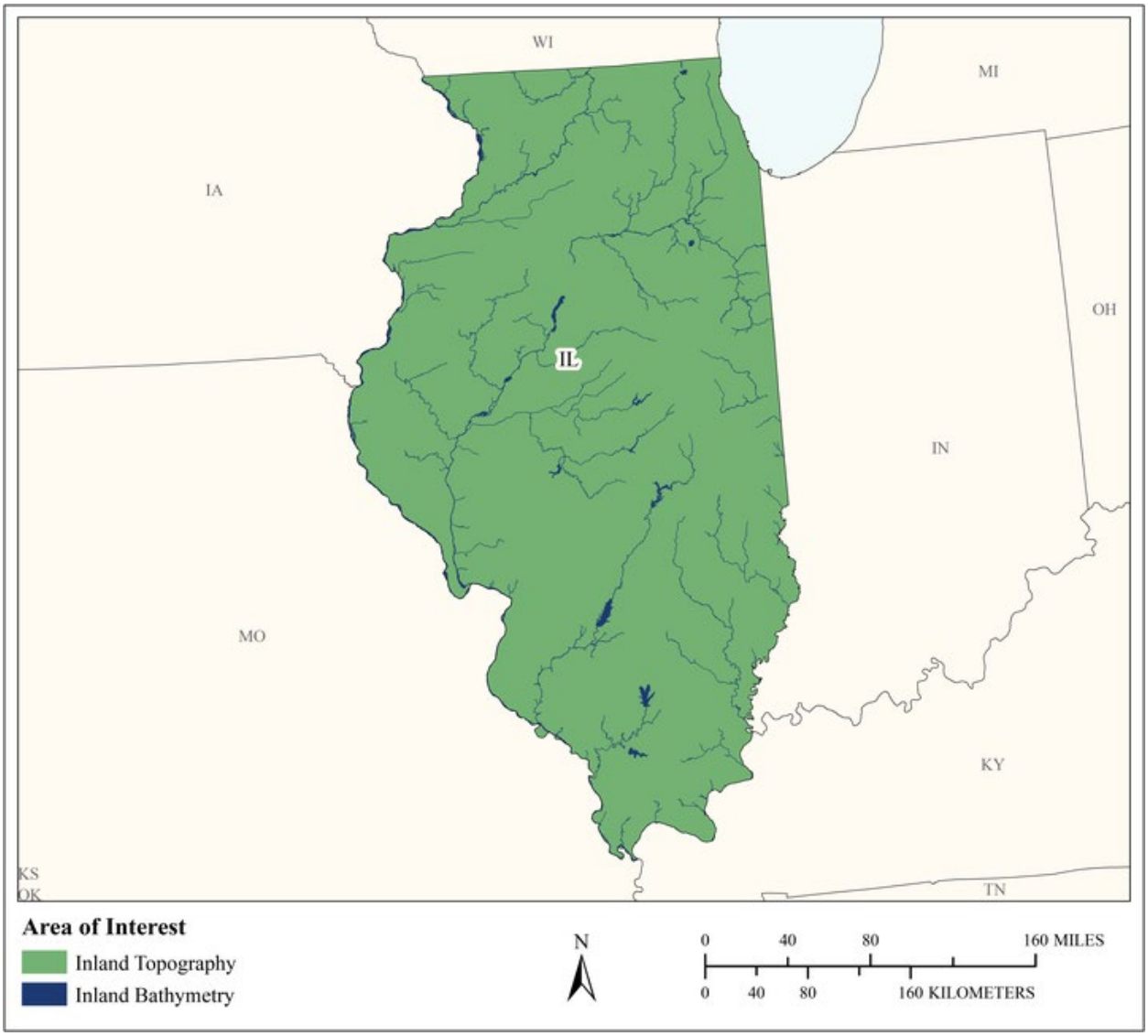
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost avoidance	Major	I don't know		
Increased revenues	None	I don't know		
Mission-driven performance improvements	Moderate	I don't know		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	I don't know		
Improved response or timeliness	Moderate	I don't know		
Improved customer experience	Moderate	I don't know		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	I don't know		
Environmental	None	I don't know		
Public safety, including life and property	Moderate	I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction	None			I don't know	Unable to provide							
Cost savings/cost reduction description	Would use freely available data from the state otherwise.											
Cost avoidance	Moderate	Unable to provide		I don't know	Unable to provide							
Increased revenues	None			I don't know	Unable to provide							
Mission-driven performance improvements	Moderate	Unable to provide		I don't know	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide							
Improved customer experience	Major	Unable to provide		I don't know	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know								
Environmental	None			I don't know								
Public safety, including life and property	Major			Moderate								
Public safety, including life and property description	Enhanced situational awareness for law enforcement responding to incidents, especially in rural areas with widely varying topography											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Flood Surveillance and Coordination with State Emergency Operations Center



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Area split by varying quality level or update frequency	One or more states, territories, or counties		
Sub Area Requirements	Illinois			

MCA Description	Response
Mission Critical Activity	Flood surveillance and coordination with State Emergency Operations Center. OWR uses elevation data to answer urgent questions regarding flooding during a specific event. This includes using elevation data to determine inundation and producing maps illustrating the threat to facilities and neighborhoods.
MCA Title	Flood Surveillance and Coordination with State Emergency Operations Center
MCA ID	21652
Organization Type	State or U.S. Territorial government
Organization Name	Illinois Department of Natural Resources, Office of Water Resources
Sub-Agency or Division	
Organization Mission	The Office of Water Resources is the lead state agency for water resources planning, navigation, floodplain management, the National Flood Insurance Program, water supply, drought, and interstate organizations on water resources. Interagency duties include the state water plan, drought response, flood emergency situation reports, and the comprehensive review of Illinois water use law. The primary capital activity of the office is in the area of urban flood damage reduction. The office assists units of local government with urban flood damage reduction projects through planning, design, construction, and financial assistance. The urban program also features the acquisition of flood prone homes and businesses
Program Name	Division of Capital Programs
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Building structures. Levees

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable

Inland Bathy Feature Size Requirements	Response
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	(a) QL0 (b) QL2	QL0B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI	Floodplains (SFHAs) only need QL0, rest can be QL2			
Acceptable Horizontal Error	Up to 30 cm	Up to 1 meter		
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Not required			Not required	
DEM for entire AOI needs to be seamless	Nice to have	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level			Up to double the required TVU at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Not required		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Not required	Not required		
Classified point cloud	Required	Required		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Not required		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required	Required		
Land use/land cover	Nice to have	Nice to have		
Wetlands	Nice to have	Not required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Required	Required		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Not required	Not required		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	County data. Varies. Each is described at the Illinois Geospatial Data Clearinghouse	Obtained by our own surveyors and from the USACE		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Illinois Geospatial Data Clearinghouse			
Other		Yes		
Other description		In house		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		

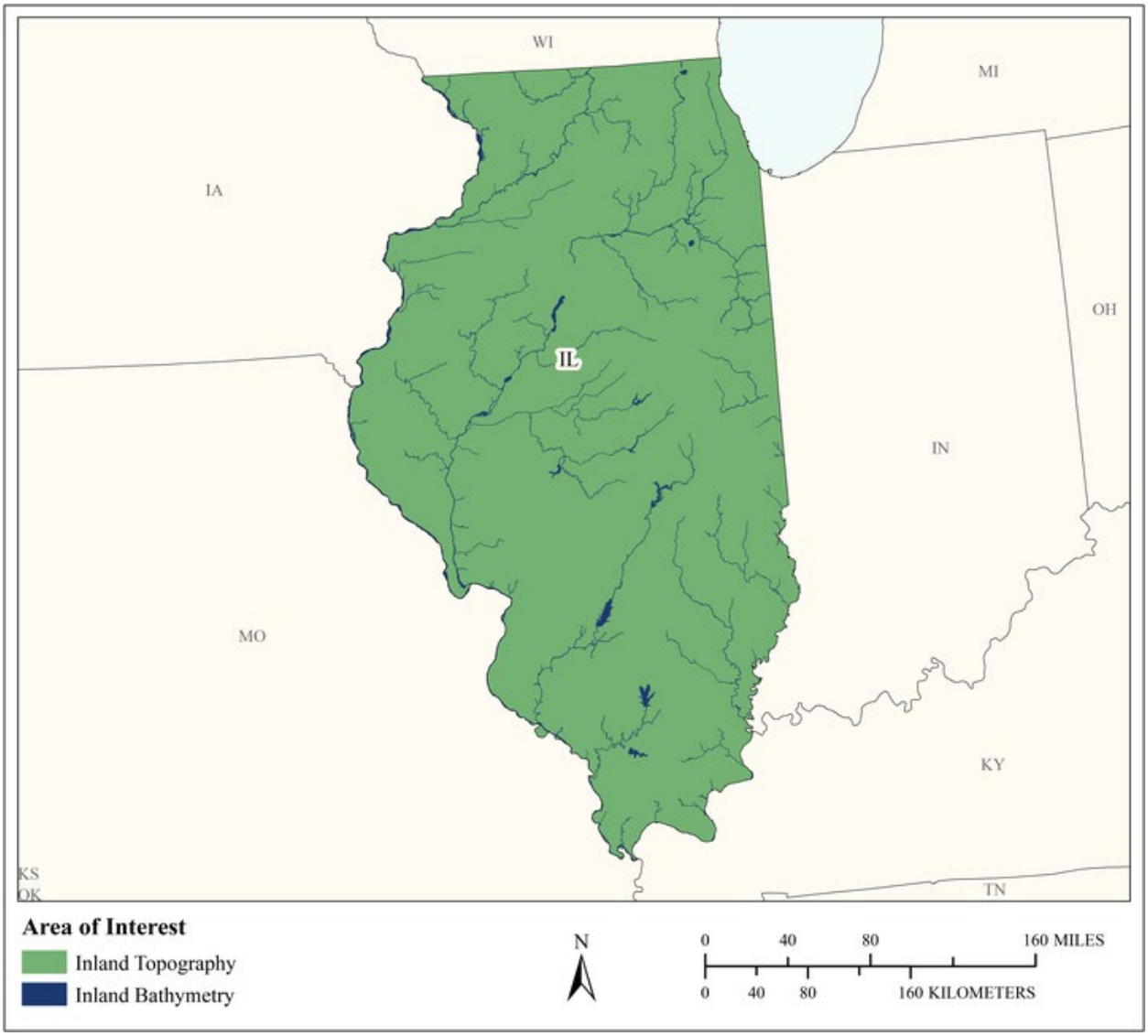
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost avoidance	Major	Major		
Increased revenues	None	I don't know		
Mission-driven performance improvements	Major	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate		
Improved response or timeliness	Major	Major		
Improved customer experience	Major	Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	I don't know		
Environmental	None	I don't know		
Public safety, including life and property	Major	Major		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	I don't know	Unable to provide		None								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Other operational benefits	Major	Unable to provide										
Other operational benefits description	Better coverage and response.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Other customer service benefits	Major	Unable to provide		Major	Unable to provide							
Other customer service benefits description	More comprehensive coverage of inundation.			Better coverage and accuracy of inundation predictions.								
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			None								
Environmental	None			None								
Public safety, including life and property	Major			Major								
Public safety, including life and property description	Better and better coverage of flood inundation predictions			Better response to flooding by correct prediction of inundation								
Other	Better response planning			Provide more and better inundation prediction products								
Other benefits	Major			Major								
Other description	Informs public and officials of potential flood levels											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Land Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Road and railroad route selection and maintenance. Slope analysis for autonomous cars. GPS navigation visualization.
MCA Title	Land Navigation and Safety
MCA ID	60144
Organization Type	State or U.S. Territorial government
Organization Name	State of Illinois
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 19 - Land Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL0B		
Update Frequency	2-3 years	2-3 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	Up to 2 meters		
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Highly desirable	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Required		
Land use/land cover	Highly desirable	Required		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	Moderate	Minor		
Increased revenues	None	None		
Mission-driven performance improvements	Major	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		

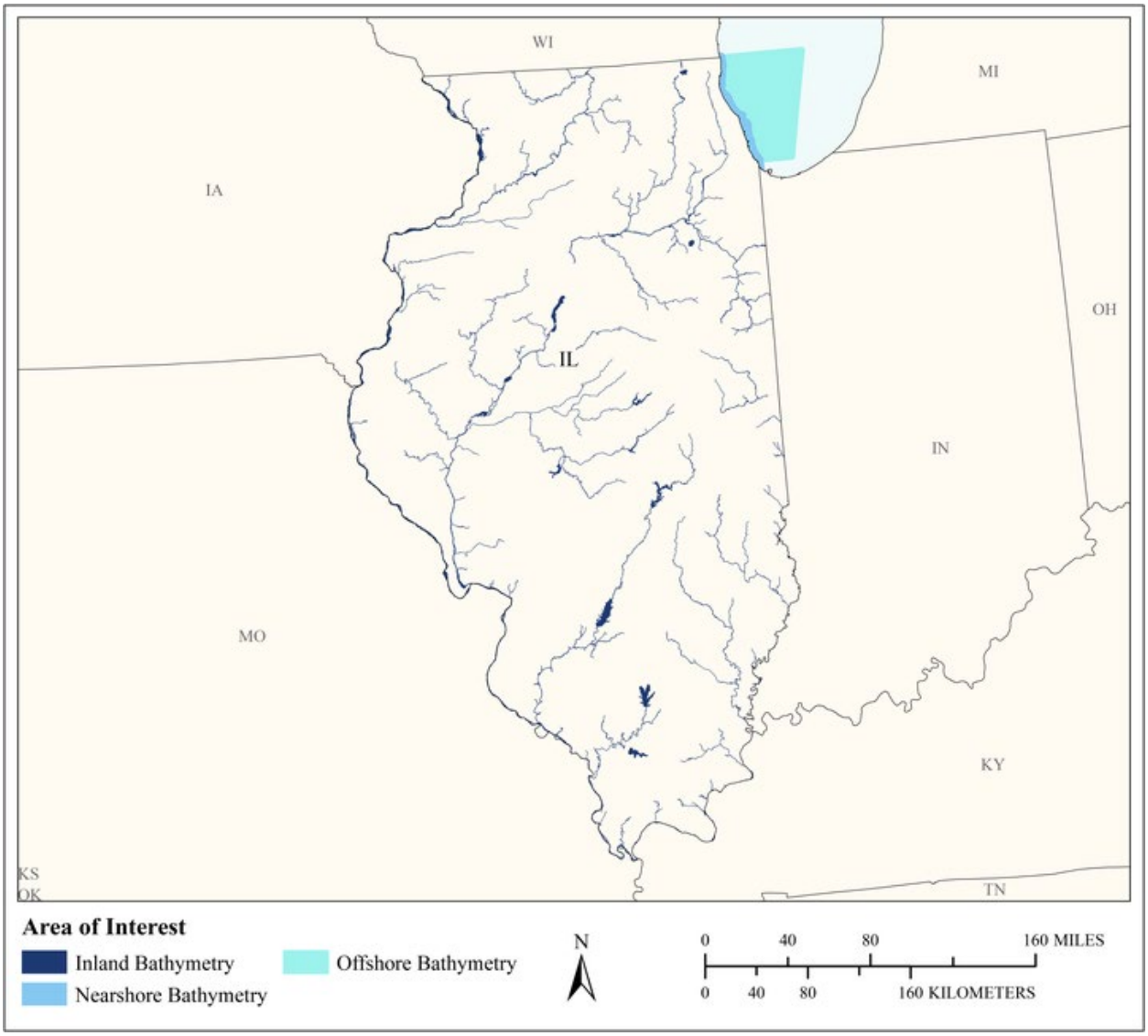
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor		
Improved customer experience	Major	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor		
Environmental	Moderate	Moderate		
Public safety, including life and property	Major	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$729,863		Annual dollars saved/ realized	$31,131						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide							
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$58,940		Annual dollars saved/ realized	$322						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor								
Environmental	Major			Moderate								
Public safety, including life and property	Major			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Marine and Riverine Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type		Required	Required	Required
Geographic Area Requirements		One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Nautical charting. Bathymetric measurements of nearshore submerged coastal topography. Identification of hazards to navigation. Sediment management at coastal navigation projects. Precision marine navigation. Movement of goods and fishing vessels.
MCA Title	Marine and Riverine Navigation and Safety
MCA ID	60145
Organization Type	State or U.S. Territorial government
Organization Name	State of Illinois
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Nice to have
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order		QL0B	QL0B	I don't know
Update Frequency		2-3 years	2-3 years	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error		Up to 2 meters	Up to 2 meters	I don't know
Acceptable Vertical Error		Up to 30 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season		Nice to have	Nice to have	I don't know		Nice to have
Entire AOI under same environmental conditions		Nice to have	Nice to have	I don't know		Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless		Required	Required	I don't know		Highly desirable
DEM for entire AOI needs to be seamless		Required	Required	I don't know		Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness		Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM		Highly desirable	Required	I don't know
DTM		Highly desirable	Required	I don't know
DEM		Required	Required	I don't know
Raw point cloud data		Nice to have	Required	I don't know
Classified point cloud		Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Highly desirable	I don't know
Full waveform		Not required	Not required	I don't know
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	I don't know
Breaklines required for standard hydro-flattening		Not required		
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	I don't know
Tide Predictions			Required	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	I don't know
Intensity imagery/sidescan imagery		Nice to have	Highly desirable	I don't know
Ground control/ground truthing		Nice to have	Highly desirable	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	I don't know
Nautical and/or navigation charts			Highly desirable	I don't know
Acoustic imagery of the seafloor			Highly desirable	I don't know
Aerial and/or satellite imagery		Required	Highly desirable	I don't know
Underwater videography			Nice to have	I don't know
Bottom texture			Highly desirable	I don't know
Bottom type			Highly desirable	I don't know
Submerged features			Highly desirable	I don't know
Subbottom characteristics			Nice to have	I don't know
Geologic and seismic data		Not required	Nice to have	I don't know
Water column properties - Physical			Nice to have	I don't know
Water column properties - Chemical			Nice to have	I don't know
Water column properties - Biological			Nice to have	I don't know
Currents			Highly desirable	I don't know
Tide/wave heights			Highly desirable	I don't know
Sea ice conditions			Nice to have	I don't know
Habitat distribution and classification			Highly desirable	I don't know
Boundaries			Nice to have	I don't know
Routes			Required	I don't know
Offshore cadastral			Nice to have	I don't know
Lease areas			Nice to have	I don't know
Fixed obstructions			Required	I don't know
Floating observation/navigation systems			Required	I don't know
Shorelines – current, historic, change rates		Required	Required	
Land use/land cover		Nice to have	Nice to have	I don't know
Wetlands		Required	Highly desirable	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	I don't know
Inland surface water features		Required	Highly desirable	
Bridges/culverts		Highly desirable		
Landmark features		Nice to have	Nice to have	
Cultural resources		Highly desirable	Nice to have	
Coastal and riverine structures		Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts		Yes	Yes	
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings		Major	Minor	I don't know
Cost savings/cost reduction		I don't know	Minor	I don't know
Cost avoidance		Major	Minor	I don't know
Increased revenues		None	Minor	I don't know
Mission-driven performance improvements		Minor	Minor	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services		None	Minor	I don't know

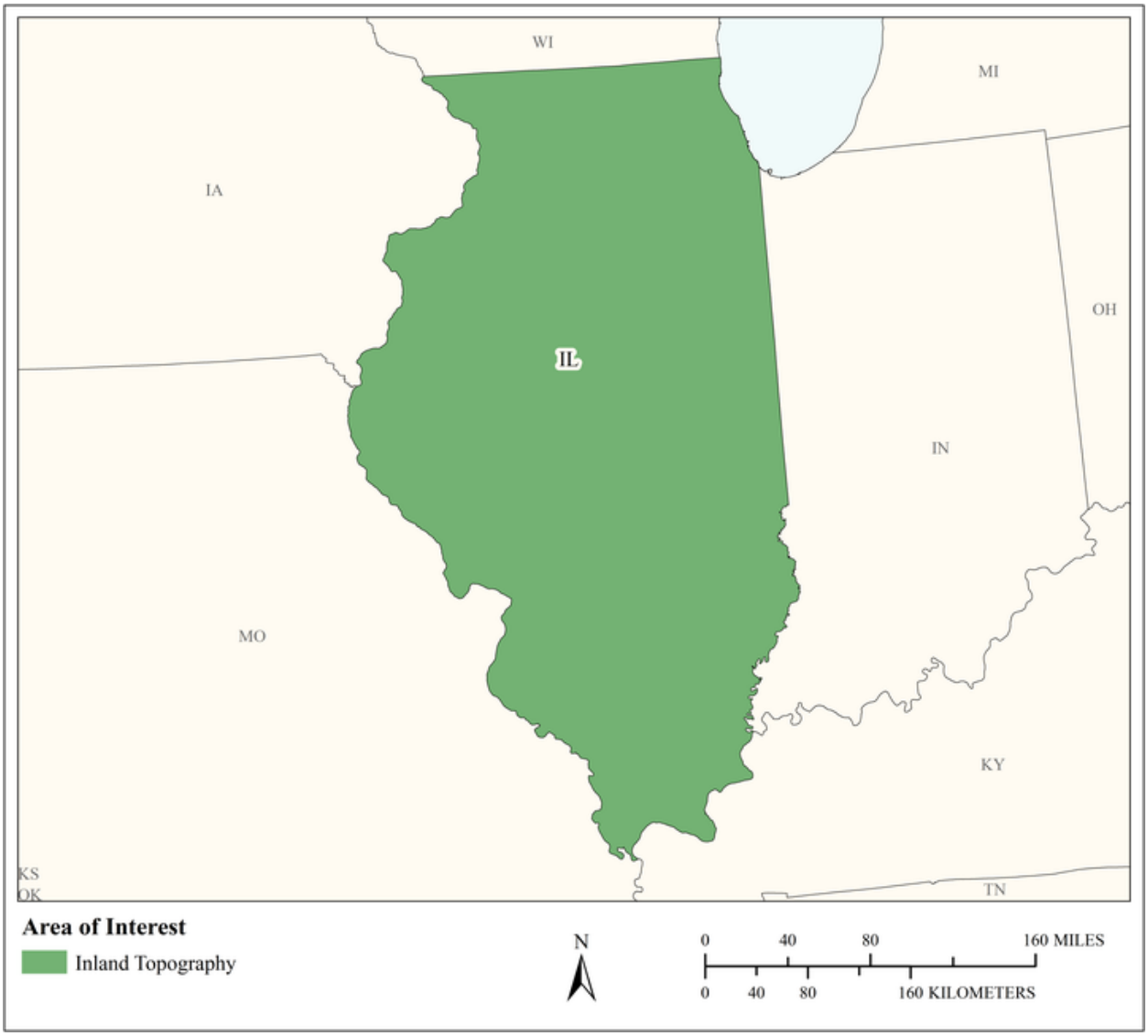
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness		None	Minor	I don't know
Improved customer experience		None	Minor	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach		None	Minor	I don't know
Environmental		None	Minor	I don't know
Public safety, including life and property		None	Major	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings				Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction				Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Cost avoidance				Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Increased revenues				Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements				Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation					Annual dollars saved/ realized	$1,027,707		Annual dollars saved/ realized	$85,262			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services				Minor	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness				Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Improved customer experience				Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Future annual customer service benefits added during validation					Annual dollars saved/ realized	$135,258		Annual dollars saved/ realized	$2,886			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach				Moderate			Minor			I don't know		
Environmental				Moderate			Major			I don't know		
Public safety, including life and property				Moderate			Major			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes	Yes	
Contours		Yes	Yes	Yes
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps				Yes
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)		Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints		Yes		
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				Yes

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Aviation Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of in-flight hazards and path obstructions. Aeronautical charting. Runway construction and repair.
MCA Title	Aviation Navigation and Safety
MCA ID	60146
Organization Type	State or U.S. Territorial government
Organization Name	State of Illinois
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 21 - Aviation Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes			
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Major			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

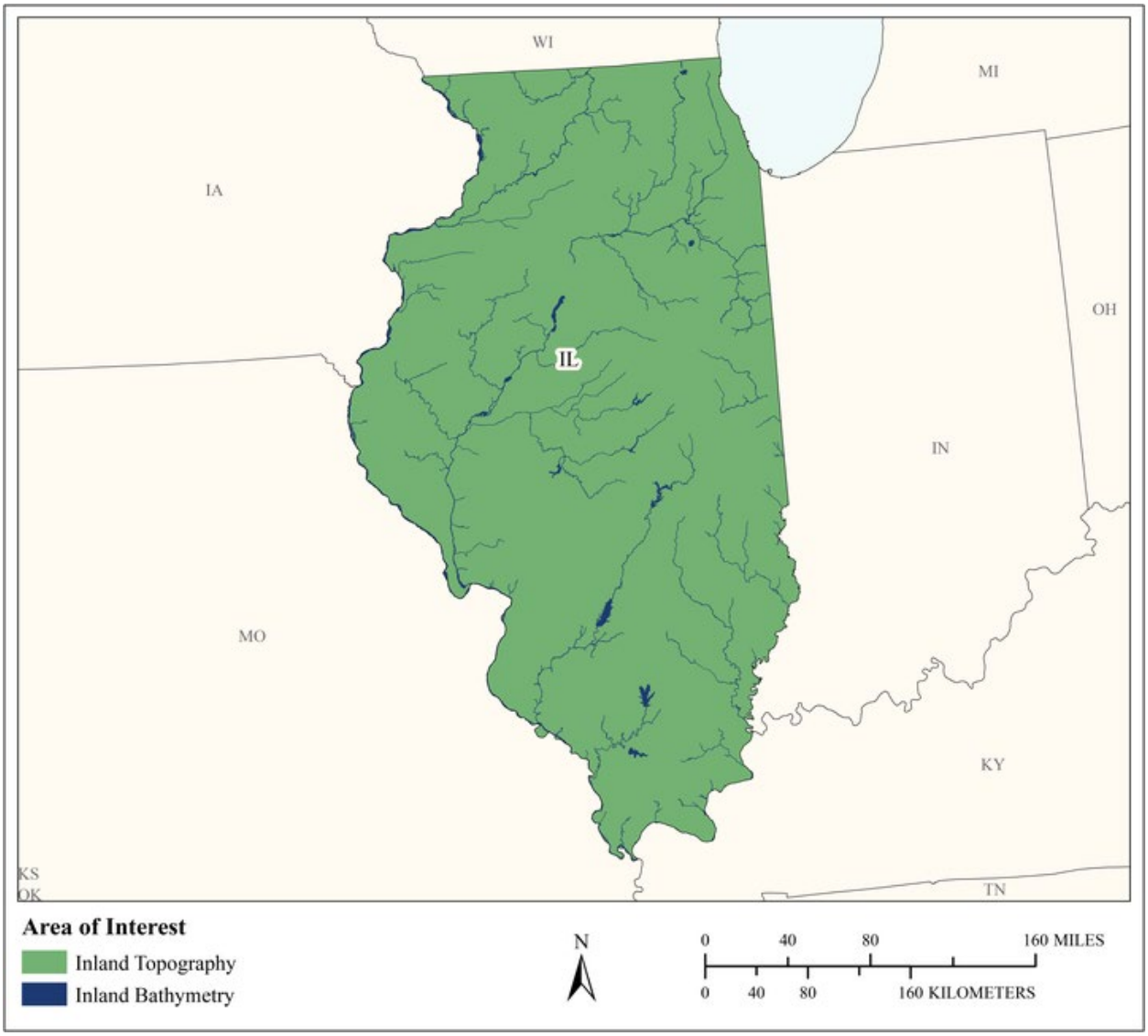
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$190,463									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$237,215									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Moderate											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Hydrologic and Hydraulic Analysis of Rivers for Flood Damage Reduction Assessment



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Area split by varying quality level or update frequency	One or more states, territories, or counties		
Sub Area Requirements	Illinois			

MCA Description	Response
Mission Critical Activity	Hydrologic and hydraulic analysis of rivers for flood damage reduction assessment. The OWR Engineering Studies uses elevation and bathymetric data to create flood models that evaluate structure, flood control and damage reduction designs. The Design and Construction Section uses elevation and bathymetric data in the design of structures and borrow areas.
MCA Title	Hydrologic and Hydraulic Analysis of Rivers for Flood Damage Reduction Assessment
MCA ID	21603
Organization Type	State or U.S. Territorial government
Organization Name	Illinois Department of Natural Resources, Office of Water Resources
Sub-Agency or Division	
Organization Mission	The Office of Water Resources is the lead state agency for water resources planning, navigation, floodplain management, the National Flood Insurance Program, water supply, drought, and interstate organizations on water resources. Interagency duties include the state water plan, drought response, flood emergency situation reports, and the comprehensive review of Illinois water use law. The primary capital activity of the office is in the area of urban flood damage reduction. The office assists units of local government with urban flood damage reduction projects through planning, design, construction, and financial assistance. The urban program also features the acquisition of flood prone homes and businesses.
Program Name	Division of Capital Programs Engineering Studies Section & Design and Construction Section
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Not required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Road lines, curbs, dams.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable

Inland Bathy Feature Size Requirements	Response
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	(a) QL0 (b) QL2	QL0B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI	Floodplains (SFHAs) only need QL0, rest can be QL2			
Acceptable Horizontal Error	Up to 30 cm	Less than 50 cm		
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs		Partial		
Cross section/transect requirement		Less than .5 ft vertical accuracy on 5 foot density		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Nice to have	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level			Up to double the required TVU at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable		
DTM	Required	Required		
DEM	Highly desirable	Highly desirable		
Raw point cloud data	Not required	Not required		
Classified point cloud	Required	Required		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required	Required		
Land use/land cover	Nice to have	Nice to have		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Required		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Not required	Not required		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Illinois Geospatial Data Clearinghouse lists the data http://clearinghouse.isgs.illinois.edu/data/elevation/illinois-height-modernization-ilhmp-lidar-data	Collected by our survey staff and also sometimes received from USACE directly.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			

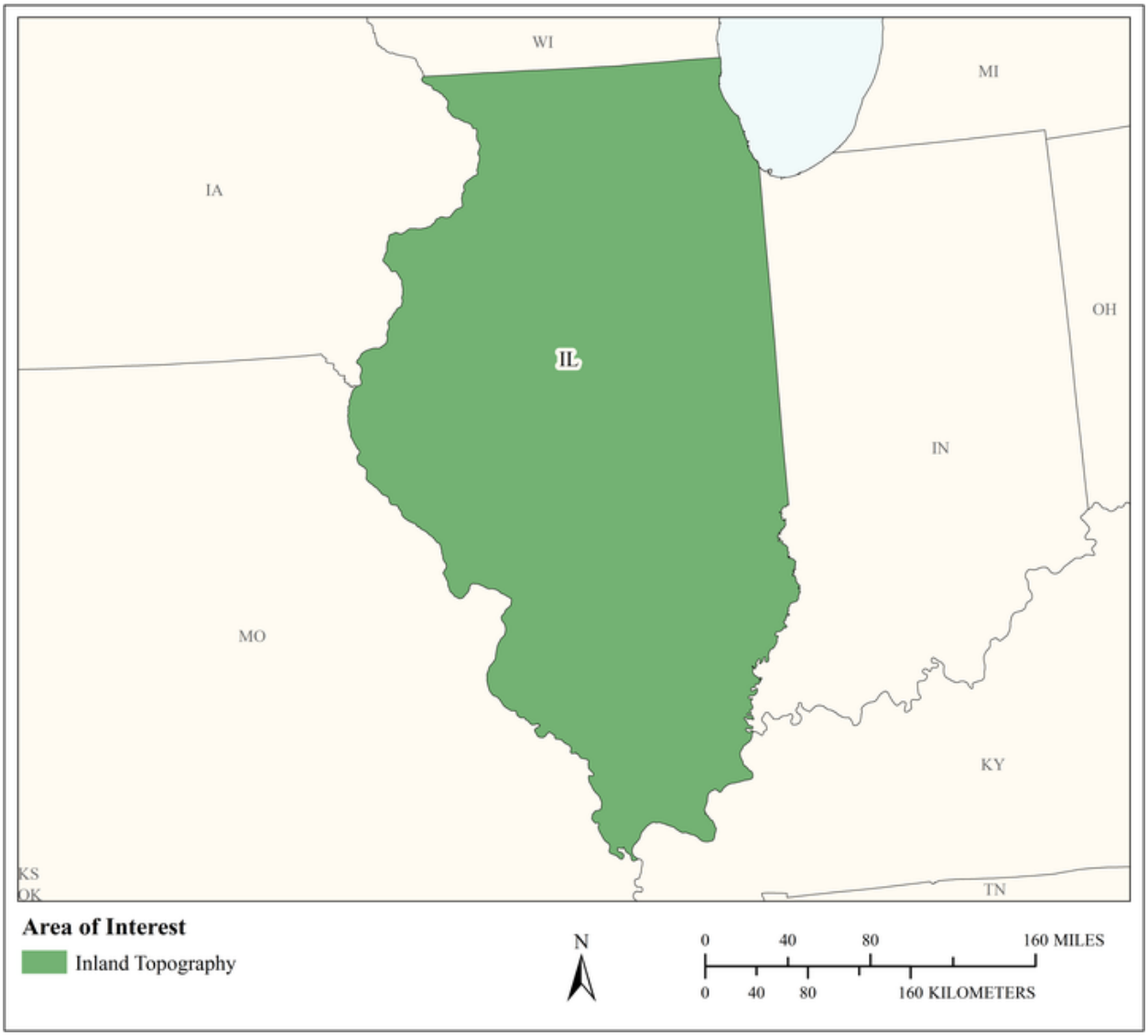
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State repositories used	Illinois Geospatial Data Clearinghouse https://elevationstudy.noaa.gov/Checkbox/Survey.aspx?s=022100e6baac450a8ee26fe2a3207ee4&i=49e3dfba41a54d1ea767788518b55869, Illinois Geospatial Data Clearinghouse http://clearinghouse.isgs.illinois.edu/data/elevation/illinois-height-modernization-ilhmp-lidar-data			
Other		Yes		
Other description		In house		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Major		
Increased revenues	None	None		
Mission-driven performance improvements	Moderate	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Major		
Improved response or timeliness	Moderate	Major		
Improved customer experience	Moderate	Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	None		
Environmental	None	None		
Public safety, including life and property	Minor	None		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		None								
Increased revenues	None			None								
Mission-driven performance improvements	Moderate	Unable to provide		Major	Unable to provide							
Other operational benefits	Major	Unable to provide		Major	Unable to provide							
Other operational benefits description	Avoid procurement/collection.			Avoid Data collection.								
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Moderate	Unable to provide		None								
Other customer service benefits	Major	Unable to provide		Major	Unable to provide							
Other customer service benefits description	Avoid collection time & cost.			More studies done.								
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			None								
Environmental	None			None								
Public safety, including life and property	Moderate			Moderate								
Public safety, including life and property description	Better and more flood control structures processed, more flood control projects completed			Better flood control from more structures/designs completed								
Other	Better flood control			More projects completed								
Other benefits	Major			Major								
Other description	More studies/designs completed			Having data readily available allows more projects to be done to provide better flood control								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Dam Inspections



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Dam inspections. Dam inspectors use elevation data to gather dam and vicinity parameters before going out on an inspection. Then they check elevation data to verify and check field observations. In the case where there may be a potential failure, elevation data are used to evaluate potential downstream impacts and possible erosion.
MCA Title	Dam Inspections
MCA ID	21665
Organization Type	State or U.S. Territorial government
Organization Name	Illinois Department of Natural Resources, Office of Water Resources
Sub-Agency or Division	
Organization Mission	The Office of Water Resources is the lead state agency for water resources planning, navigation, floodplain management, the National Flood Insurance Program, water supply, drought, and interstate organizations on water resources. Interagency duties include the state water plan, drought response, flood emergency situation reports, and the comprehensive review of Illinois water use law. The primary capital activity of the office is in the area of urban flood damage reduction. The office assists units of local government with urban flood damage reduction projects through planning, design, construction, and financial assistance. The urban program also features the acquisition of flood prone homes and businesses
Program Name	Division of Capital Programs Dam Safety Program
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Usually Dam structures. Sometimes downstream Areas

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0			
Update Frequency	4-5 years			
Event type(s)				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI	Only need areas of dams and downstream from dams			
Acceptable Horizontal Error	Up to 60 cm			
Acceptable Vertical Error	Less than 5 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required			
DTM	Required			
DEM	Highly desirable			
Raw point cloud data	Not required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable			
Cultural resources	Not required			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	County LiDAR datasets. More information listed at the Illinois Geospatial Data Clearinghouse			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Illinois State Geological Survey			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	None			

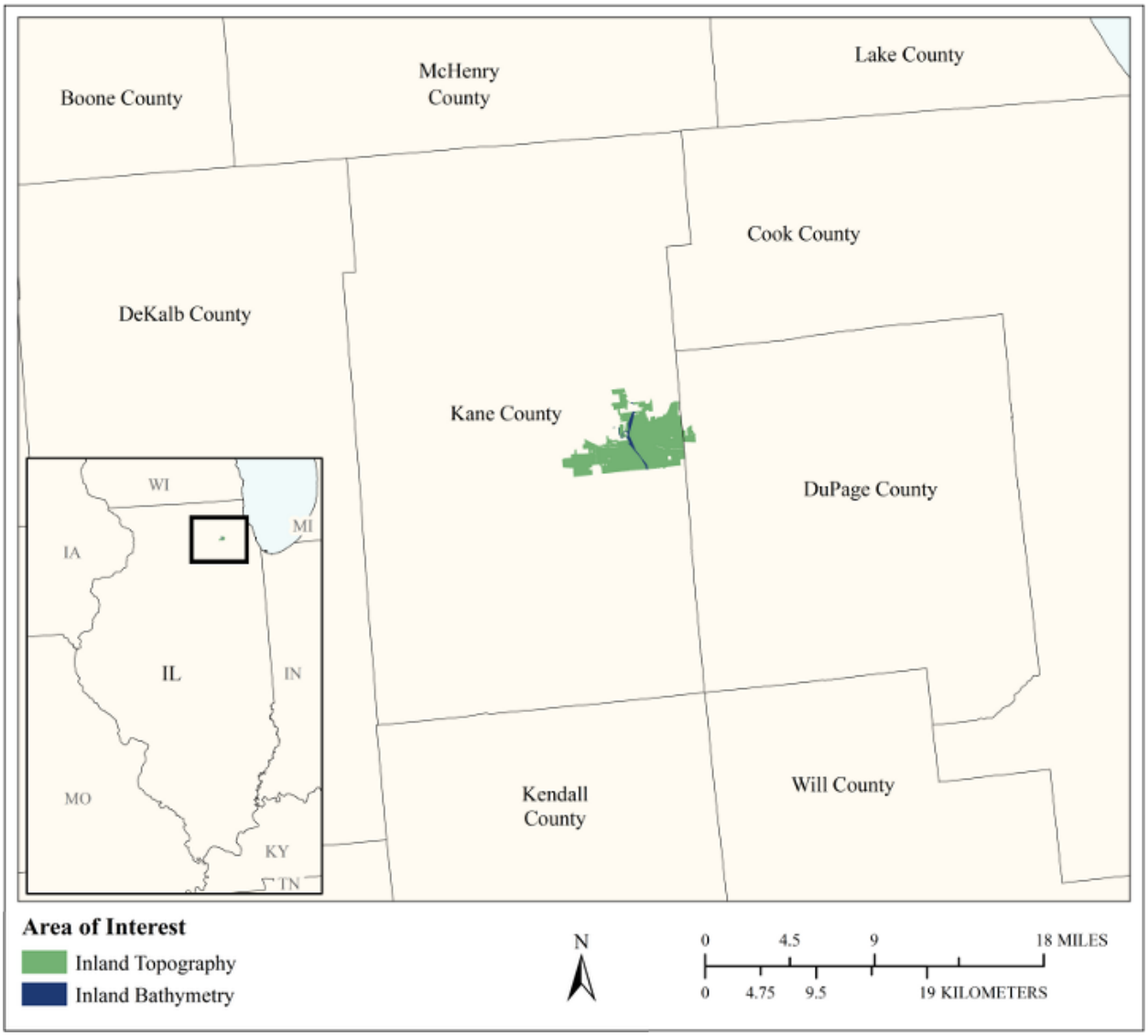
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Mission-driven performance improvements	I don't know			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know			
Improved response or timeliness	Major			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	None			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Annual dollars saved/realized	$27,500									
Cost savings/cost reduction description	25 single dam inspections. large downstream building evaluation ~2 years.											
Cost avoidance	I don't know	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Moderate	Unable to provide										
Other operational benefits	Major	Unable to provide										
Other operational benefits description	Continued efficency to monitor elevations.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Other customer service benefits	Major	Unable to provide										
Other customer service benefits description	Faster inspections.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None											
Environmental	None											
Public safety, including life and property	Major											
Public safety, including life and property description	Better and timely monitoring and inspections											
Other	Less time and expense for inspections											
Other benefits	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours				
Hillshades	Yes			
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: City Land Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Highly desirable		
Geographic Area Requirements	Custom description	Custom description		
Sub Area Requirements	St. Charles, IL	St. Charles, IL		

MCA Description	Response
Mission Critical Activity	Land Management Including; development and zoning, municipal mapping of building footprints, elevations, floodplain management, and emergency management.
MCA Title	City Land Management
MCA ID	21593
Organization Type	Regional, County, City, or other local government
Organization Name	City of St. Charles, Illinois
Sub-Agency or Division	
Organization Mission	City of St. Charles Mission: Heritage. Community. Service. Opportunity. Service. It's the third of four key components of the City's mission. Our sole function as a government organization is to supply crucial services the community wants and needs. Public safety, public works, along with responsible financial stewardship, communication and community development are what our community looks to us to provide.
Program Name	This is not a program, it is a core business function of the City supported by: Community Development Department - Building and Code Division, Engineering Division Public Works Department - Engineering Division Information System Department - GIS Division
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Utility Poles, manholes (2 ft), electric pedestal, street signs, street lights, cracks in pavement, sidewalk squares, hydrants, pavement markings, elevation benchmarks.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Not required
51 - 100 ft	Not required

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Not required
5.1 – 10 acres	Not required
Greater than 10 acres	Not required
Other	Highly desirable
Other description	Fox River

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	I don't know		
Update Frequency	4-5 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Up to 1 meter		
Acceptable Vertical Error	Less than 5 cm	Up to 1 meter		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Not required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required			Not required	
Entire AOI under same environmental conditions	Nice to have	Not required			Not required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Not required			Not required	
DEM for entire AOI needs to be seamless	Required	Not required			Not required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have		
DTM	Required	Nice to have		
DEM	Required	Nice to have		
Raw point cloud data	Highly desirable	Nice to have		
Classified point cloud	Required	Highly desirable		
Edited/cube XYZ		Highly desirable		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Highly desirable		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Not required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required	Not required		
Land use/land cover	Highly desirable	Not required		
Wetlands	Nice to have	Nice to have		
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Highly desirable	Not required		
Landmark features	Not required	Not required		
Cultural resources	Not required	Not required		
Coastal and riverine structures	Highly desirable	Not required		
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	I do not use any of the products through the national map or NOAA, it is not accurate enough for local use. We use: Geiger Mode 20 PPM Lidar Data, 2017 20 2nd order class II vertical benchmarks, maintained bi-annually Leica RTK Survey Grade receiver, real time	Information provided on engineering plans, annual pond inspection estimates.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				

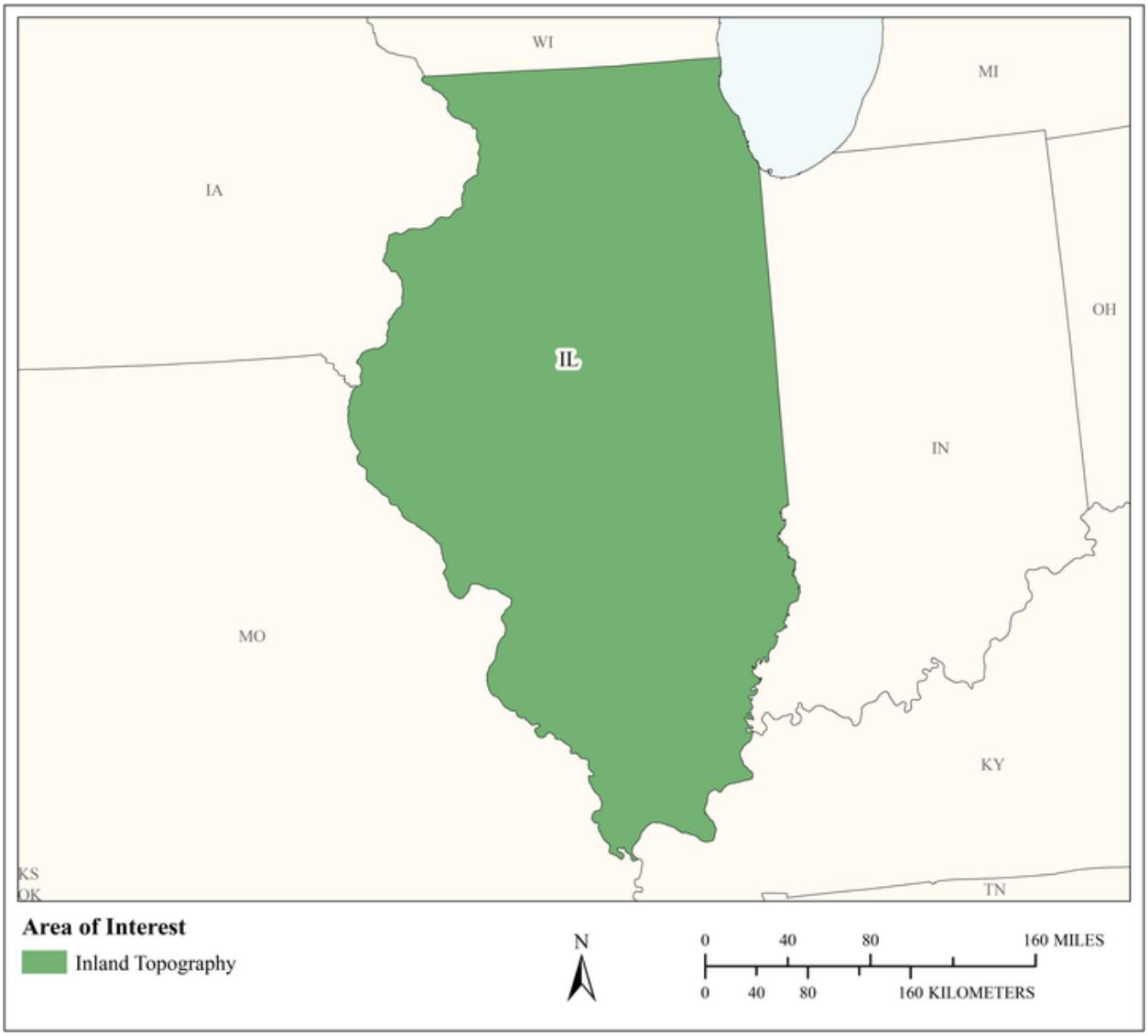
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	Private contracts			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know	None		
Cost savings/cost reduction	I don't know	None		
Cost avoidance	I don't know	None		
Increased revenues	I don't know	None		
Mission-driven performance improvements	I don't know	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know	Moderate		
Improved response or timeliness	I don't know	None		
Improved customer experience	I don't know	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor		
Environmental	Moderate	Moderate		
Public safety, including life and property	Moderate	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$3,467	Moderate	Annual dollars saved/realized	$1,055						
Cost savings/cost reduction	Major	Annual dollars saved/realized	$20,000	None								
Cost avoidance	Major	Annual dollars saved/realized	$26,000	Moderate	Unable to provide							
Increased revenues	None			None								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Other operational benefits				Moderate	Unable to provide							
Other operational benefits description												
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$452	None								
Improved response or timeliness	Major	Annual dollars saved/realized	$1,362	Major	Unable to provide							
Improved customer experience	Minor	Unable to provide		None								
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate								
Environmental	Moderate			Moderate								
Public safety, including life and property	Moderate			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps				
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Classification of Structures for Flood Insurance and Buy Out



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Area split by varying quality level or update frequency			
Sub Area Requirements	Illinois			

MCA Description	Response
Mission Critical Activity	Classification of structures for flood insurance and buy out. The OWR Mitigation Section routinely and frequently uses elevation data to determine if houses and structures are in a flood zone for the applicability of flood insurance rules. This affects mortgage and building loans. Ground elevations are needed for compliance with FIRM zones and base flood elevation.
MCA Title	Classification of Structures for Flood Insurance and Buy Out
MCA ID	21663
Organization Type	State or U.S. Territorial government
Organization Name	Illinois Department of Natural Resources, Office of Water Resources
Sub-Agency or Division	
Organization Mission	The Office of Water Resources is the lead state agency for water resources planning, navigation, floodplain management, the National Flood Insurance Program, water supply, drought, and interstate organizations on water resources. Interagency duties include the state water plan, drought response, flood emergency situation reports, and the comprehensive review of Illinois water use law. The primary capital activity of the office is in the area of urban flood damage reduction. The office assists units of local government with urban flood damage reduction projects through planning, design, construction, and financial assistance. The urban program also features the acquisition of flood prone homes and businesses
Program Name	Division of Resource Management Mitigation Section
Total Annual Program Budget	
Primary Business Use	BU 25 - Real Estate, Banking, Mortgage, and Insurance
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Building structures. Especially houses.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	(a) QL0 (b) QL2			
Update Frequency	4-5 years			
Event type(s)				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI	In floodplains (SFHAs) only need QL0, rest can be QL2			
Acceptable Horizontal Error	Up to 40 cm			
Acceptable Vertical Error	Less than 5 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required			
DTM	Required			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Not required			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Not required			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	County LiDAR datasets. These are listed on the Illinois Geospatial Data Clearinghouse.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	REST services from the Illinois Geological Survey			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			

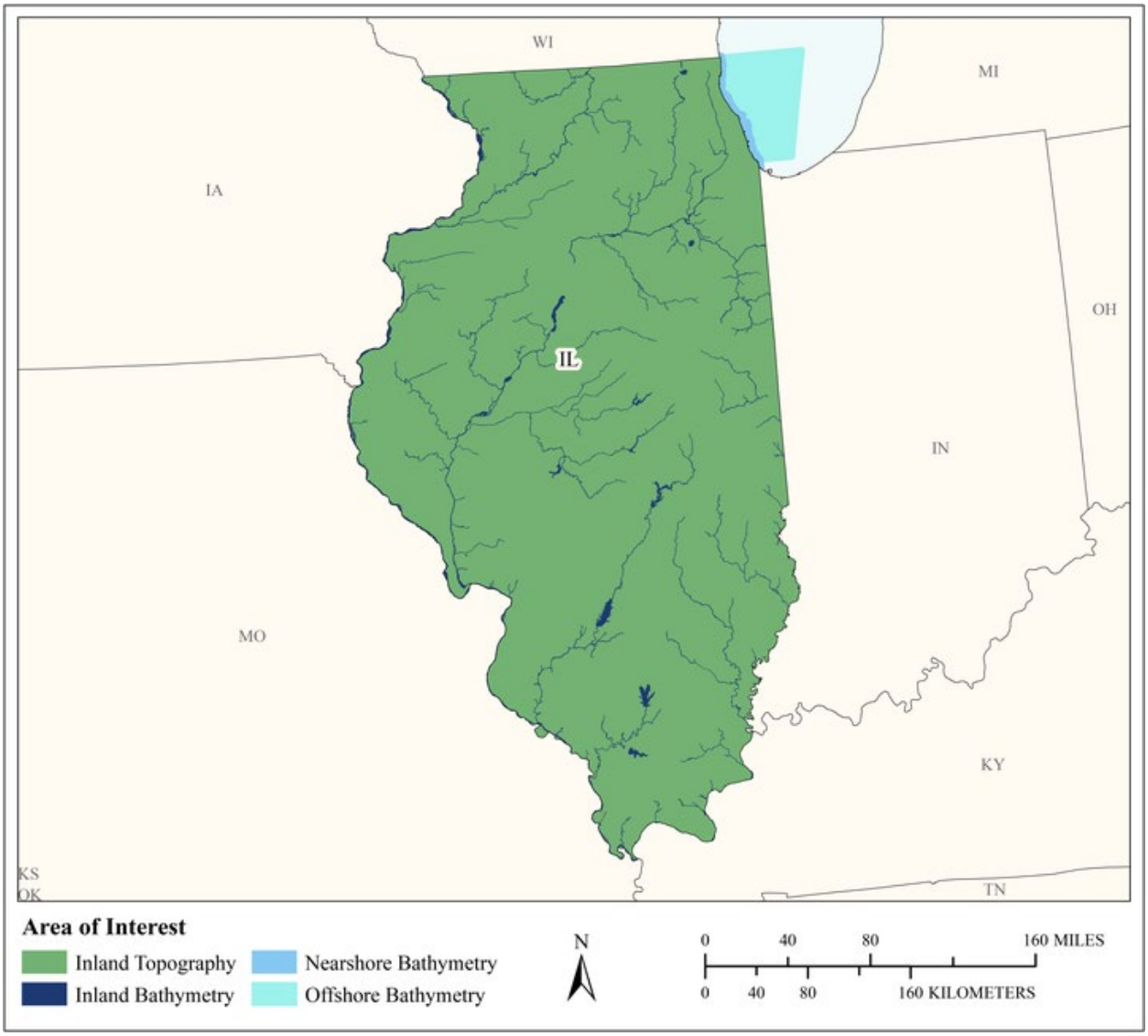
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	I don't know			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	I don't know	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Other operational benefits	Major	Unable to provide										
Other operational benefits description	Easier determination of Flood Insurance rules.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Other customer service benefits	Major	Unable to provide										
Other customer service benefits description	Faster response to customer questions.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None											
Environmental	None											
Public safety, including life and property	I don't know											
Other	Better compliance with flood insurance rules											
Other benefits	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades	Yes			
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Recreation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Planning and development of recreational facilities such as rafting, boating, swimming, diving, and fishing areas; ski slopes; and golf courses. Location- based products and services such as maps and guides. Tourism. Trail and vista site planning. Orienteering.
MCA Title	Recreation
MCA ID	60147
Organization Type	State or U.S. Territorial government
Organization Name	State of Illinois
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 27 - Recreation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	I don't know
Update Frequency	4-5 years	4-5 years	4-5 years	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required	Highly desirable	I don't know	Not required	Not required
Entire AOI under same environmental conditions	Required	Not required	Highly desirable	I don't know	Not required	Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Nice to have	I don't know	Nice to have	Not required
DEM for entire AOI needs to be seamless	Required	Nice to have	Nice to have	I don't know	Nice to have	Not required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	I don't know
DTM	Nice to have	Highly desirable	Highly desirable	I don't know
DEM	Required	Required	Required	I don't know
Raw point cloud data	Nice to have	Nice to have	Not required	I don't know
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Nice to have	I don't know
Full waveform	Not required	Nice to have	Not required	I don't know
Bathymetric Attributed Grid (BAG)		Highly desirable	Nice to have	I don't know
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	I don't know
Tide Predictions			Nice to have	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	I don't know
Intensity imagery/sidescan imagery	Not required	Nice to have	Not required	I don't know
Ground control/ground truthing	Nice to have	Nice to have	Not required	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	I don't know
Nautical and/or navigation charts			Not required	I don't know
Acoustic imagery of the seafloor			Not required	I don't know
Aerial and/or satellite imagery	Required	Required	Not required	I don't know
Underwater videography			Not required	I don't know
Bottom texture			Nice to have	I don't know
Bottom type			Highly desirable	I don't know
Submerged features			Highly desirable	I don't know
Subbottom characteristics			Nice to have	I don't know
Geologic and seismic data	Not required	Highly desirable	Nice to have	I don't know
Water column properties - Physical			Nice to have	I don't know
Water column properties - Chemical			Nice to have	I don't know
Water column properties - Biological			Nice to have	I don't know
Currents			Nice to have	I don't know
Tide/wave heights			Nice to have	I don't know
Sea ice conditions			Not required	I don't know
Habitat distribution and classification			Highly desirable	I don't know
Boundaries			Not required	I don't know
Routes			Nice to have	I don't know
Offshore cadastral			Nice to have	I don't know
Lease areas			Nice to have	I don't know
Fixed obstructions			Highly desirable	I don't know
Floating observation/navigation systems			Highly desirable	I don't know
Shorelines – current, historic, change rates	Not required	Highly desirable	Highly desirable	
Land use/land cover	Nice to have	Highly desirable	Highly desirable	I don't know
Wetlands	Highly desirable	Highly desirable	Highly desirable	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	I don't know
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Not required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Minor	I don't know
Cost savings/cost reduction	Moderate	Minor	Minor	I don't know
Cost avoidance	Major	Minor	Minor	I don't know
Increased revenues	None	Minor	Minor	I don't know
Mission-driven performance improvements	Major	Minor	Minor	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor	Minor	I don't know

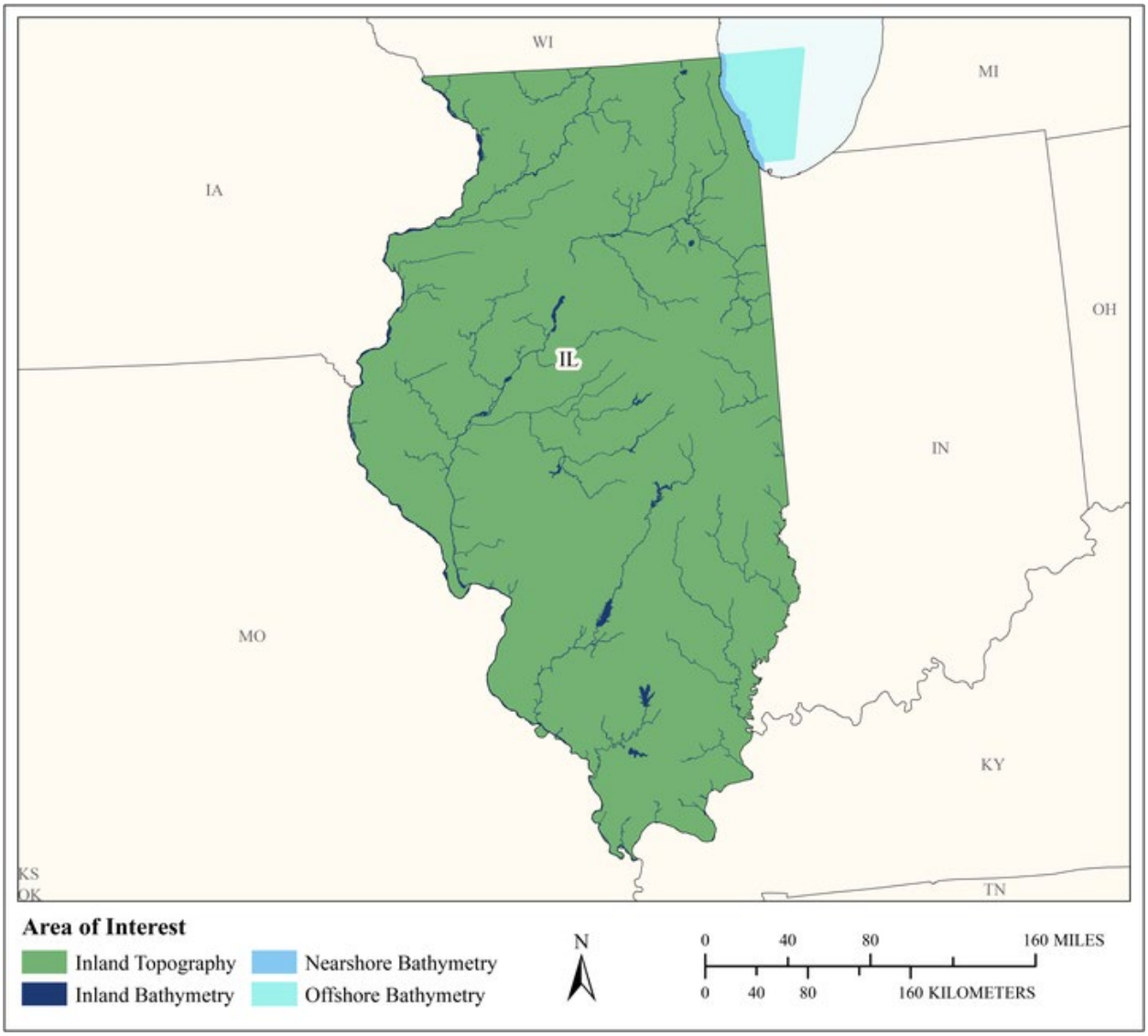
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	Minor	Minor	I don't know
Improved customer experience	Moderate	Minor	Minor	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	I don't know
Environmental	Major	Minor	Minor	I don't know
Public safety, including life and property	Major	Minor	Minor	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Increased revenues	None			Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$12,928		Annual dollars saved/ realized	$7,785		Annual dollars saved/ realized	$14,394			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Major			I don't know		
Environmental	Moderate			Major			Major			I don't know		
Public safety, including life and property	Moderate			Moderate			Moderate			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes		
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Maritime and Land Boundary Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Delimitation of legal and other coastal boundaries, inland boundaries, and ordinary high water lines (OHWL).
MCA Title	Maritime and Land Boundary Management
MCA ID	60148
Organization Type	State or U.S. Territorial government
Organization Name	State of Illinois
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 30 - Maritime and Land Boundary Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B	QL0B	I don't know
Update Frequency	6-10 years	6-10 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Highly desirable	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Nice to have	Nice to have	Highly desirable	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable	Highly desirable	Required	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable	Highly desirable	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	Required
DTM	Required	Required	Required	Required
DEM	Highly desirable	Required	Required	Required
Raw point cloud data	Nice to have	Highly desirable	Required	Required
Classified point cloud	Highly desirable	Highly desirable	Required	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Not required	Nice to have
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Not required
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Nice to have	Required	Not required	Not required
Ground control/ground truthing	Highly desirable	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Required	Highly desirable	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Nice to have
Water column properties - Biological			Not required	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Highly desirable	Nice to have
Routes			Nice to have	Highly desirable
Offshore cadastral			Highly desirable	Nice to have
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Required	Required
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Nice to have
Wetlands	Required	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Highly desirable	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Minor	None	I don't know
Cost savings/cost reduction	Moderate	None	Minor	Moderate
Cost avoidance	Moderate	None	Minor	Moderate
Increased revenues	Minor	None	None	I don't know
Mission-driven performance improvements	Major	None	Moderate	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None	None	I don't know

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	None	Minor	Moderate
Improved customer experience	Major	None	Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	Moderate
Environmental	Major	Minor	Minor	Moderate
Public safety, including life and property	Moderate	None	Minor	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	Minor	Unable to provide		None			None			I don't know	Unable to provide	
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$63,398		Annual dollars saved/ realized	$47,578		Annual dollars saved/ realized	$25,549			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$243,073									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Moderate			Moderate		
Environmental	Minor			Major			Major			Major		
Public safety, including life and property	None			Moderate			Moderate			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps		Yes		
Cross sections		Yes		
Height-Above-Ground maps		Yes		
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

Indiana

About Indiana

The State of Indiana covers over 36,000 square miles and is the 38th-largest state by area and the 17th-most populous with over 6.7 million residents. Indiana is located in the U.S. Midwest and Great Lakes regions, bordered on the north by Michigan and Lake Michigan, Ohio on the east, Illinois on the west partially separated by the Wabash River, and Kentucky on the south separated by the Ohio River.

The average altitude of Indiana is about 760 feet above sea level. The highest point in the state is at 1,257 feet, and the lowest point at 320 feet. Till plains make up the northern and central regions of Indiana with numerous kettle lakes in the north, the result of elements left behind by glaciers. Central Indiana is mainly flat with some low rolling hills. Southern Indiana, not impacted by glaciers, valleys, and rugged hilly terrain with bedrock exposed at the surface provide contrast from much of the state, and due to the prevalent Indiana limestone, the area has many caves, caverns, quarries, and karst features.

Current status of elevation data for Indiana

Indiana's first statewide lidar data collection was conducted from 2011 to 2013 as part of the State of Indiana GIO's Ortho-Lidar Project. The requirements for this acquisition were based on Indiana's NEEA study, and they match current 3DEP QL3 Base Lidar Specifications.

Under the current USGS 3DEP Broad Agency Announcement (BAA) Grant program, acquisition of new QL2 lidar for the State of Indiana began in 2016, and the goal to complete Indiana's statewide QL2 topographic lidar acquisition in 2020.

This current acquisition has been accomplished through the following BAA initiatives:

- In 2015 the Indiana Geographic Information Council (IGIC) submitted a 3DEP BAA proposal to the USGS in partnership with three Indiana Counties (Marion, Hamilton, and Wayne) to acquire new QL2 lidar data products. This grant was awarded in 2016 and this project was completed in 2019.
- In 2016 the IGIC submitted a 3DEP BAA proposal to the USGS in partnership with the Indiana office of the USDA - Natural Resource Conservation Service (NRCS) to acquire new QL2 lidar data products for 12 additional Indiana Counties in northeast Indiana. Before the agreement was finalized the Indiana NRCS office allocated additional funds (totaling $6.625 million), and with additional 3DEP Federal Funds from the USGS, the BAA proposal was expanded to collect new 3DEP lidar data products for all of the remaining 89 Indiana counties. This grant was awarded by USGS in 2017 and this project is scheduled to be completed in 2020.

As these 3DEP efforts are nearing completion, Indiana's efforts are turning toward enhanced data distribution, the development of derivative products, and the collection of bathymetry data for inland river, streams, lakes, and dams of all types for modeling, monitoring, and safety. Indiana's GIO is working with state agencies, the state GIS council, and other partners to identify inland bathymetric data needs to incorporate into Indiana's statewide lidar maintenance plan for new acquisition beginning in 2025. For the status of Indiana's 3DEP lidar initiatives please see the latest update post here – https://legacy.igic.org/indianas-new-3dep-lidar-data-and-informational-resources/.

Importance of elevation data to Indiana

Indiana has become very dependent on high-precision and high-resolution elevation data to help save lives, time, and money by helping preserve and maintain Indiana's cultural, natural, human, and business / economic resources.

For example, Indiana is the tenth largest farming state in the nation, with more than 80% of land in Indiana devoted to farms, forests, and woodland, and over 15 million acres of farmland contributing an estimated $31.2 billion, or just under 10% of Indiana's annual GDP of $352 billion. In support, Indiana's USDA NRCS Office provided over 90% of the funds needed to collect new statewide lidar data in 2016-2020. The ROI for this NRCS investment - that benefits the entire state, people, and economy was made solely on the benefit to Indiana's agriculture segment.

This USGS and NOAA 3D Nation Elevation Requirements and Benefits Study (3D Nation Survey) for the State of Indiana identifies the need for free and ubiquitous access to statewide Quality Level 2 (QL2) topographic lidar, plus both coastal and inland bathymetric data based on the USGS 3D Elevation Program (3DEP) specification.

This document provides a high-level summary of Indiana's requirements and uses of these important statewide elevation data products.

The State of Indiana has a variety of requirements for high-quality elevation data. QL2 lidar is utilized for Mission Critical Activities at all levels of government, academia, and private organizations and provides significant cost savings related to utilizing lidar as a resource. Use case examples identified include:

- Surface and Ground Water Quality and Riverine Management;
- Coastal Zone and Maritime Management, Navigation and Safety, Maritime Boundaries, Climate Change, Habitat Protection and Restoration, and Sea Level Rise and Subsidence;
- Forest, Rangeland, Natural Resource and Wildlife Management;
- Agriculture, Precision Farming, Fisheries Management and Aquaculture;
- Geologic Mapping/Assessment, Hazard Mitigation, Mining and Extraction;
- Renewable Energy, Oil, and Gas Resources;
- Soil Mapping and Analysis;
- Conservation Assessment, Planning, and Practice Implementation;
- Cultural Resource Preservation;
- Surface Hydrology / Watershed Mapping and Modeling;
- Floodplain Mapping, Modeling, Flood Risk Management and Mitigation;
- Homeland Security, Disaster Response, and Wildfire Management;
- Environmental and Disaster Informatics;
- Land Navigation, Marine and Riverine Navigation, Aviation Navigation and Safety;
- Infrastructure and Construction Management (Surveying, Engineering, Transportation, and Construction);
- Urban and Regional Planning;
- Health and Human Services;
- Real Estate, Banking, Insurance, and Land Boundary Management;
- Education K12 and Beyond, Basic Research;
- Recreation;
- Telecommunications; and
- Military Applications.

High-level summary of elevation data requirements

In general, the State of Indiana requires QL1 inland topography and QL1B inland and nearshore bathymetry all updated every 4-5 years.

Elevation data planning and data distribution

With the leadership of Indiana's GIO, the IGIC Elevation Workgroup has developed and maintains Indiana's 3DEP Statewide Elevation Plan. This plan is published as an ArcGIS Online Story Map that documents the history of Indiana's elevation initiatives, current data collection initiatives and their progress, and Indiana's future plans (https://arcg.is/1GOj1z).

A strong data distribution program provides ubiquitous access to Indiana's statewide elevation data. In addition to the USGS data distribution solutions, Indiana's statewide elevation data and derived products are freely distributed on IndianaMap using a variety of platforms, formats and data distribution methods. These include:

- Hard Drives distributed by IGIC to each County, GIO, IndianaMap Partner, IGIC Corporate Members, and Travel Drives that can be checked out by others.
- IndianaMap Viewer hosted at the Indiana Water and Geological Survey (https://maps.indiana.edu/layerGallery.html?category=Elevation).
- Indiana Spatial Data Portal hosted on the Indiana University Bloomington IUScholarWorks site by the University Information Technology Services (UITS) (http://gis.iu.edu/).
- Cloud-based distribution by IGIC of County-wide 2016-2020 Digital Elevation Model (DEM) Mosaics (https://legacy.igic.org/indiana-orthophotography-and-dem-download-story-app/).
- Purdue University Download Indiana 2016-2020 Statewide Lidar LAS & DEM tiles by County – (http://lidar.jinha.org/).
- Indiana's current Open-Topography Server (currently hosting Indiana's 2011-2013 statewide lidar) is managed by IGIC and based at the San Diego Supercomputer Center at the University of California, San Diego and operated in collaboration with colleagues in the School of Earth and Space Exploration at Arizona State University and at UNAVCO. (http://bit.ly/Xwy86P).

It is important to mention that each of these methods plays an important role in making Indiana's elevation data available, but that the OpenTopography solution removes **all** of the barriers of getting to Indiana's lidar data. Small and large businesses; governments of all sizes; the urban/rural; the technical/non-technical; and any/all citizens in Indiana (or around the world) can get easy, quick, and free access to Indiana's lidar data for the exact area they need and in the format they can immediately use. OpenTopography provides Indiana with an economic engine to empower anyone needing access to Indiana's lidar data. A recent report of usage metrics of Indiana's OpenTopography 2011-2013 lidar and DEM data can be found **here**.

The State of Indiana has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

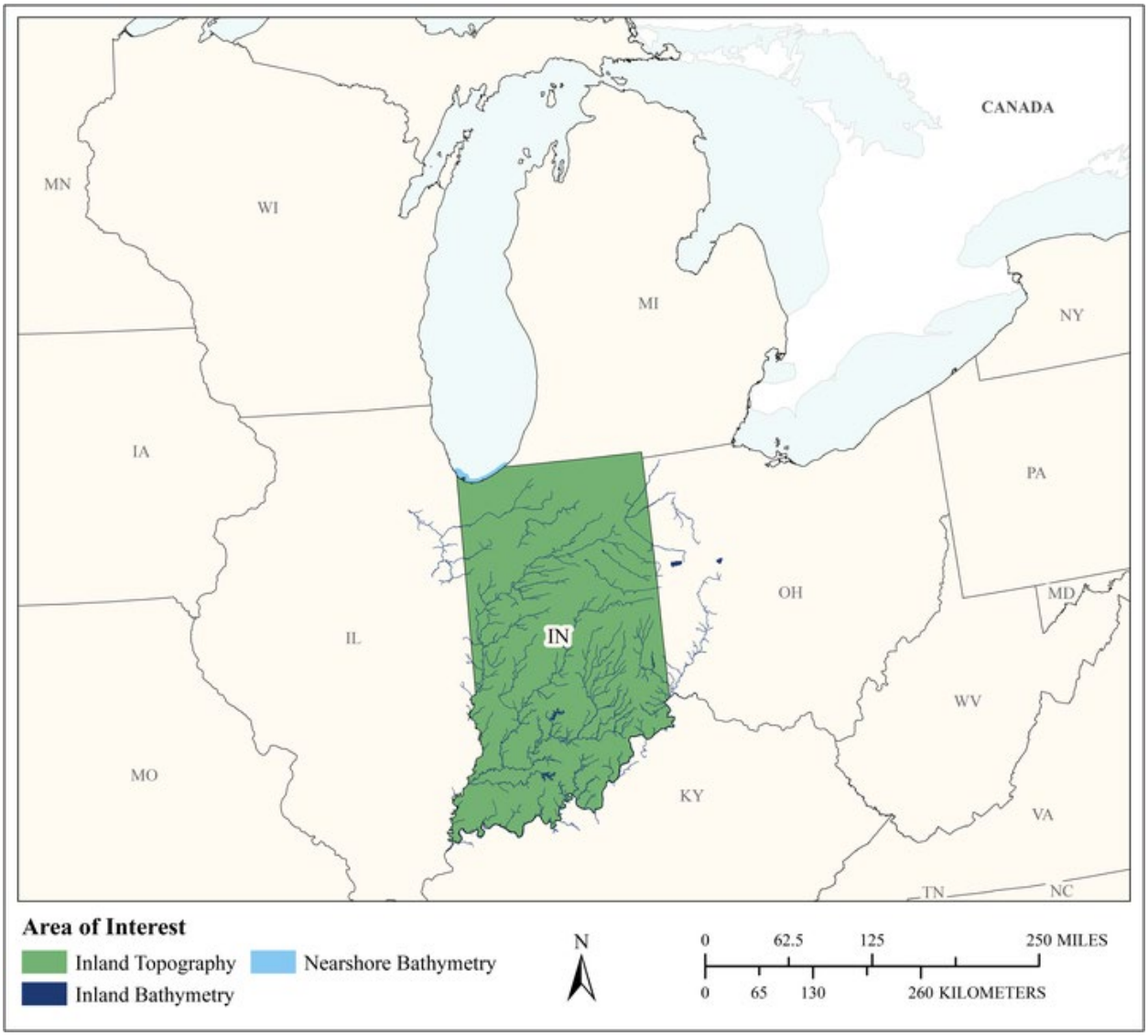
Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 02 – Riverine Ecosystem Management	IN Department of Environmental Management	1104	Water Quality Management	Inland Topo	Cross sections and/or transects meet needs	(a) 4-5 years (b) 6-10 years	$99,495	$6,482	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$8,291	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL0B	4-5 years	$7,839	$3,015	Major	Major	Major
BU 03 – Coastal Zone Management	State of Indiana	60149	Coastal Zone Management	Inland Topo	QL1	4-5 years	$1,865,469	$326,123	Major	Major	Major
				Inland Bathy	QL1B	4-5 years	$800,518	$469,302	Minor	Moderate	Moderate
				Nearshore Bathy	QL0B	4-5 years	$8,653	$14,638	Moderate	Major	Major
BU 04 – Forest Resource Management	Indiana DNR	22143	Forest Resources Management	Inland Topo	QL2	2-3 years	$143,061	$207,383	None	Moderate	None
BU 05 – Rangeland Management	State of Indiana	60150	Rangeland Management	Inland Topo	QL2	Annually	Unable to quantify	Unable to quantify	Minor	Major	I don't know
BU 06 – Natural Resource Management	Indiana DNR	22177	Abandoned Mine Lands Reclamation	Inland Topo	QL2	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Moderate
BU 06 – Natural Resource Management	State of Indiana	60151	Natural Resources Conservation	Inland Topo	QL1 HD	4-5 years	$1,419,207	$5,211,761	Major	Major	Major
				Inland Bathy	QL0B	6-10 years	$192,357	$8,659	Major	Major	Major
				Nearshore Bathy	QL1B	6-10 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate
BU 07 – Wildlife and Habitat Management	Department of Natural Resources	50001	Wildlife and Habitat Management	Inland Topo	QL2	4-5 years	$8,619	$24,894	Minor	Major	None
				Inland Bathy	QL2B	4-5 years	$69,074	$41,751	Minor	Major	None
				Nearshore Bathy	QL0B	4-5 years	$38	$2	Moderate	Major	Moderate
BU 08 – Agriculture	State of Indiana	60152	Agriculture and Precision Farming	Inland Topo	QL2	2-3 years	$41,892	$33,210	Major	Major	Minor
BU 11 – Geologic Resource Extraction	State of Indiana	60153	Geologic Resource Mining and Extraction	Inland Topo	QL1 HD	2-3 years	$8,838	$5,863	Minor	Major	Major
BU 12 – Renewable Energy Resources	State of Indiana	60154	Renewable Energy Resources	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	None

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 14 – Cultural Resource Management	State of Indiana	60155	Cultural Resources Preservation and Management	Inland Topo	QL1	4-5 years	$6,632	$5,798	Minor	Minor	Minor
BU 15 – Flood Risk Management	The Polis Center at IUPUI	1359	Environmental and Disaster Informatics	Inland Topo	QL1 HD	6-10 years	$134,732	$8,683	Major	I don't know	I don't know
				Nearshore Bathy	QL2B	6-10 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 15 – Flood Risk Management	Indiana Department of Natural Resources	21579	Floodplain Mapping, Modeling and Management	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
				Inland Bathy	QL2B	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 16 – Sea Level Rise and Subsidence	State of Indiana	60156	Sea Level Rise and Subsidence	Inland Topo	QL1 HD	4-5 years	$1,904,948	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Minor
BU 17 – Wildfire Management	State of Indiana	60157	Wildfire Management, Planning, and Response	Inland Topo	QL1	4-5 years	$194,406	Unable to quantify	Major	Major	Major
BU 18 – Homeland Security	State of Indiana	60158	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management	Inland Topo	QL2	4-5 years	$1,067,408	$18,865	Major	Moderate	Major
BU 19 – Land Navigation	State of Indiana	60159	Land Navigation and Safety	Inland Topo	QL0	2-3 years	$468,729	$37,852	Minor	Major	Major
BU 20 – Marine and Riverine Navigation	State of Indiana	60160	Marine and Riverine Navigation and Safety	Inland Topo	QL0 HD	2-3 years	$1,386,113	Unable to quantify	None	None	Minor
				Inland Bathy	QL0B	2-3 years	$660,010	$86,864	Moderate	Moderate	Moderate
				Nearshore Bathy	QL0B	2-3 years	$29,616	$1,002	Minor	Major	Major
BU 21 – Aviation Navigation	State of Indiana	60161	Aviation Navigation and Safety	Inland Topo	QL1 HD	Annually	$122,318	$152,343	Minor	Moderate	Moderate
BU 22 – Infrastructure Management	State of Indiana	60162	Infrastructure and Construction Management	Inland Topo	QL0 HD	4-5 years	$1,626,060	$4,785,167	Minor	Moderate	Major

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 23 – Urban and Regional Planning	Indiana Geographic Information Council, Inc (IGIC)	1288	Indiana Statewide Data Coordination, Distribution, and Access	Inland Topo	QL2	2-3 years	$9,735,469	$1,123,964	I don't know	I don't know	I don't know
				Inland Bathy	QL1B	6-10 years	$396,508	$501,617	Moderate	Moderate	Major
				Nearshore Bathy	QL2B	4-5 years	$7,071	$7,459	Moderate	Moderate	Moderate
BU 24 – Health and Human Services	State of Indiana	60163	Health and Human Services	Inland Topo	QL1	6-10 years	$12,910	$1	Moderate	Moderate	Major
BU 25 – Real Estate, Banking, and Insurance	State of Indiana	60164	Real Estate, Banking, Mortgage, and Insurance	Inland Topo	QL1 HD	4-5 years	$1,257,197	Unable to quantify	Minor	Minor	Major
BU 27 – Recreation	Indiana Department of Natural Resources	50000	Fisheries Management	Inland Topo	QL2	4-5 years	$10,000 to $19,000	Unable to quantify	Moderate	Minor	None
				Inland Bathy	QL1B	4-5 years	$5,000 to $9,999	Unable to quantify	Moderate	Minor	None
				Nearshore Bathy	QL1B	4-5 years	$5,000 to $9,999	Unable to quantify	Moderate	Minor	None
BU 28 – Telecom-munications	State of Indiana	60165	Telecommunications	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 29 – Military	State of Indiana	60166	Military	Inland Topo	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 30 – Maritime and Land Boundary Management	State of Indiana	60167	Maritime and Land Boundary Management	Inland Topo	QL1	6-10 years	$40,715	$156,105	Moderate	Minor	None

MCA Title: Water Quality Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Area split by varying quality level or update frequency	One or more Hydrologic Units (HUC8s)	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements	Indiana			

MCA Description	Response
Mission Critical Activity	Ensure that regulated entities comply with federal and state environmental laws and rules that help protect citizens and our environment. Elevation data are needed to derive slopes for flow direction, velocity, and gradient calculations. The data are also used to assess water quality and biological habitats, identify species habitats in different land use areas, and identify how they impact water quality and water uses. Managing agricultural use of water and runoff is another important use for elevation data related to water quality.
MCA Title	Water Quality Management
MCA ID	1104
Organization Type	State or U.S. Territorial government
Organization Name	IN Department of Environmental Management
Sub-Agency or Division	
Organization Mission	IDEM's mission is to implement federal and state regulations to protect human health and the environment while allowing the environmentally sound operations of industrial, agricultural, commercial and government activities vital to a prosperous economy.
Program Name	Office of Water Quality and Office of Land Quality
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Tertiary Business Use	BU 01 - Water Supply and Quality

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Not required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Full range from individual feature to 200,000 sq miles
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Well locations, bore hole locations from soil sample sites, permitted facilities water outfalls and intakes (end of pipe)

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required

Inland Bathy Feature Size Requirements	Response
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	Cross sections and/or transects meet needs	QL0B	QL0B	
Update Frequency	(a) 4-5 years (b) 6-10 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI	Landuse changes around urbanized areas 4-5 years frequency			
Acceptable Horizontal Error	Less than 20 cm	Less than 50 cm	Less than 50 cm	
Acceptable Vertical Error	Less than 5 cm	Up to 20 cm	Less than 10 cm	
How far onshore needed			1 kilometer inland	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			No requirement for tide correction	
Cross sections and/or transects meet needs	Yes			
Cross section/transect requirement	Less than 5 cm vertical accuracy Sampling density of 3 meters minimum			

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Highly desirable	Highly desirable		Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Required	Required		Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	
DTM	Required	Highly desirable	Required	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Nice to have	Nice to have	
Classified point cloud	Nice to have	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Highly desirable	
Full waveform	Nice to have	Highly desirable	Required	
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Highly desirable	
Ground control/ground truthing	Nice to have	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Highly desirable	
Bottom type			Required	
Submerged features			Required	
Subbottom characteristics			Required	
Geologic and seismic data	Highly desirable	Highly desirable	Nice to have	
Water column properties - Physical			Highly desirable	
Water column properties - Chemical			Highly desirable	
Water column properties - Biological			Highly desirable	
Currents			Highly desirable	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Required	Highly desirable	
Land use/land cover	Required	Required	Required	
Wetlands	Required	Required	Required	
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Nice to have		
Landmark features	Highly desirable	Highly desirable	Nice to have	
Cultural resources	Highly desirable	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	DEMs, date unknown; Topography (Quarter Quads), date varies; Orthophotography at 1:24,000 2013-2014	We don't have any and use others' imagery - see 34b.	We have only local data and Federal data to pull.	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts		Yes	Yes	
USACE navigation charts				
USGS Inland Waters server		Yes		
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State repositories used	IndianaMap Rest Services (https://gis.in.gov/arcgis/rest/services); Indiana State Services (https://imagery.gis.in.gov/arcgis/services)			
Other			Yes	
Other description			Northwest Regional Planning Commission resources, Et al.	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Major	Moderate	
Cost savings/cost reduction	Moderate	I don't know	Moderate	
Cost avoidance	Moderate	I don't know	I don't know	
Increased revenues	Minor	I don't know	None	
Mission-driven performance improvements	Major	I don't know	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate	Moderate	
Improved response or timeliness	Moderate	Moderate	Moderate	
Improved customer experience	Major	Moderate	Moderate	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major	Moderate	
Environmental	Moderate	Major	Major	
Public safety, including life and property	Major	Major	Major	

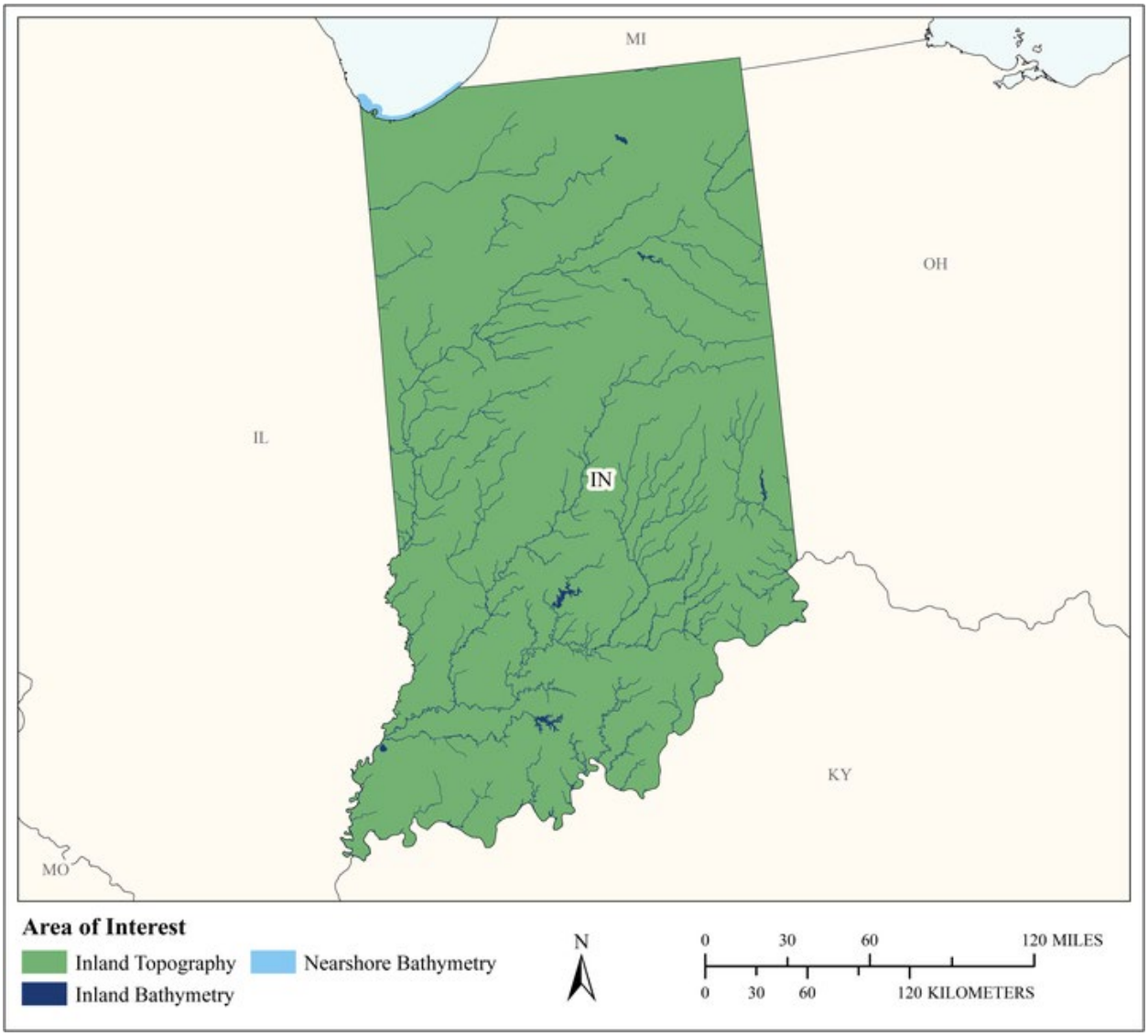
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$94,068	Major	Annual dollars saved/realized	$8,291	Moderate	Annual dollars saved/realized	$7,839			
Time savings description	Our data quality review loops are thorough, but we are improving with digital data upload and improved base data layers. Our water field staff perform routine monitoring and inspection except in special cases. County and municipal data and other sources need time to normalize and reproject, as needed/provided. Extensive quality assurance project plans, work plans and self-auditing are already in place so minimal impact on an annual basis. Better base data will help with coordination among permitted facilities and regulatory agencies. Reporting, mapping, data dissemination are communication tools that will be improved.			Gradients are calculated as well as substrate evaluated. Don't know if permitting spends much time on bathymetric data regularly. Reduced learning curve once standardized consistent high res. data is available. Gradients are calculated as well as substrate evaluated and reported. Working with different sources requires reprojection at times. Gradients are calculated as well as substrate and riparian areas evaluated.			Since L. Michigan shoreline is small in Indiana the impact on effort is smaller than other states. Monitoring is in the field and samples sent to labs. Water quality monitoring and inspections are routine and sites need little additional investigation after the first visit.					
Cost savings/cost reduction	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction description	We use funds for volunteer programs and these could be influenced by better, more current data to provide for more efficient use of the materials and funds. Because this is expensive and no annual budgeting has been granted, we look at competitive grant funds for supporting individual projects.			Not applicable. Our resources of funds are intermittent and I do not have these figures.			Any funds used in projects in this area are grants administered by local/regional entities. No current annual costs from which to estimate annual or monthly savings.					
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide				
Cost avoidance description							Unfamiliar with effects better data would have on this. I am not involved with budget and spending nor the processes, but any data we receive post processes is best for efficiency as a data user.					
Increased revenues	None			I don't know	Unable to provide		Moderate	Unable to provide				
Increased revenues description	Not applicable.						Not applicable. Improved communications with stakeholders through new web apps and services.					
Mission-driven performance improvements	Moderate	Unable to provide		Major	Annual percent improvement	8%	Moderate	Annual percent improvement	10%			
Mission-driven performance improvements description	With better data comes better analytical results in locating pollution and determining best areas for remediation or best management practices. Helps target funding and activities that will improve our natural resources. Communication improvements using spatial data helps to engage stakeholders.			Consistent, high res data will provide for better analytical results.			Already have improved communications and seek to further maintain and improve on our current systems. Already have improved communications and analysis and seek to further maintain and improve on our current systems.					
Other operational benefits	Major	Annual dollars saved/realized	$5,427				Moderate	Unable to provide				
Other operational benefits description	Visual trend analyses. Operational benefits could assure consistency of annual data to apply toward spatial trend analyses that currently requires more time to normalize between years.						Regarding additional environmental impacts on riparian areas and tributaries seiche from L. Michigan. Improved decision making.					

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$5,427	Major	Unable to provide		Major	Unable to provide				
Value added to products or services description	Not applicable. Cross platform and application use of the data would help normalize related data being used in these types of products and services.			Aquatic life indices and habitat evaluations rely on quality spatial data that we could use.			Better understanding of hydro systems in this region will improve recreation and aquatic productivity and industry. L. Michigan shoreline and tributaries studies need improved data for future decision making.					
Improved response or timeliness	Major	Annual dollars saved/realized	$1,055	Major	Unable to provide		Major	Annual dollars saved/realized	$3,015			
Improved response or timeliness description	Systems are already upgraded and are being further improved already, but this can help with current locational information. Unfamiliar with resources used for this activity although there is a call for best current data for this. Just starting to become familiar with these resource options. Again, across platform and application use of the data would help normalize related data being used in these types of products and services.			Well cached high res data to provide through web map apps is what we are promoting and developing. Unfamiliar with this activity but I suspect it would be great info to have for this. Can help with improving boundaries and definitions of wetlands and other land cover categories. High res data to provide for maps to communicate our mission, goals, and results.			The AOI has very involved stakeholders and this better data will provide better communications through web apps and other formats. Unfamiliar with this type of response activity in the AOI. Better data in better apps for staff involved in these activities equals better efficiency. Unfamiliar with this type of recovery activity in the AOI. Unfamiliar with this type of projections activity in the AOI.					
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience description	Always expanding our services and applications because we know the value and want to maintain high quality data availability. Also our mission is to keep improving for customer satisfaction. Customer confidence has improved with better data for analyses and communication and we want to keep improving.			Always important but especially to water resource enthusiasts and scientists.			Due to high interest by stakeholders in AOI current quality data in current apps and services goes a long way toward customer confidence. Due to high interest by stakeholders in AOI current quality data goes a long way toward customer confidence. Due to high interest by stakeholders in AOI readily available current quality data goes a long way toward customer confidence.					
Other customer service benefits	Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Other customer service benefits description	Using consistently updated spatial data in applications to address larger issues where many partners are participating in planning and implementation activities. Improved coordination between data resource providers.			Spectral data. Would be useful for habitat evaluations if wave data is provided.			Information dissemination.					
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major					
Education or outreach description	Spatial data is a foundation for expressing ideas and understanding place and time which are great for communicating with stakeholders			Training students and staff about the subsurface terrain improves users understanding			Due to high interest by stakeholders in AOI current quality data provides the best foundation for this.					
Environmental	Major			Major			Major					
Environmental description	Spatial and spectral analysis tools are very useful with current data as collected annually for environmental impacts			Scientists can evaluate the ecological significance better with more accurate bathymetry			Current quality data provides the best foundation for this as well.					
Public safety, including life and property	Major			Major			Major					
Public safety, including life and property description	Staff use spatial data for reconnaissance and investigations that keep them and the public safe.			Subsurface terrain is very important in safety and rescue in water features			Current data is always preferred for emergency situations, especially in this unique area of the state					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes			
Curvature maps	Yes	Yes	Yes	
Cross sections		Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes		Yes	
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Coastal Zone Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Analysis of coastal erosion and inundation. Hurricane storm surge and wind damage modeling and assessment. Coastal hazard modeling and mapping. Coastal hazard mitigation. Tsunami modeling. Land use and environmental planning. Coastal resiliency. Oil spill modeling. Littoral zone management including dunes and beaches.
MCA Title	Coastal Zone Management
MCA ID	60149
Organization Type	State or U.S. Territorial government
Organization Name	State of Indiana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL0B	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable		Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Nice to have	
DTM	Required	Highly desirable	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Nice to have	Nice to have	
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	
Ground control/ground truthing	Highly desirable	Required	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Required	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Highly desirable	Highly desirable	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Highly desirable	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Moderate	
Cost savings/cost reduction	Moderate	Moderate	Moderate	
Cost avoidance	Major	Minor	Moderate	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	Moderate	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Moderate	

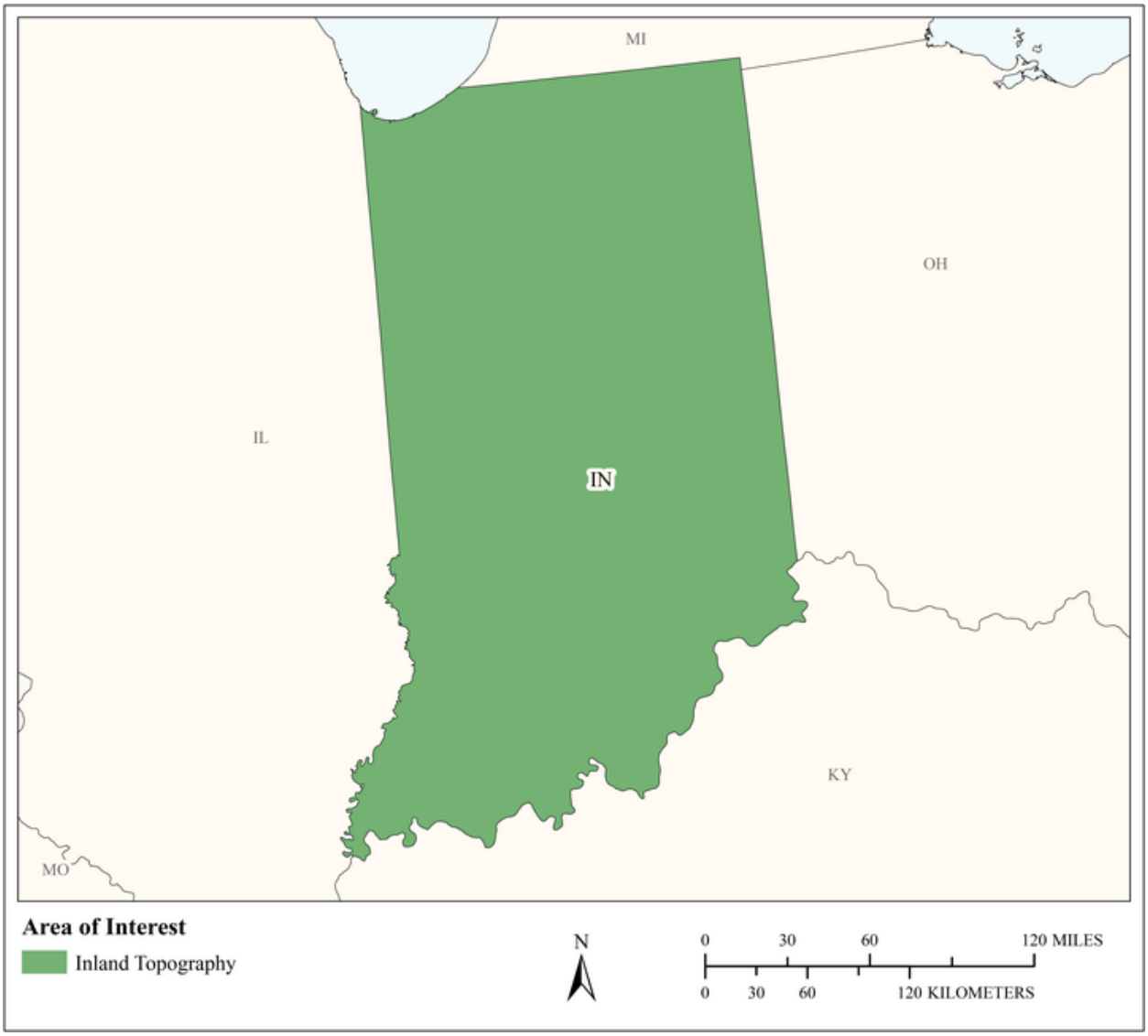
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	Moderate	
Improved customer experience	Major	Moderate	Moderate	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Moderate	
Environmental	Major	Moderate	Moderate	
Public safety, including life and property	Major	Moderate	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Increased revenues	None			None			Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,865,469		Annual dollars saved/ realized	$800,518		Annual dollars saved/ realized	$8,653			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$326,123		Annual dollars saved/ realized	$469,302		Annual dollars saved/ realized	$14,638			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Minor			Moderate					
Environmental	Major			Moderate			Major					
Public safety, including life and property	Major			Moderate			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Forest Resources Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Forest health assessment. Determination of standing inventory of forest resources. Prescribed burn planning. Harvest systems planning.
MCA Title	Forest Resources Management
MCA ID	22143
Organization Type	State or U.S. Territorial government
Organization Name	Indiana DNR
Sub-Agency or Division	
Organization Mission	Steward Indiana's natural resources. The mission of the Indiana Department of Natural Resources is to protect, enhance, preserve, and wisely use natural, cultural, and recreational resources for the benefit of Indiana's citizens through professional leadership, management, and education. The forestry division supports multiple uses: recreation, timber production, watershed protection, hunting, and healthy fish and wildlife populations. District Foresters can assist landowners with inspections and management plans tailored to satisfy individual forest stewardship objectives. State nurseries provide stock for landscaping, windbreaks, fire control, and other uses.
Program Name	Indiana Division of Forestry
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Trails, haul roads

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required			
DTM	Not required			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Not required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Nice to have			
Wetlands	Required			
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Indiana state LiDAR			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			

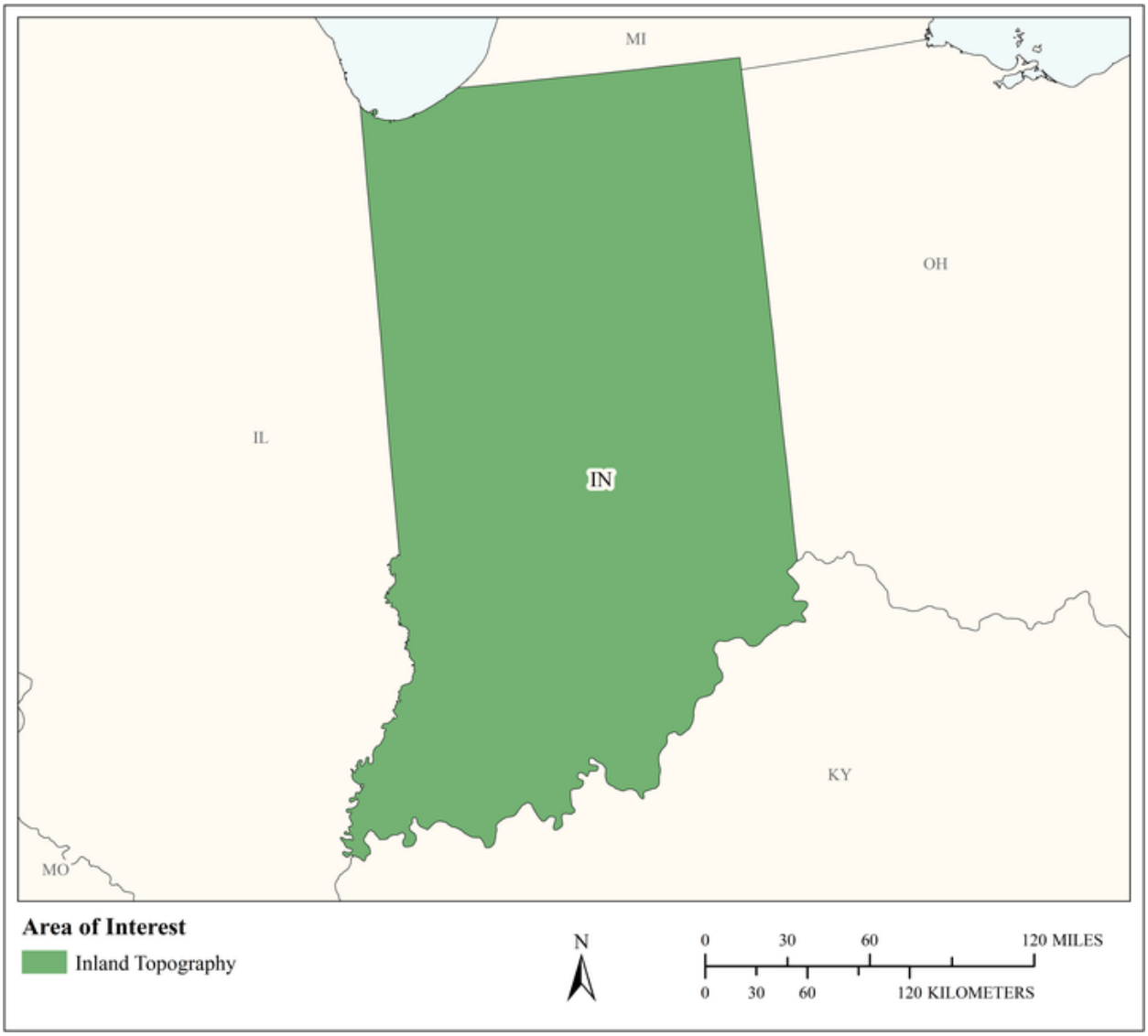
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Cost savings/cost reduction	Minor	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$143,061									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$207,383									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None											
Environmental	Moderate											
Public safety, including life and property	None											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Rangeland Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Assessment of rangeland health. Mapping for soil erosion potential due to grazing.
MCA Title	Rangeland Management
MCA ID	60150
Organization Type	State or U.S. Territorial government
Organization Name	State of Indiana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 05 - Rangeland Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Highly desirable			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Not required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None			
Cost savings/cost reduction	None			
Cost avoidance	None			
Increased revenues	None			
Mission-driven performance improvements	None			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None			

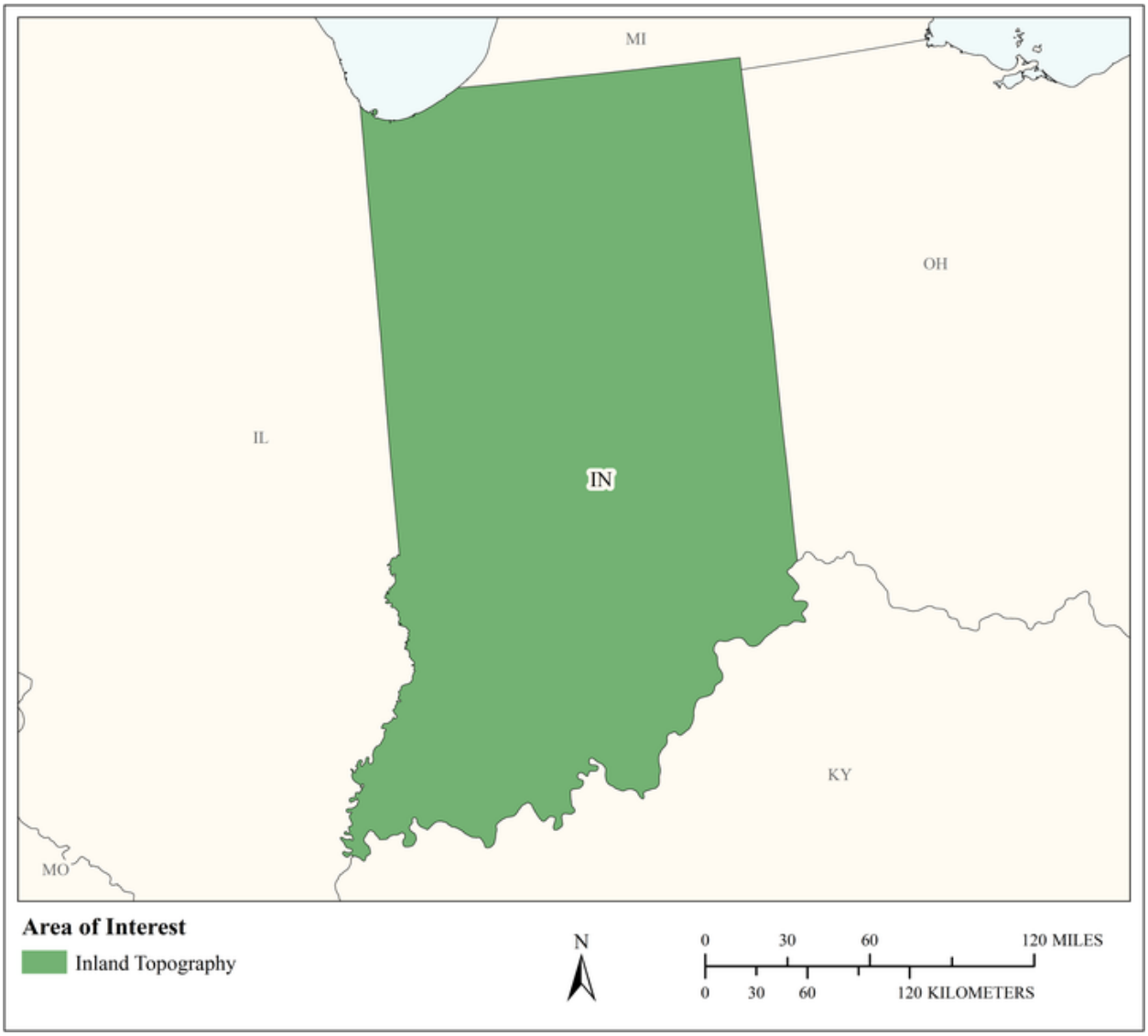
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	None			
Improved customer experience	None			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	None			
Public safety, including life and property	None			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	None											
Cost avoidance	Minor	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Abandoned Mine Lands Reclamation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Abandoned Mine lLands (AML) reclamation.
MCA Title	Abandoned Mine Lands Reclamation
MCA ID	22177
Organization Type	State or U.S. Territorial government
Organization Name	Indiana DNR
Sub-Agency or Division	
Organization Mission	The Division of Reclamation: AML Program's mission is to provide a means to rectify the abandoned mine lands into an environmentally sustainable habitat.
Program Name	AML Reclamations
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Mine subsidences, mine void openings, abandoned structure footprints, pits, ditches, stream beds

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Nice to have			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Highly desirable			
Wetlands	Required			
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Highly desirable			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Indiana state LiDAR QL2			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Indiana State Repository data for LiDAR.			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	Major			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	Minor			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

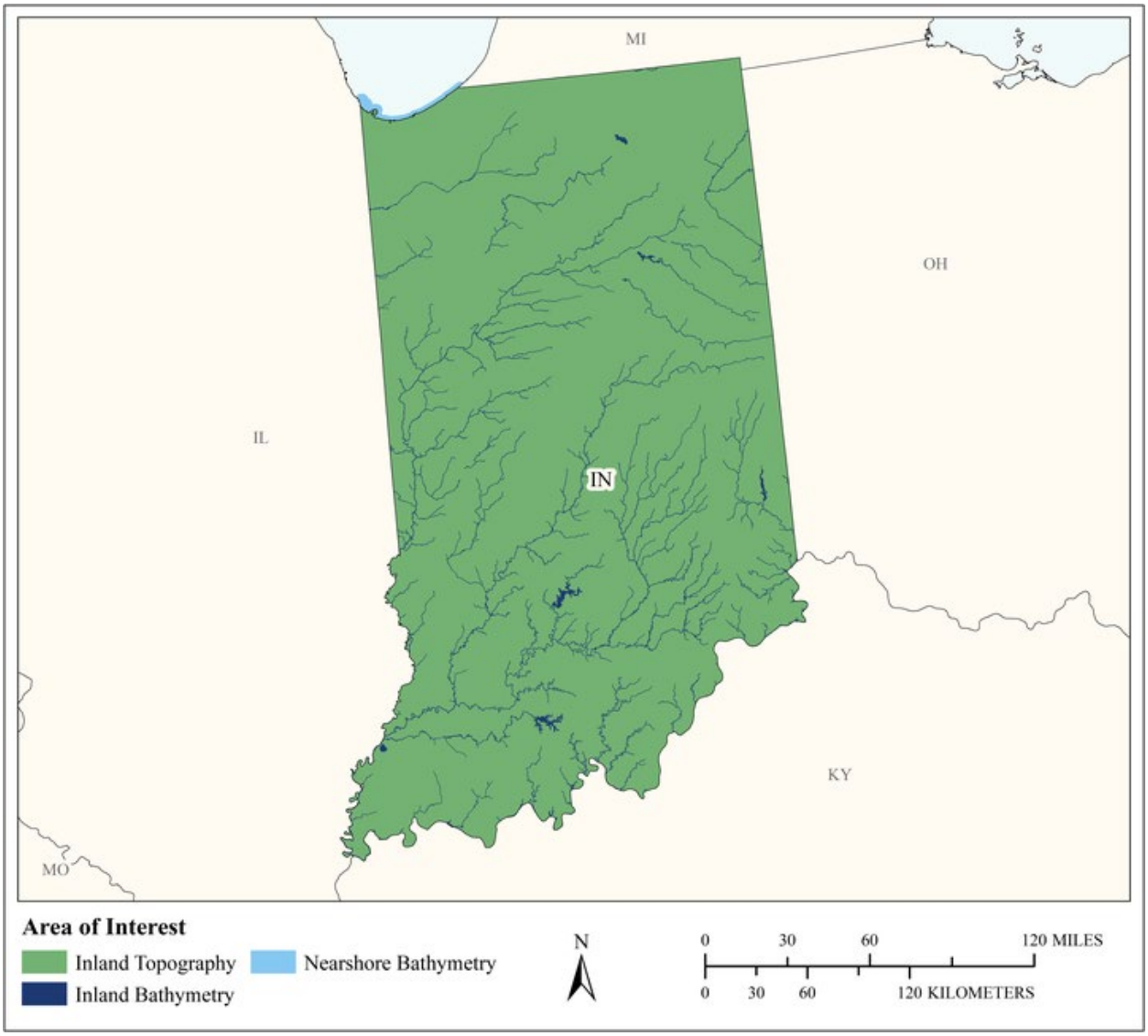
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Major	Annual percent improvement	40%									
Mission-driven performance improvements description	Time taken away from going into the field without knowledge of surroundings and potential findings could be reduced saving time and money.											
Other operational benefits	Major	Unable to provide										
Other operational benefits description	There are many applications which could be utilized if the processing power of my organization's computers were able to carry out the different applications of advanced imagery.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Value added to products or services description	This would be of continued benefit to many within my organization.											
Improved response or timeliness	Major	Unable to provide										
Improved response or timeliness description	If there were more properly trained experts using this within my organization, I could foresee this having a major impact upon several aspects of my organizations operations. Flood hazards are used to inform the public of potential risks on a routine basis within my organization. Flood hazard maps are used frequently within the daily parameters of my organization's operations.											
Improved customer experience	Major	Unable to provide										
Improved customer experience description	Reliable mapping gives my colleagues the ability to give more confident answers to queries made by the public.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Education or outreach description	Having an awareness as to how to ask questions to professionals who understand how to interpret 3D elevation data would streamline the effects of having this data public.											
Environmental	Major											

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Environmental description	The ability to respond to environmental events using 3D elevation maps is relatively new to my organization and I feel that as time move forward it will continue to be used to a greater extent giving my colleagues an easier methodology to performing their daily tasks set before them.			
Public safety, including life and property	Moderate			

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Natural Resources Conservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation engineering. Soils and wetlands mapping and characterization. Modeling of biological and ecological systems. Erosion control. Rainfall penetration studies, impervious surfaces. Assessment of blue carbon stocks.
MCA Title	Natural Resources Conservation
MCA ID	60151
Organization Type	State or U.S. Territorial government
Organization Name	State of Indiana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B	QL1B	
Update Frequency	4-5 years	6-10 years	6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Highly desirable	Required		Required	Required
Entire AOI under same environmental conditions	Required	Required	Required		Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required		Required	Required
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Required	Required	Required	
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Highly desirable	Required	
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Nice to have	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Highly desirable	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Required	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Highly desirable	Required	Highly desirable	
Land use/land cover	Required	Required	Highly desirable	
Wetlands	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Nice to have	Highly desirable	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	
Cost savings/cost reduction	Major	Major	Minor	
Cost avoidance	Major	Moderate	Minor	
Increased revenues	Minor	Minor	None	
Mission-driven performance improvements	Major	Major	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Moderate	

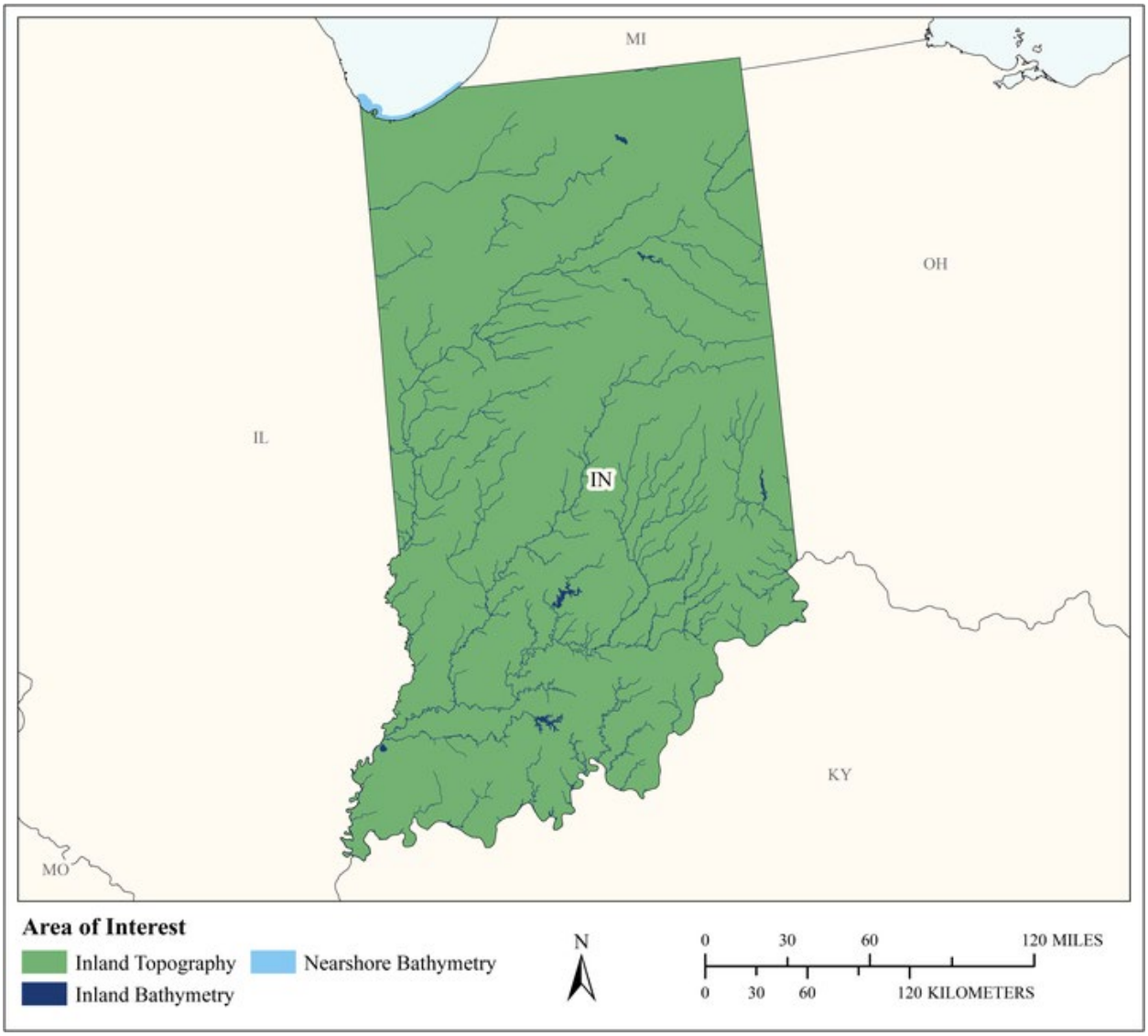
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major	Moderate	
Improved customer experience	Major	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Moderate	
Environmental	Major	Major	Major	
Public safety, including life and property	Major	Moderate	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		None					
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,419,207		Annual dollars saved/ realized	$192,357						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$5,211,761		Annual dollars saved/ realized	$8,659						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate					
Environmental	Major			Major			Major					
Public safety, including life and property	Major			Major			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes		Yes	
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Wildlife and Habitat Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Wildlife Section
MCA Title	Wildlife and Habitat Management
MCA ID	50001
Organization Type	State or U.S. Territorial government
Organization Name	Department of Natural Resources
Sub-Agency or Division	Division of Fish and Wildlife
Organization Mission	The mission of the Indiana Department of Natural Resources is to protect, enhance, preserve, and wisely use natural, cultural, and recreational resources for the benefit of Indiana's citizens through professional leadership, management, and education. The Division of Fish and Wildlife manages the state's fish and wildlife thorough professional research, regulation of hunting, fishing and trapping, and restoration of rare species. The fish and wildlife division also stocks fish in public waters, offers hunting, fishing and wildlife watching on division properties, provides access to public lakes and rivers, and offers advice and incentives to landowners for development of wildlife habitat. Hunting, fishing, horseback riding, hiking, trapping, camping, and even photography are some of the adventures to be found at F&W properties scattered throughout the State. Staff relies heavily on citizen input to design and apply professional wildlife practices to both public and private lands to improve habitat, promote wildlife management, and increase recreational opportunities.
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Individual trees or fence lines

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable

Inland Bathy Feature Size Requirements	Response
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B	QL0B	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter	Up to 2 meters	
Acceptable Vertical Error	Up to 1 meter	Up to 1 meter	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed	Below MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Highly desirable	
DTM	Nice to have	Nice to have	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Not required	Not required	Nice to have	
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ			Nice to have	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)			Nice to have	
Breaklines required for standard hydro-flattening	Not required	Not required		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Nice to have	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Highly desirable	
Routes			Nice to have	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Nice to have	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Indiana 2011 - 2013 Statewide QL3 Lidar & DEM data available from a custom OpenTopography site (http://bit.ly/Xwy86P). QL2 data statewide is currently being acquired through 2018 for delivery in 2019	None statewide, some project specific data was collected for lakes and rivers by USGS		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	IndianaMap & Indiana Spatial Data Portal			

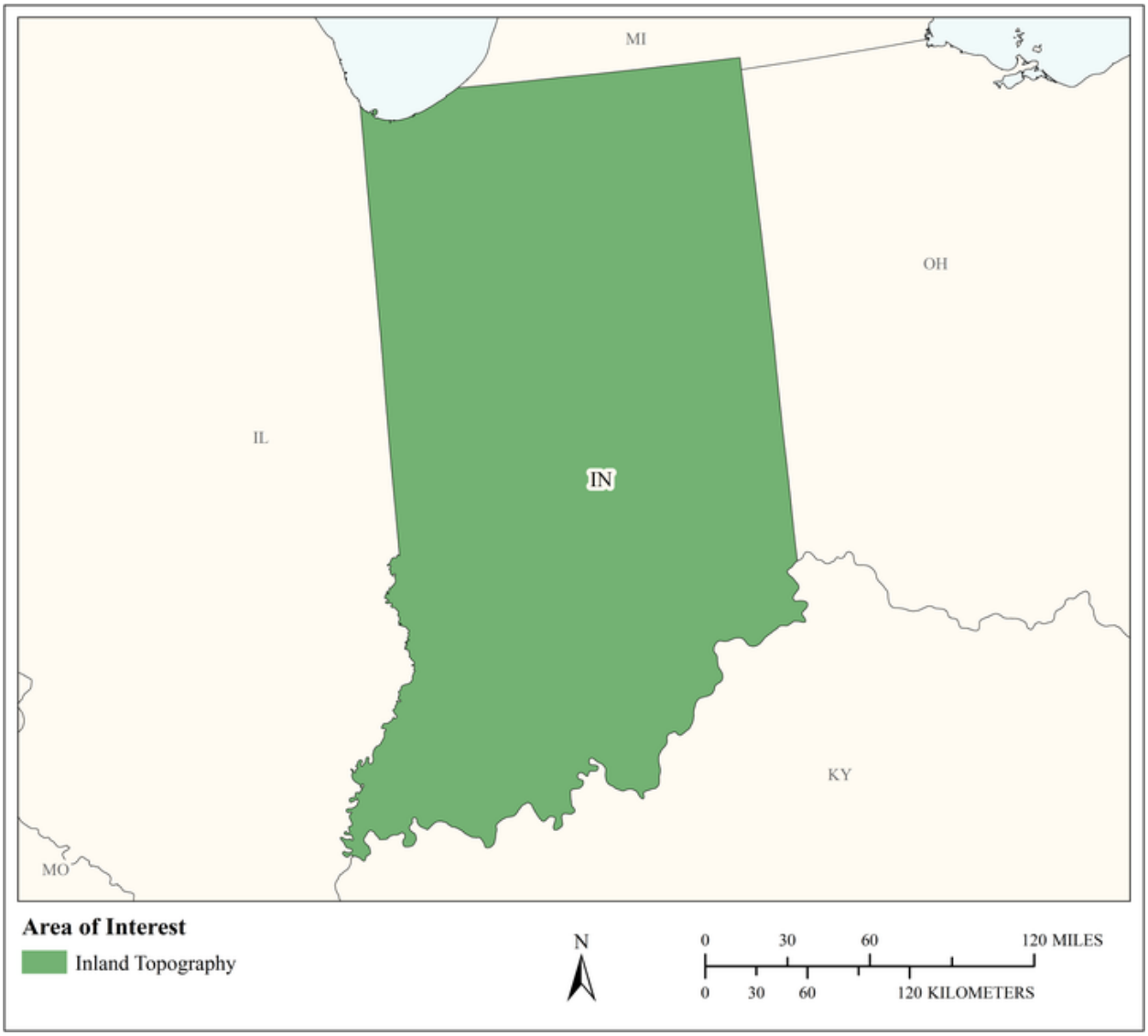
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other	Yes	Yes		
Other description	IndianaMap & Indiana Spatial Data Portal	Individual agencies that collected data		
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None	None	Minor	
Cost savings/cost reduction	None	None	Minor	
Cost avoidance	None	None	Moderate	
Increased revenues	None	None	None	
Mission-driven performance improvements	Moderate	Moderate	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None	None	Minor	
Improved response or timeliness	None	None	Minor	
Improved customer experience	None	None	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	Minor	
Environmental	Moderate	Moderate	Moderate	
Public safety, including life and property	None	None	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	None			None			Major	Unable to provide				
Cost savings/cost reduction	None			None			Moderate	Unable to provide				
Cost avoidance	None			None			Major	Unable to provide				
Increased revenues	None			None			Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$8,619		Annual dollars saved/ realized	$69,074		Annual dollars saved/ realized	$38			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	None			None			Moderate	Unable to provide				
Improved response or timeliness	None			None			Moderate	Unable to provide				
Improved customer experience	None			None			Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$24,894		Annual dollars saved/ realized	$41,751		Annual dollars saved/ realized	$2			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			Moderate					
Environmental	Major			Major			Major					
Public safety, including life and property	None			None			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	
Contours			Yes	
Hillshades				
Slope maps			Yes	
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Agriculture and Precision Farming



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Farm pond design. Irrigation system design. Detailed site analysis to support precision farming. Analysis of farm sedimentation and runoff. Calibration of fertilizer application, fertilizer management, and irrigation planning. Optimized terraforming.
MCA Title	Agriculture and Precision Farming
MCA ID	60152
Organization Type	State or U.S. Territorial government
Organization Name	State of Indiana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 08 - Agriculture and Precision Farming
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

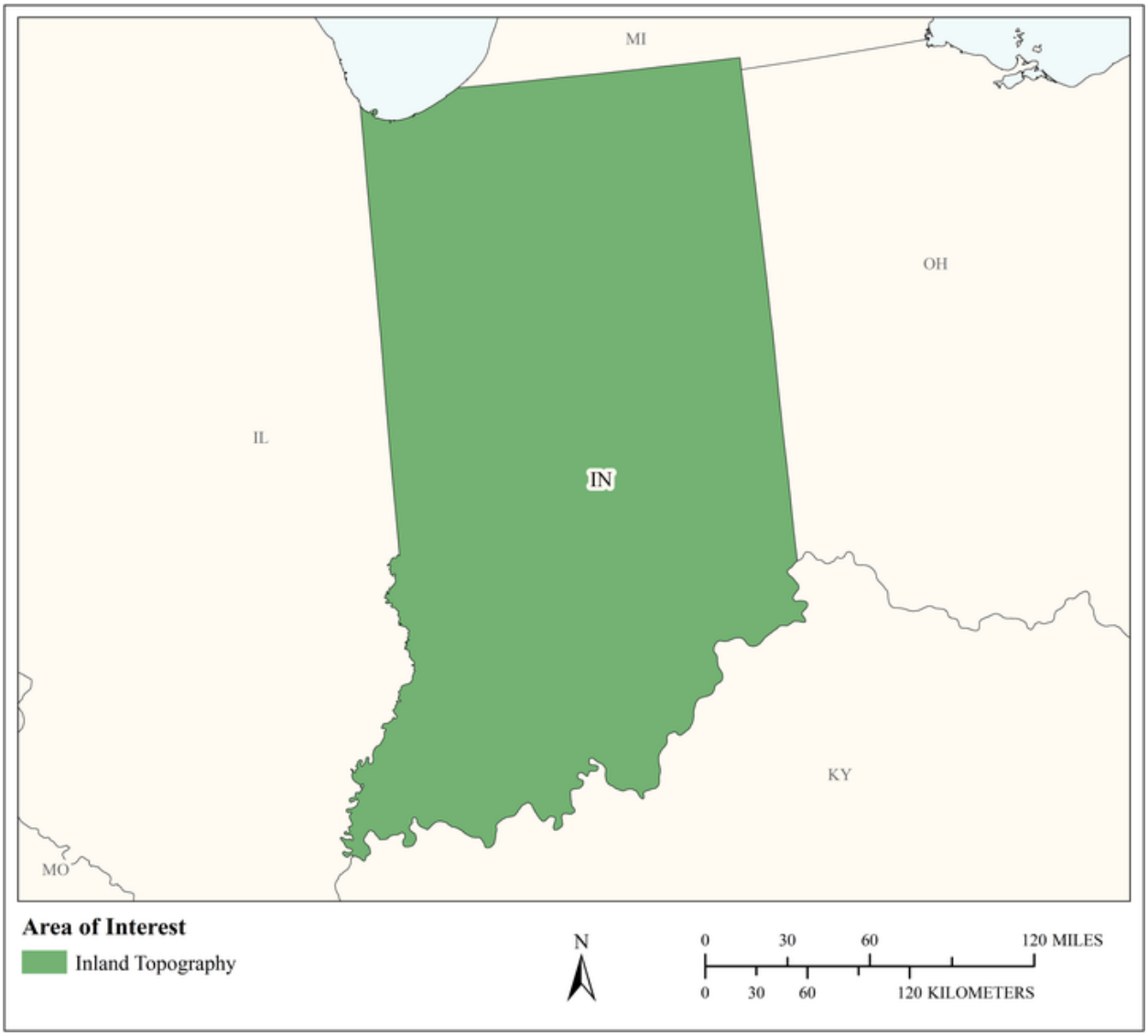
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$41,892									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$33,210									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Minor											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic Resource Mining and Extraction



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Onshore or offshore mineral extraction. Monitoring sand as a local resource. Seabed resources. Open mine volume computations. Stockpile analysis. Environmental impact assessment and site restoration.
MCA Title	Geologic Resource Mining and Extraction
MCA ID	60153
Organization Type	State or U.S. Territorial government
Organization Name	State of Indiana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 11 - Geologic Resource Mining and Extraction
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			

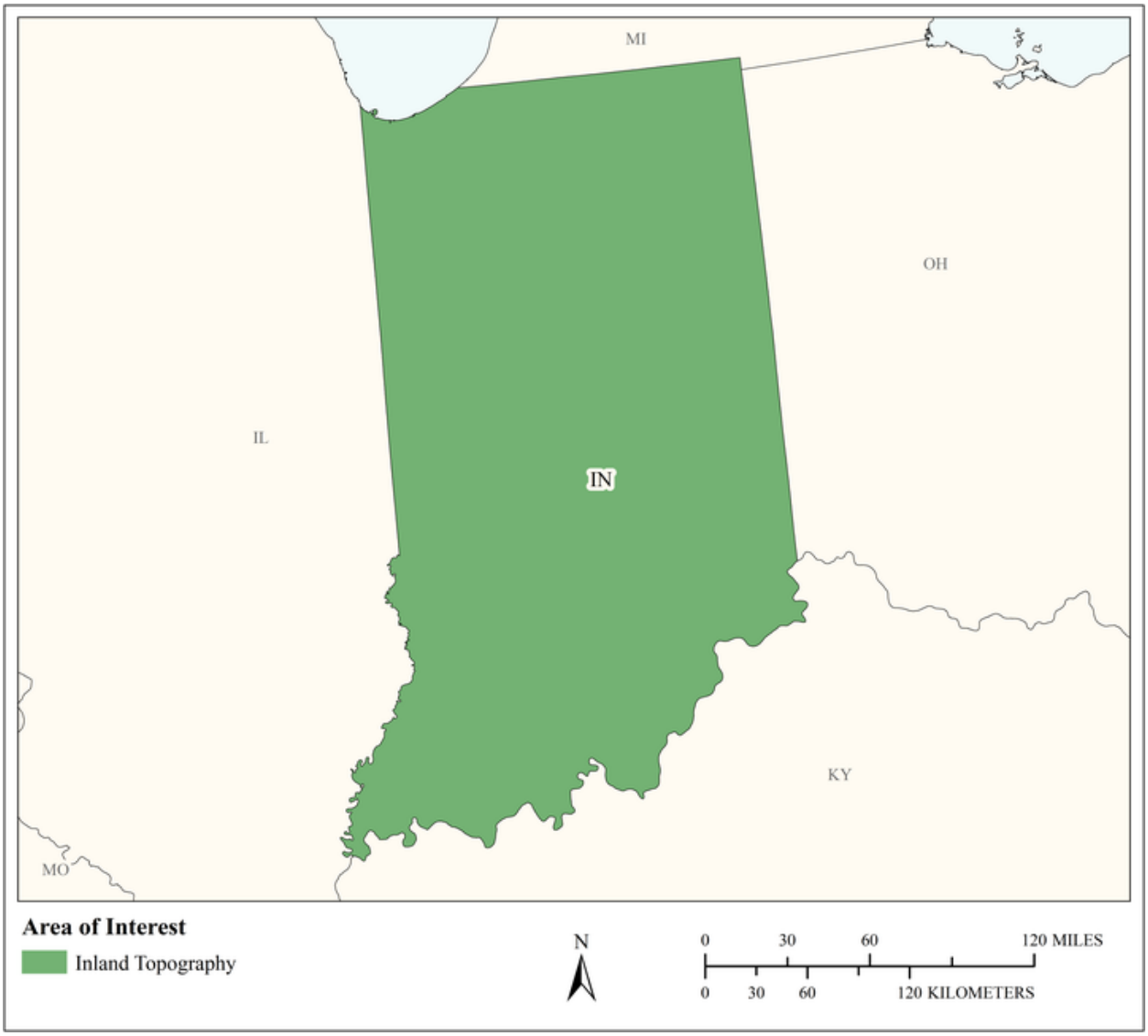
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Minor	Unable to provide										
Cost avoidance	Minor	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$8,838									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$5,863									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Renewable Energy Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Alternate energy development – solar, tidal, wind, wave, and ocean current. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Low head power potential for hydropower.
MCA Title	Renewable Energy Resources
MCA ID	60154
Organization Type	State or U.S. Territorial government
Organization Name	State of Indiana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Not required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Minor			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor			

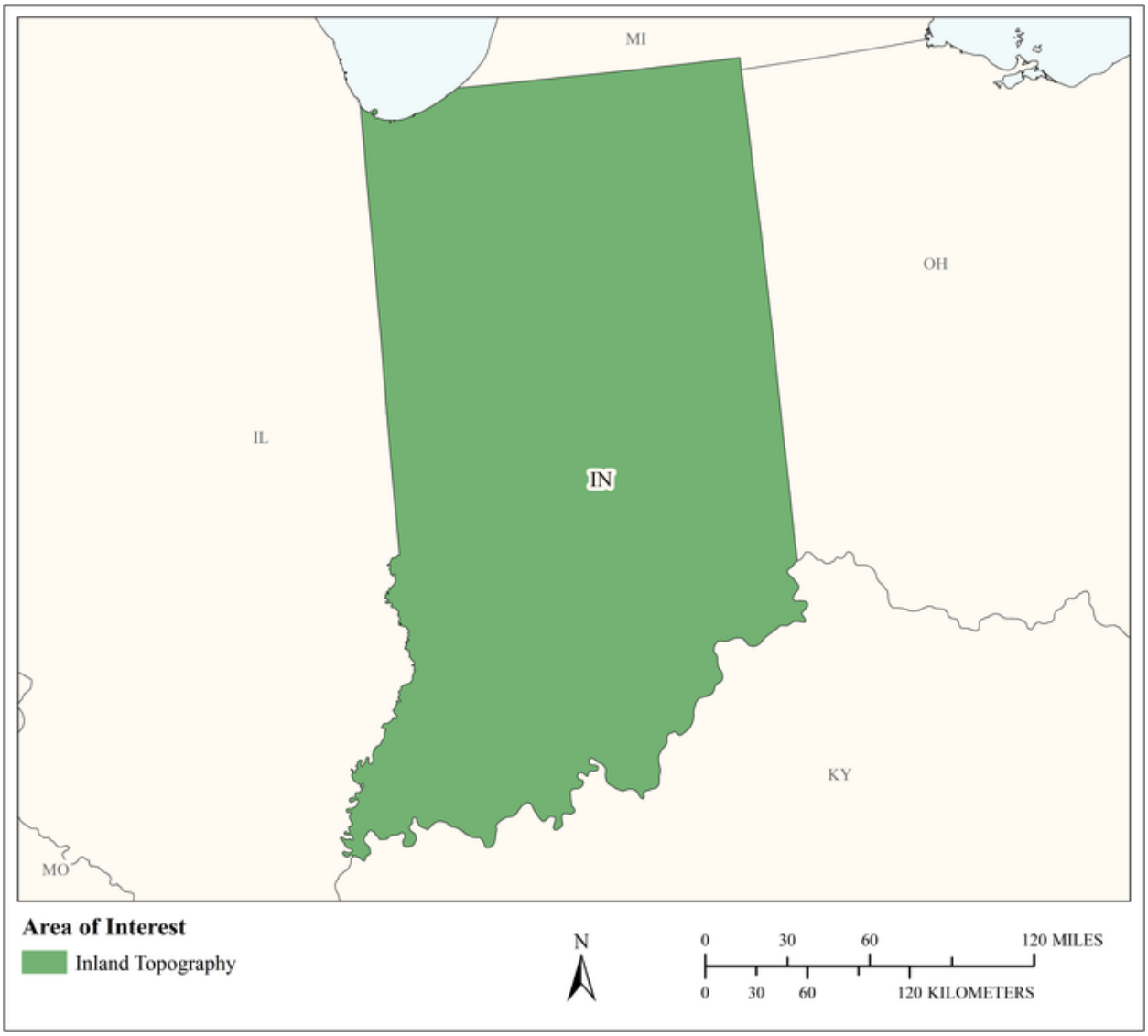
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	None											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Cultural Resources Preservation and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Discovery and analysis of underwater archaeological and historical cultural sites. Site protection and preservation planning. Discovery and analysis of Native American and other historical cultural sites and subsistence activities.
MCA Title	Cultural Resources Preservation and Management
MCA ID	60155
Organization Type	State or U.S. Territorial government
Organization Name	State of Indiana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Nice to have					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have					
DEM for entire AOI needs to be seamless	Nice to have					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Moderate			
Cost avoidance	Minor			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			

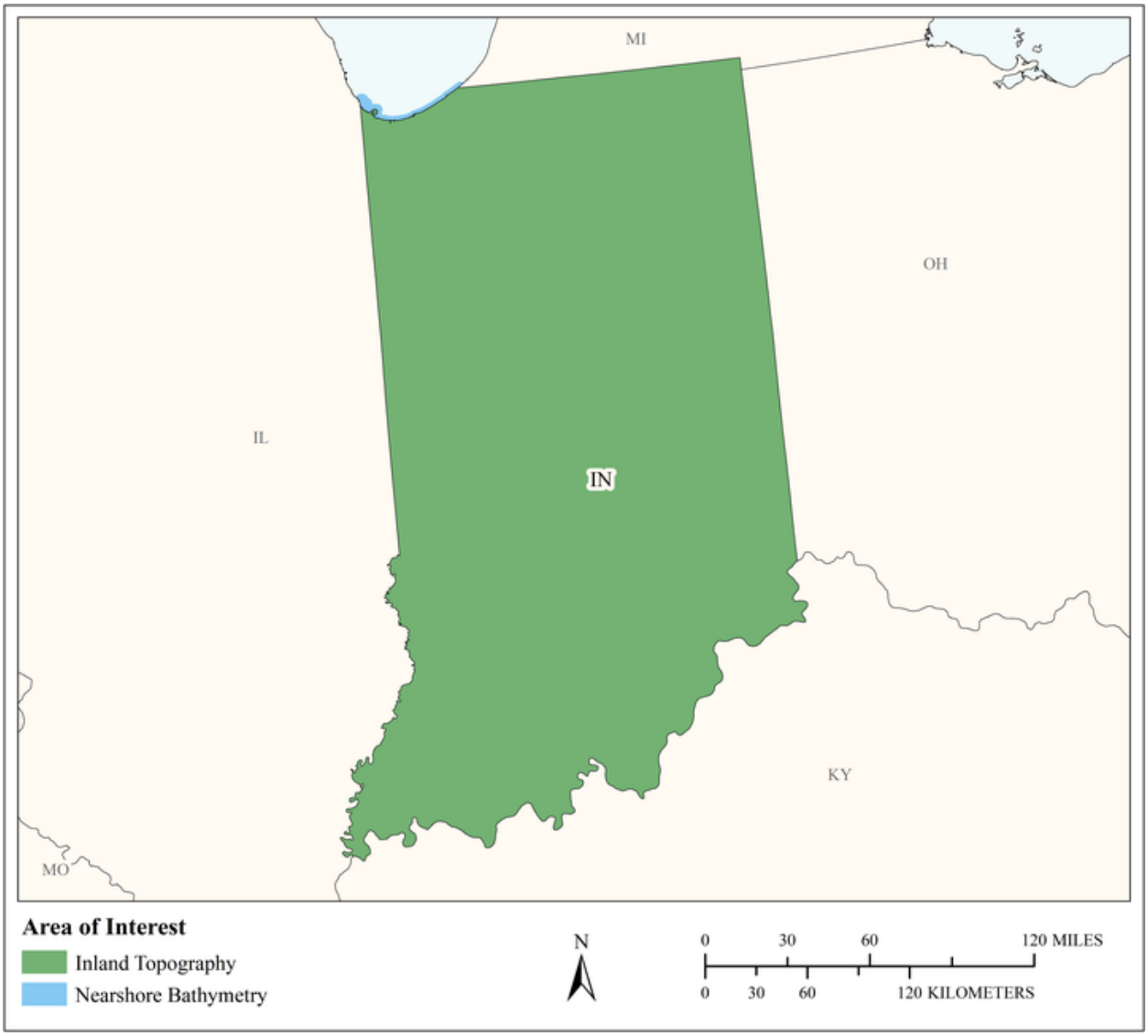
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Cost savings/cost reduction	Minor	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Moderate	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$6,632									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$5,798									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	Minor											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Environmental and Disaster Informatics



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Flood mapping and disaster mitigation planning. The Polis Center is a FEMA CTP for floodplain mapping the state and performs additional work for DNR. The Polis Center also does work for Indiana Homeland Security for mitigation planning, and for Indiana DOT. Elevation data are needed for H&H modeling, floodplain mapping, flood hazard analysis, to identify vulnerable infrastructure for DOT, and to develop and interpret climate data.
MCA Title	Environmental and Disaster Informatics
MCA ID	1359
Organization Type	Academic or Not-for-Profit
Organization Name	The Polis Center at IUPUI
Sub-Agency or Division	
Organization Mission	We use collaboration, interdisciplinary methods, civic engagement, and our knowledge of advanced spatial technologies to provide reliable information, thoughtful analysis, and creative solutions for the improvement of communities and organizations in Indiana and beyond through work in four areas of emphasis: geoinformatics, community informatics, health geoinformatics, and spatial humanities. We also offer professional education, mostly related to our work in geoinformatics.
Program Name	Disaster Informatics
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 26 - Education K12 and Beyond, Basic Research
Tertiary Business Use	BU 23 - Urban and Regional Planning

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Trees, utility-related elements (e.g. outflows)

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD		QL2B	
Update Frequency	6-10 years		6-10 years	
Event type(s)				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm		Less than 50 cm	
Acceptable Vertical Error	Up to 10 cm		Up to 40 cm	
How far onshore needed			500 meters inland	
How far down the beach profile needed	Not applicable		To MHHW	
Tide correction requirement			No requirement for tide correction	
Cross sections and/or transects meet needs			Partial	
Cross section/transect requirement			Unknown	

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required		Not required			Not required
Entire AOI under same environmental conditions	Highly desirable		Required			Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable		Nice to have			Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable		Required			Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		I don't know			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable		Not required	
DTM	Highly desirable		Highly desirable	
DEM	Required		Required	
Raw point cloud data	Highly desirable		Nice to have	
Classified point cloud	Required		Highly desirable	
Edited/cube XYZ			Not required	
Full waveform	Not required		Not required	
Bathymetric Attributed Grid (BAG)			Not required	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)			Not required	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Highly desirable		Nice to have	
Ground control/ground truthing	Highly desirable		Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required		Nice to have	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Not required	
Submerged features			Not required	
Subbottom characteristics			Not required	
Geologic and seismic data	Nice to have		Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Not required	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have		Not required	
Land use/land cover	Highly desirable		Highly desirable	
Wetlands	Highly desirable		Highly desirable	
Estuaries			Not required	
Inland surface water features	Required		Required	
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable		Nice to have	
Cultural resources	Highly desirable		Nice to have	
Coastal and riverine structures	Required		Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	2011-2013 QL3		Unknown	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI			Yes	
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	IndianaMap, State GIO Library			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		I don't know	
Cost savings/cost reduction	Major		I don't know	
Cost avoidance	Major		I don't know	

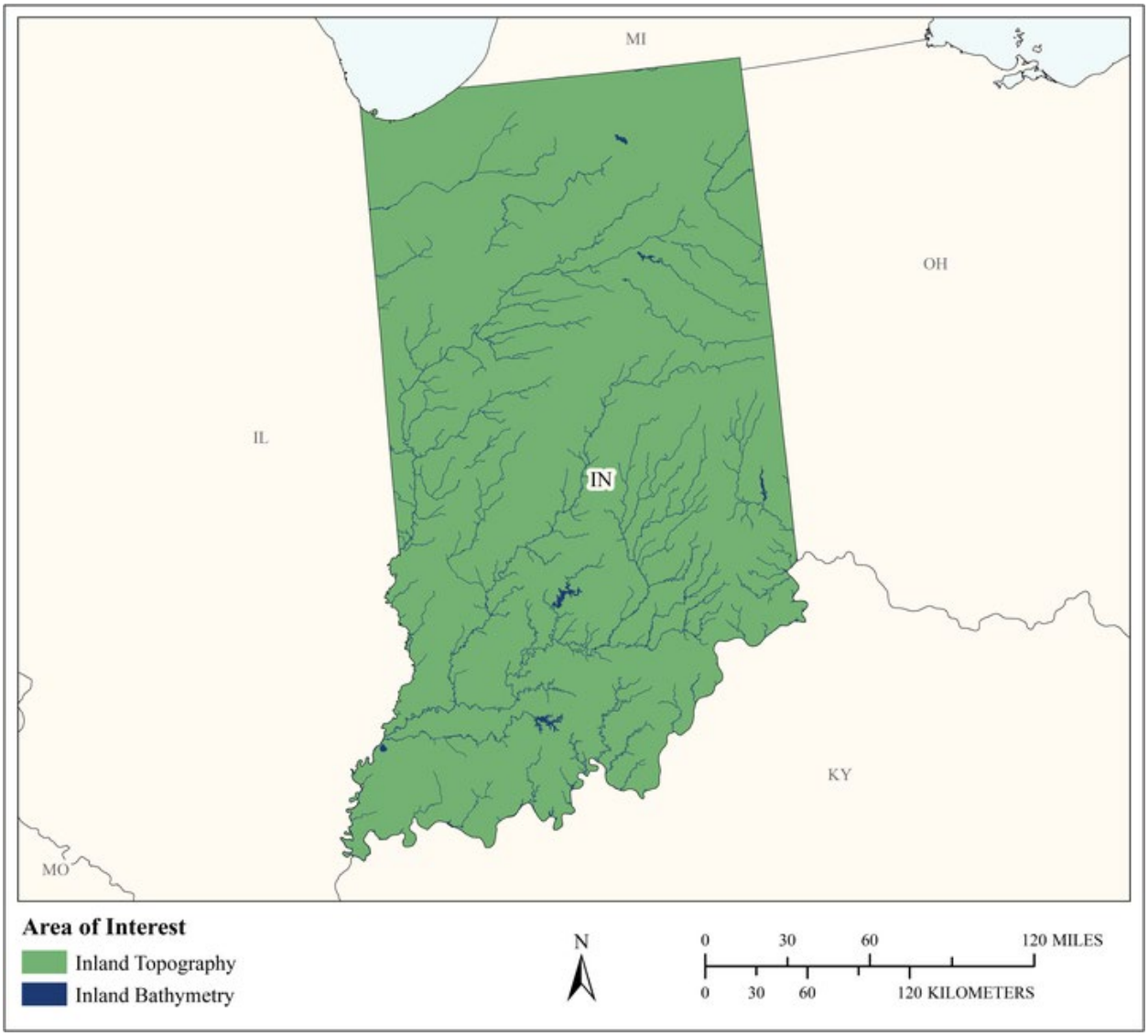
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	None		I don't know	
Mission-driven performance improvements	Major		I don't know	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate		I don't know	
Improved response or timeliness	Moderate		I don't know	
Improved customer experience	Major		I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor		I don't know	
Environmental	Moderate		I don't know	
Public safety, including life and property	Major		I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$34,733				I don't know	Unable to provide				
Time savings description	We run models and will spend less time fixing problems if we use consistent high quality elevation data. Time saving related to less data prep and data cleaning. Less time finding and fixing errors.											
Cost savings/cost reduction	Major	Annual dollars saved/realized	$100,000				I don't know	Unable to provide				
Cost savings/cost reduction description	Estimated cost of annual data acquisition.											
Cost avoidance	I don't know	Unable to provide					I don't know	Unable to provide				
Increased revenues	None						I don't know	Unable to provide				
Mission-driven performance improvements	Major	Annual percent improvement	20%				I don't know	Unable to provide				
Mission-driven performance improvements description	Better data is directly related to better decisions. Elevation data is essential. Benefit to models.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide					I don't know	Unable to provide				
Improved response or timeliness	Major	Annual dollars saved/realized	$8,683				I don't know	Unable to provide				
Improved response or timeliness description	Improved coordination due to better visualization.											
Improved customer experience	I don't know	Unable to provide					I don't know	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major						I don't know					
Education or outreach description	High quality elevation data supports education efforts											
Environmental	I don't know						I don't know					
Public safety, including life and property	I don't know						I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				
Other (please specify)			Yes	
Other description	Raw data only needed to supplement imagery for nearshore bathymetry			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Floodplain Mapping, Modeling and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Floodplain Mapping, Modeling and Management. Our agency is both the State Coordinating Agency for the NFIP and a Cooperating Technical Partner with FEMA for Floodplain Mapping. In addition, we have permitting responsibilities statewide for construction in a floodway. Elevation data are needed for H&H modeling, to support the Lake Michigan coastal zone program, and for coastal science for Lake Michigan. The DNR's Oil and Gas division would also use elevation data. Elevation data would also be valuable to the State Parks division for use in designing and enhancing park property. DNR currently has access to nearshore and offshore bathymetry that was developed for the new coastal flood mapping project. Inland bathymetry used to build 2D hydraulic models to help update existing and new Flood Insurance Study areas.
MCA Title	Floodplain Mapping, Modeling and Management
MCA ID	21579
Organization Type	State or U.S. Territorial government
Organization Name	Indiana Department of Natural Resources
Sub-Agency or Division	
Organization Mission	The mission of the Indiana Department of Natural Resources is to protect, enhance, preserve, and wisely use natural, cultural, and recreational resources for the benefit of Indiana's citizens through professional leadership, management, and education.
Program Name	Indiana Floodplain Management program, Indiana Floodplain Mapping program
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Buildings, bottom surface of lakes and rivers

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter		
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm		
How far onshore needed				
How far down the beach profile needed	Below MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Highly desirable	
Entire AOI under same environmental conditions	Required	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Required			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have		
DTM	Nice to have	Nice to have		
DEM	Required	Required		
Raw point cloud data	Required	Required		
Classified point cloud	Highly desirable	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Required		
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Nice to have	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Currently using QL3 data acquired from 2011 - 2013 by the State of Indiana. QL2 data statewide is currently being acquired through 2018 for delivery in 2019	None statewide, some project specific data was collected for lakes and rivers by USGS		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Data is available to state employees through the SDE databases maintained by the Indiana GIO			

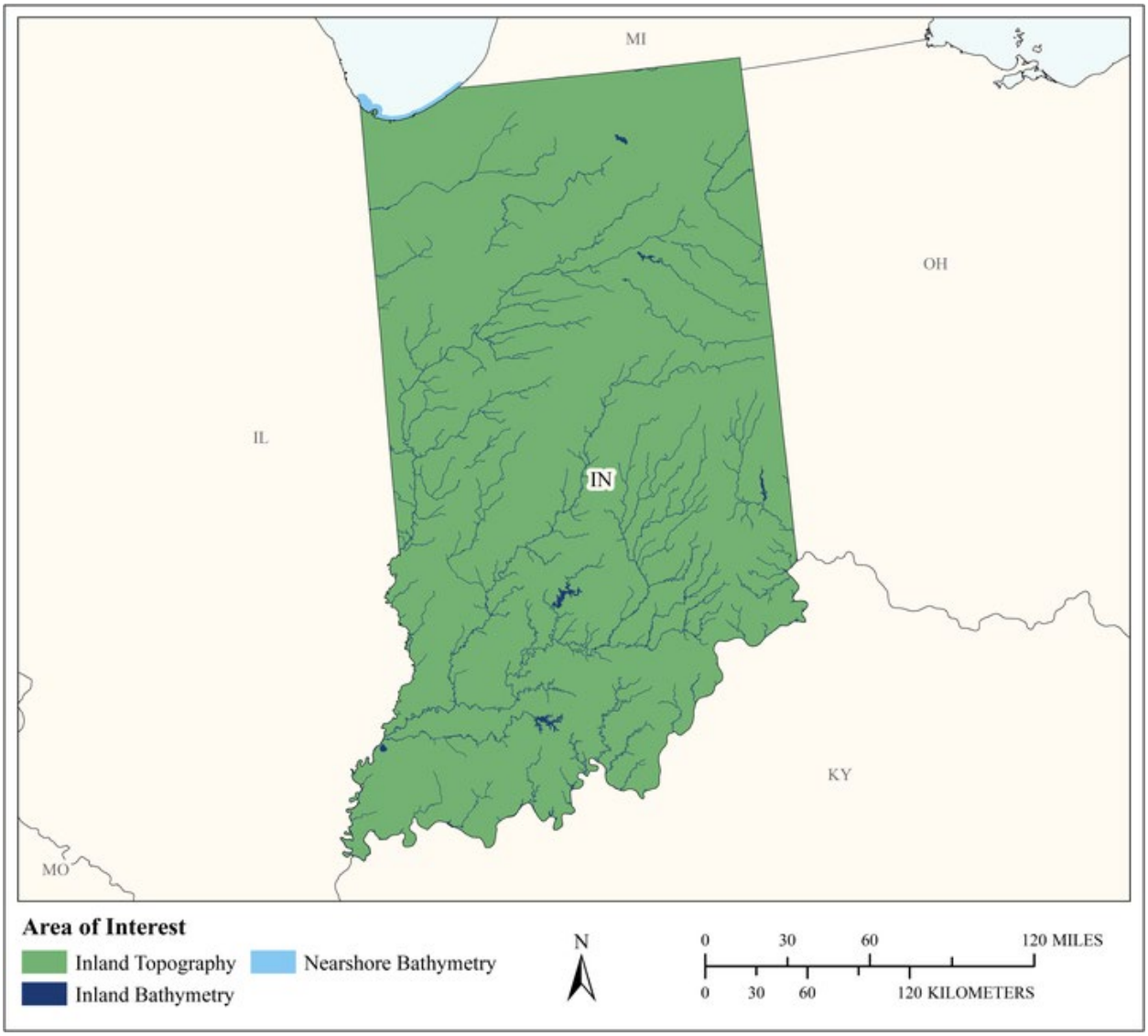
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other		Yes		
Other description		Individual agencies that collected data		
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Major	Moderate		
Cost avoidance	Major	Moderate		
Increased revenues	Moderate	Moderate		
Mission-driven performance improvements	Major	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate		
Improved response or timeliness	Major	Moderate		
Improved customer experience	Major	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate		
Environmental	Moderate	Moderate		
Public safety, including life and property	Major	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		I don't know	Unable to provide							
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide							
Increased revenues	None			I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	Major	Unable to provide		I don't know	Unable to provide							
Improved customer experience	Major	Unable to provide		I don't know	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			I don't know								
Environmental	Major			I don't know								
Public safety, including life and property	Major			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps				
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			
Other (please specify)		Yes		
Other description	Docks, other structures			

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Sea Level Rise and Subsidence



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Modeling and mapping the effects of sea level rise or subsidence. Population and economic vulnerability assessments. Coastal inundation and infrastructure assessment.
MCA Title	Sea Level Rise and Subsidence
MCA ID	60156
Organization Type	State or U.S. Territorial government
Organization Name	State of Indiana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 16 - Sea Level Rise and Subsidence
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL1B	QL2B	
Update Frequency	4-5 years	4-5 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Required	Required		Highly desirable	Required
Entire AOI under same environmental conditions	Highly desirable	Required	Required		Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Required		Highly desirable	Required
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have	Highly desirable	
DTM	Required	Required	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Highly desirable	Nice to have	
Classified point cloud	Required	Nice to have	Highly desirable	
Edited/cube XYZ		Not required	Not required	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Not required	Not required	
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Highly desirable	
Ground control/ground truthing	Required	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Required	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Required	Required	Highly desirable	
Wetlands	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Required	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes	Yes	Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Major	
Cost savings/cost reduction	Major	Major	Major	
Cost avoidance	Major	Major	Major	
Increased revenues	None	Minor	Minor	
Mission-driven performance improvements	Major	Major	Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	

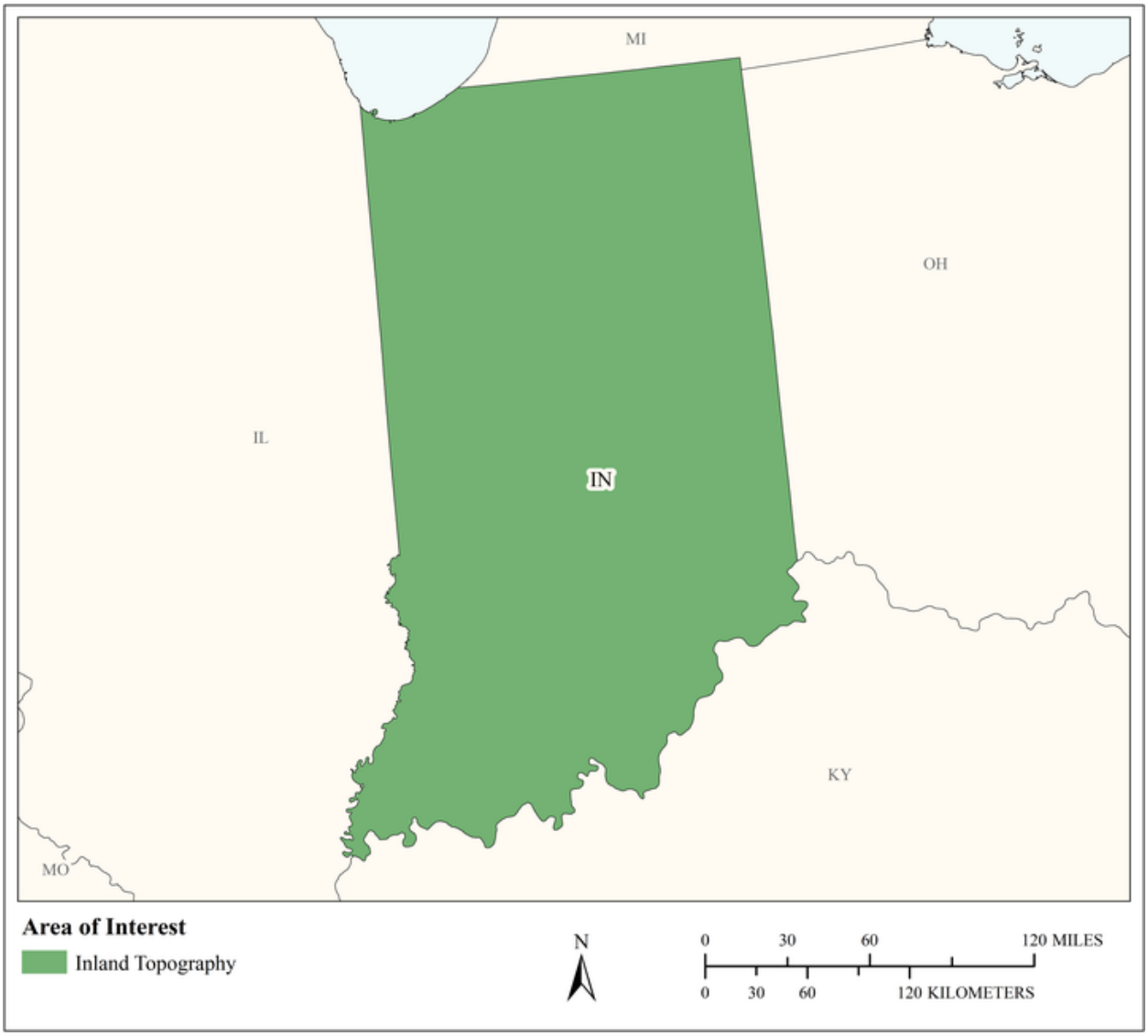
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Minor	Major	
Improved customer experience	Moderate	Moderate	Major	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Major	
Environmental	Moderate	Moderate	Major	
Public safety, including life and property	Major	Moderate	Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Increased revenues	Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,904,948									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Major					
Environmental	Moderate			Major			Major					
Public safety, including life and property	Moderate			Major			Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Wildfire Management, Planning, and Response



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of forest fuel and fire susceptibility. Fire behavior modeling to support wildfire suppression activities. Wildland/urban interface building identification. Post fire analysis to determine landslide prone areas.
MCA Title	Wildfire Management, Planning, and Response
MCA ID	60157
Organization Type	State or U.S. Territorial government
Organization Name	State of Indiana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 17 - Wildfire Management, Planning, and Response
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

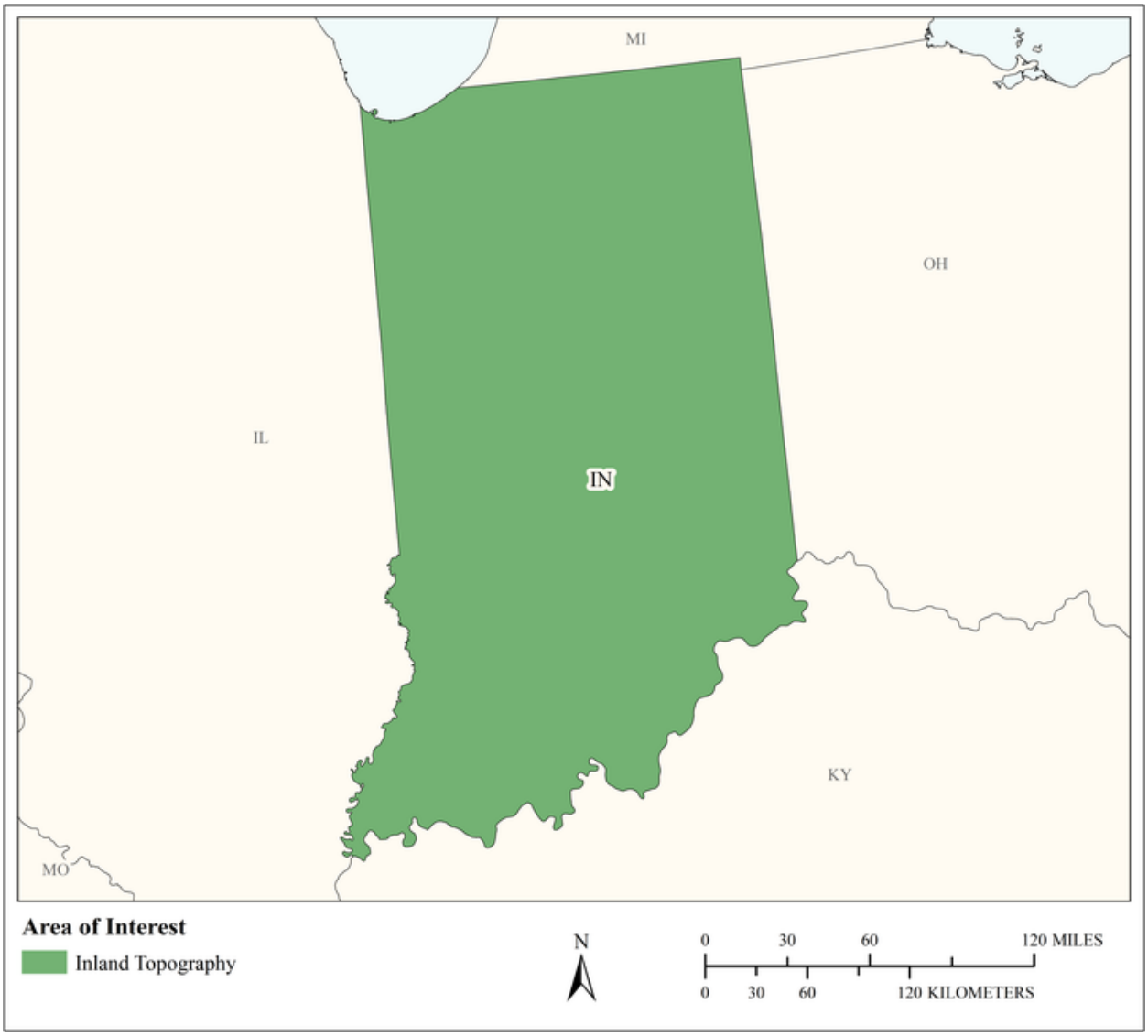
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$194,406									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Homeland Security, Law Enforcement, Disaster Response, and Emergency Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Infrastructure and border protection. Coastal search and rescue. Population dynamics. Emergency fuel supply and movement. Line of sight analysis in urban areas. Disaster response. Flood risk analysis resulting from acts of terrorism.
MCA Title	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
MCA ID	60158
Organization Type	State or U.S. Territorial government
Organization Name	State of Indiana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

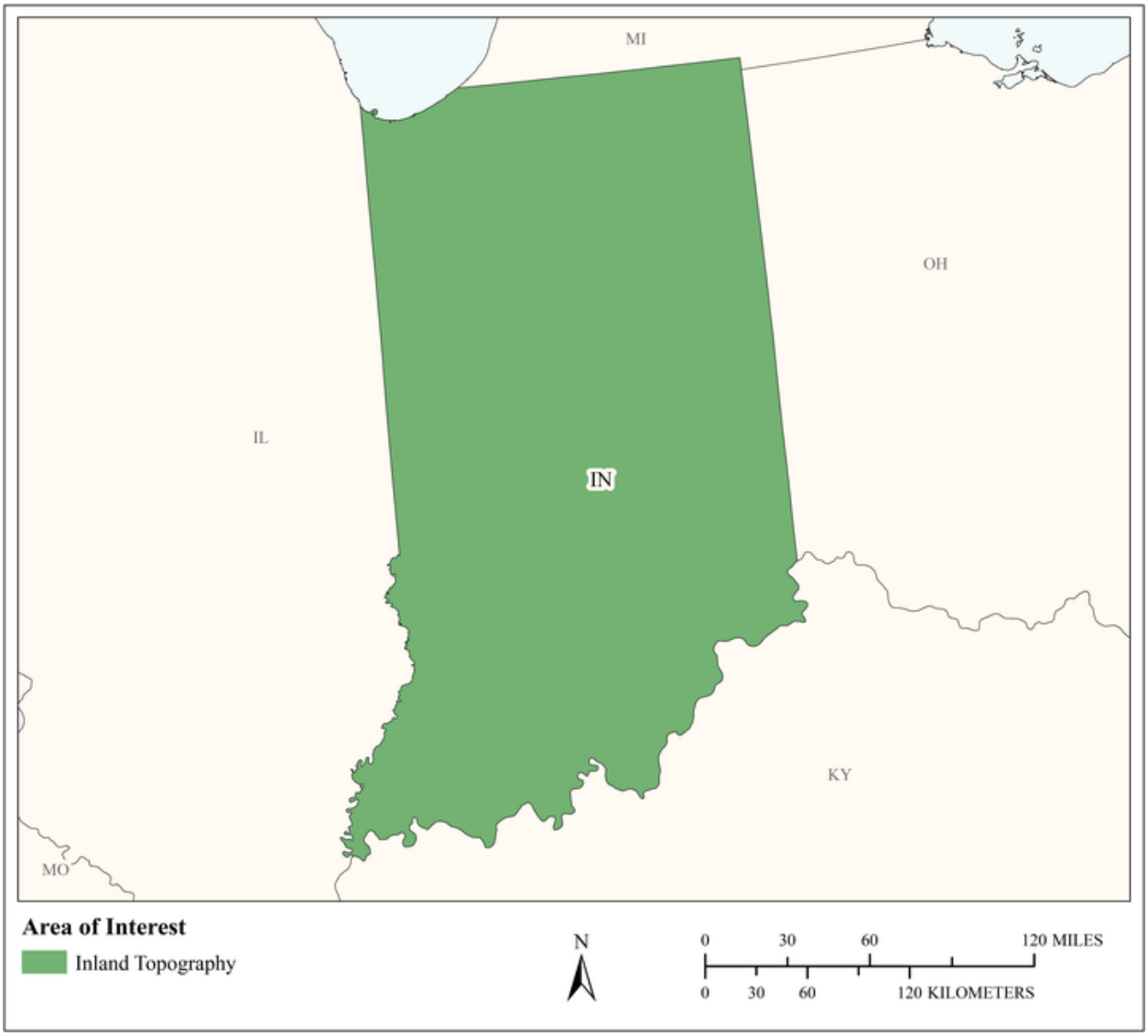
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Minor			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,067,408									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$18,865									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Moderate											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Land Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Road and railroad route selection and maintenance. Slope analysis for autonomous cars. GPS navigation visualization.
MCA Title	Land Navigation and Safety
MCA ID	60159
Organization Type	State or U.S. Territorial government
Organization Name	State of Indiana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 19 - Land Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

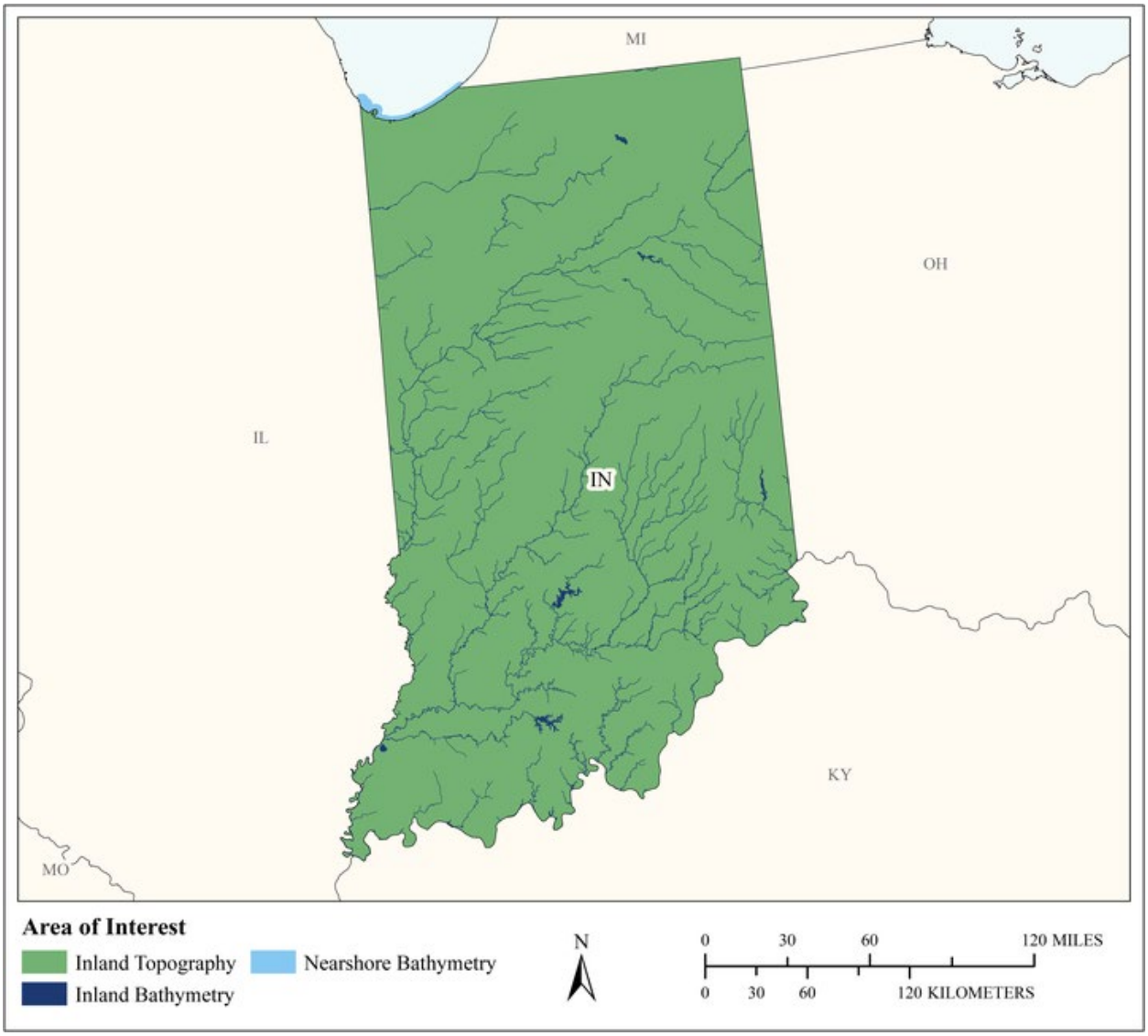
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Moderate			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Moderate	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$468,729									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$37,852									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Marine and Riverine Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Nautical charting. Bathymetric measurements of nearshore submerged coastal topography. Identification of hazards to navigation. Sediment management at coastal navigation projects. Precision marine navigation. Movement of goods and fishing vessels.
MCA Title	Marine and Riverine Navigation and Safety
MCA ID	60160
Organization Type	State or U.S. Territorial government
Organization Name	State of Indiana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Nice to have
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B	QL0B	
Update Frequency	2-3 years	2-3 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Nice to have	Nice to have		Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required		Required	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Required	
DTM	Required	Highly desirable	Required	
DEM	Required	Required	Required	
Raw point cloud data	Required	Nice to have	Required	
Classified point cloud	Required	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Highly desirable	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	
Breaklines required for standard hydro-flattening	Highly desirable	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Highly desirable	
Ground control/ground truthing	Required	Nice to have	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Required	Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Not required	Not required	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Highly desirable	
Boundaries			Nice to have	
Routes			Required	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Required	
Floating observation/navigation systems			Required	
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Nice to have	Nice to have	Nice to have	
Wetlands	Highly desirable	Required	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Highly desirable	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Required	Nice to have	Nice to have	
Cultural resources	Highly desirable	Highly desirable	Nice to have	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts		Yes	Yes	
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	
Cost savings/cost reduction	Major	I don't know	Minor	
Cost avoidance	Moderate	Major	Minor	
Increased revenues	Moderate	None	Minor	
Mission-driven performance improvements	Moderate	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	None	Minor	

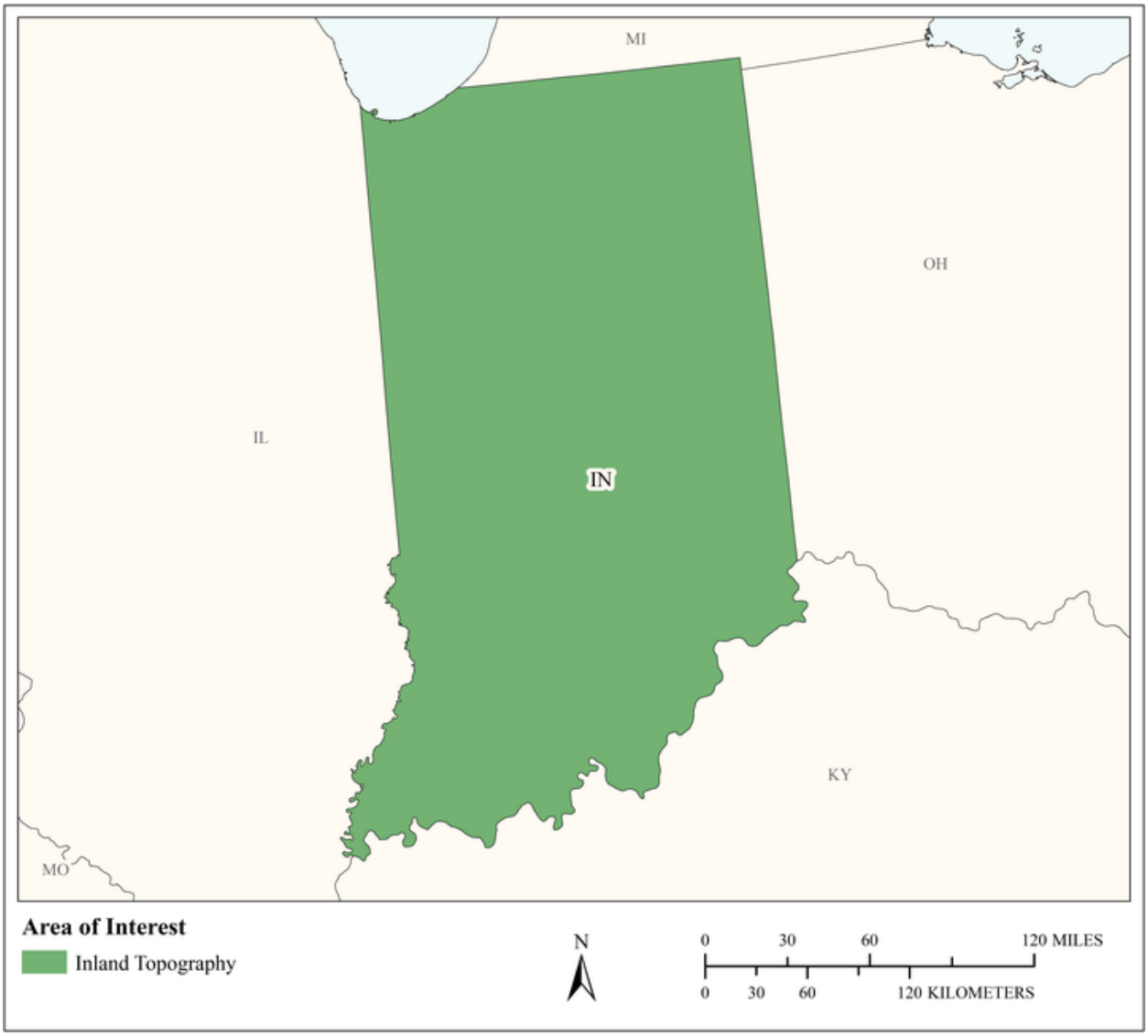
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Minor	None	Minor	
Improved customer experience	Moderate	None	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	None	Minor	
Environmental	Moderate	None	Minor	
Public safety, including life and property	Major	None	Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Increased revenues	None			Moderate	Unable to provide		Major	Unable to provide				
Mission-driven performance improvements	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,386,113		Annual dollars saved/ realized	$660,010		Annual dollars saved/ realized	$29,616			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Future annual customer service benefits added during validation					Annual dollars saved/ realized	$86,864		Annual dollars saved/ realized	$1,002			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			Moderate			Minor					
Environmental	None			Moderate			Major					
Public safety, including life and property	Minor			Moderate			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps				
Aspect maps				
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Aviation Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of in-flight hazards and path obstructions. Aeronautical charting. Runway construction and repair.
MCA Title	Aviation Navigation and Safety
MCA ID	60161
Organization Type	State or U.S. Territorial government
Organization Name	State of Indiana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 21 - Aviation Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes			
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Major			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

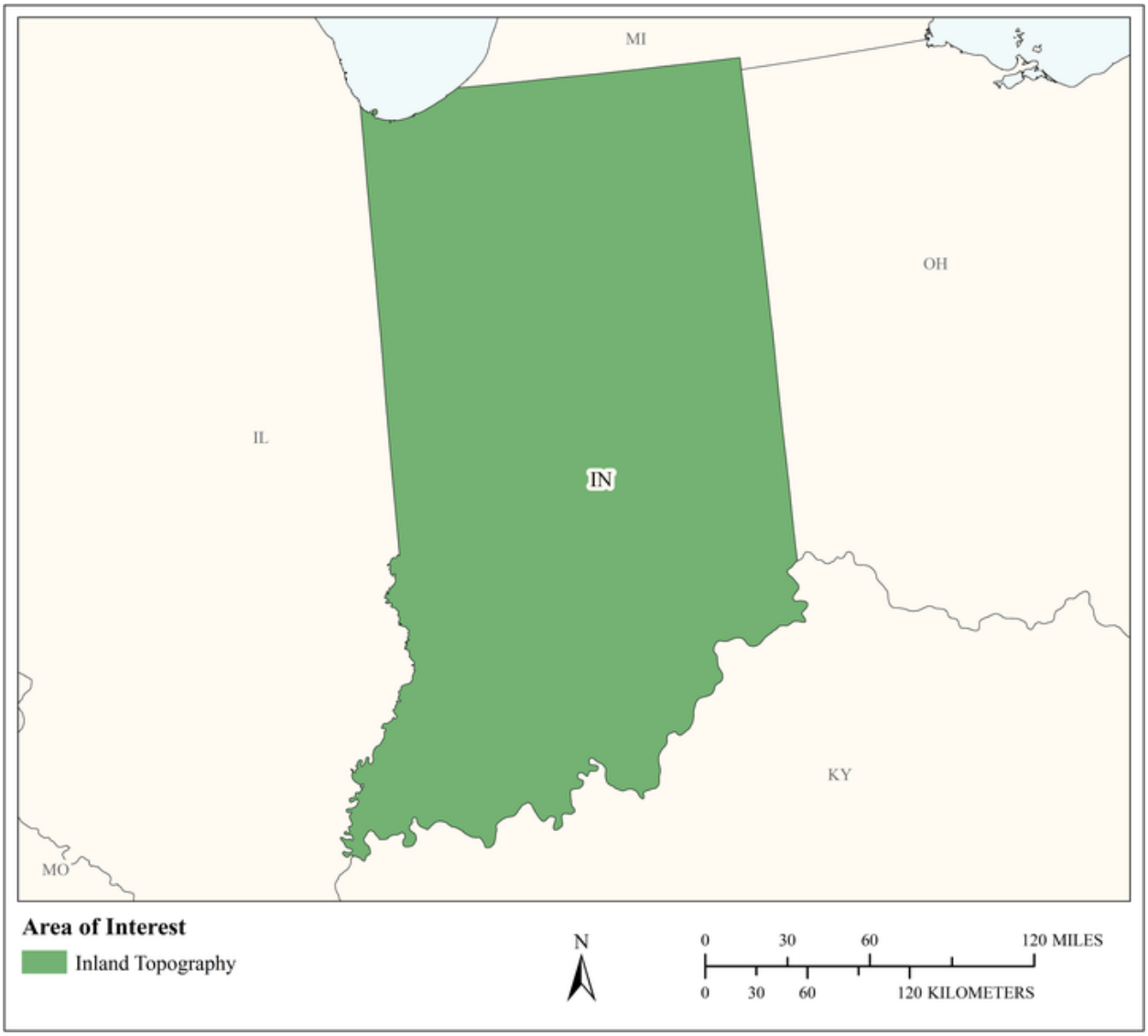
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$122,318									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$152,343									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Moderate											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Infrastructure and Construction Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Marine construction. Bridge design and construction. Engineering and construction of dams, levees, dikes, reservoirs, and coastal structures. Shipyard and port construction. Water, sewer, or power line planning and vegetation analysis. Pump, drain, and well placement. Stormwater modeling. Cut and fill analysis for earth-moving. Building site analysis. Road infrastructure. Infrastructure hardening or mitigation for climate change effects, e.g. sea level change.
MCA Title	Infrastructure and Construction Management
MCA ID	60162
Organization Type	State or U.S. Territorial government
Organization Name	State of Indiana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm			
Acceptable Vertical Error	Up to 10 cm			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			

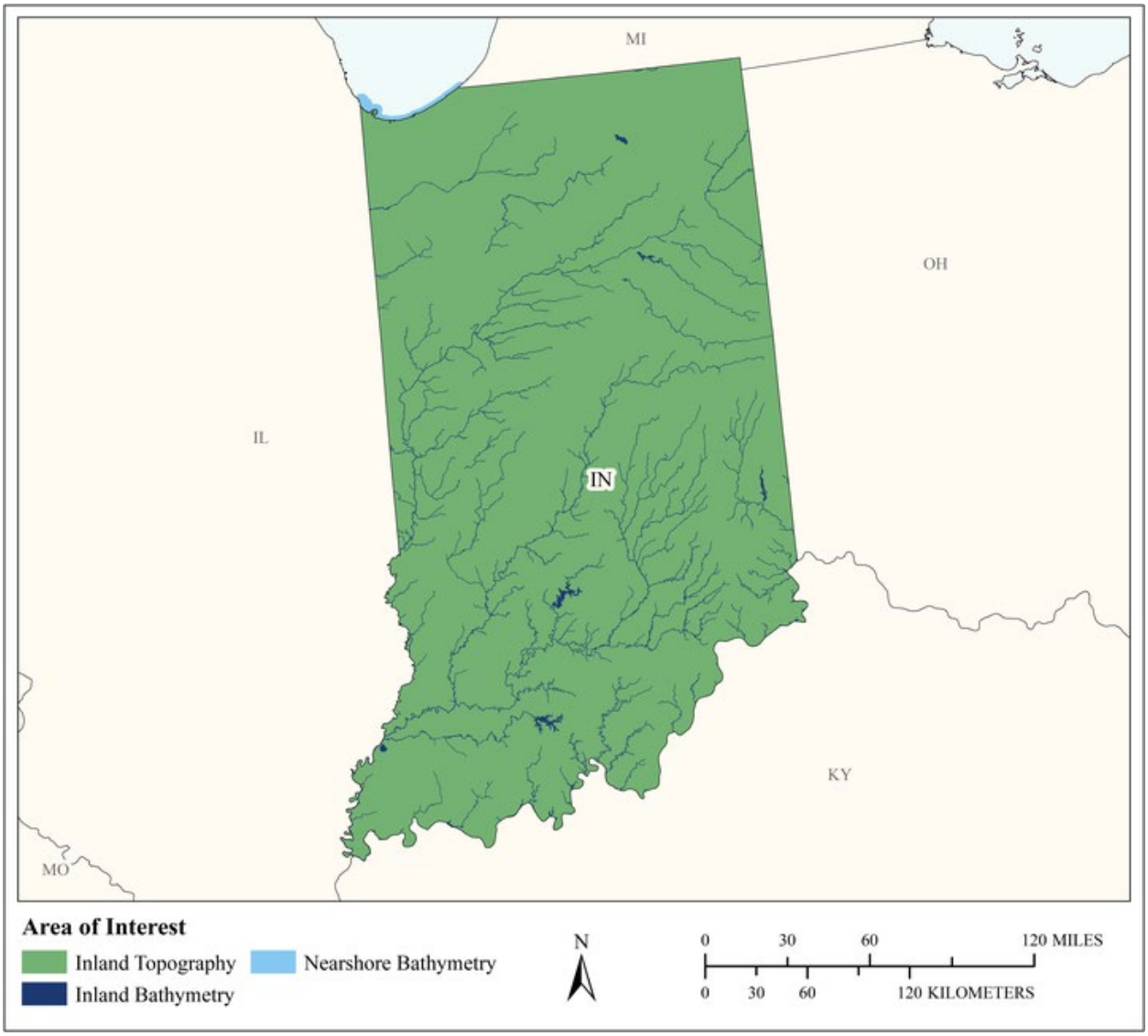
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Moderate			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,626,060									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$4,785,167									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Moderate											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Indiana Statewide Data Coordination, Distribution, and Access



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	IGIC's mission is to lead the effective application of geographic information across Indiana and our vision to provide a modern, accurate, documented, and accessible geospatial information infrastructure for Indiana. IGIC's cornerstone initiative to accomplish this is IndianaMap. IndianaMap is a single statewide map for Indiana. It includes the information people need most in a format that is accessible to both expert GIS users and the general public. (www.indianamap.org). This IGIC survey response represents input from our statewide IndianaMap private business power-users of our existing statewide Lidar & DEM data.
MCA Title	Indiana Statewide Data Coordination, Distribution, and Access
MCA ID	1288
Organization Type	Academic or Not-for-Profit
Organization Name	Indiana Geographic Information Council, Inc (IGIC)
Sub-Agency or Division	
Organization Mission	IGIC is a nonprofit membership organization of GIS users, professionals and educators. Our membership includes individuals from all levels of government, private industry, educational institutions and other nonprofit groups. Administered by an elected board of directors IGIC member work through our committees and workgroups to support statewide GIS initiatives (www.igic.org).
Program Name	Support for professional services provided to our customers.
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 30 - Maritime and Land Boundary Management
Tertiary Business Use	BU 13 - Oil and Gas Resources

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Edge of Pavement, Building Footprint, Fire Hydrants

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL2B	
Update Frequency	2-3 years	6-10 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI	Urban areas of change more frequent than rural.			
Acceptable Horizontal Error	Less than 20 cm	Up to 2 meters	Up to 5 meters	
Acceptable Vertical Error	Less than 5 cm	Up to 30 cm	Up to 40 cm	
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Required	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Required	Nice to have	Highly desirable	
Classified point cloud	Required	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Not required	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Nice to have	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Highly desirable	Nice to have	Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Nice to have	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Indiana 2011 - 2013 Statewide QL3 Lidar & DEM data available from a custom OpenTopography site (http://bit.ly/Xwy86P).			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	IndianaMap & Indiana Spatial Data Portal			

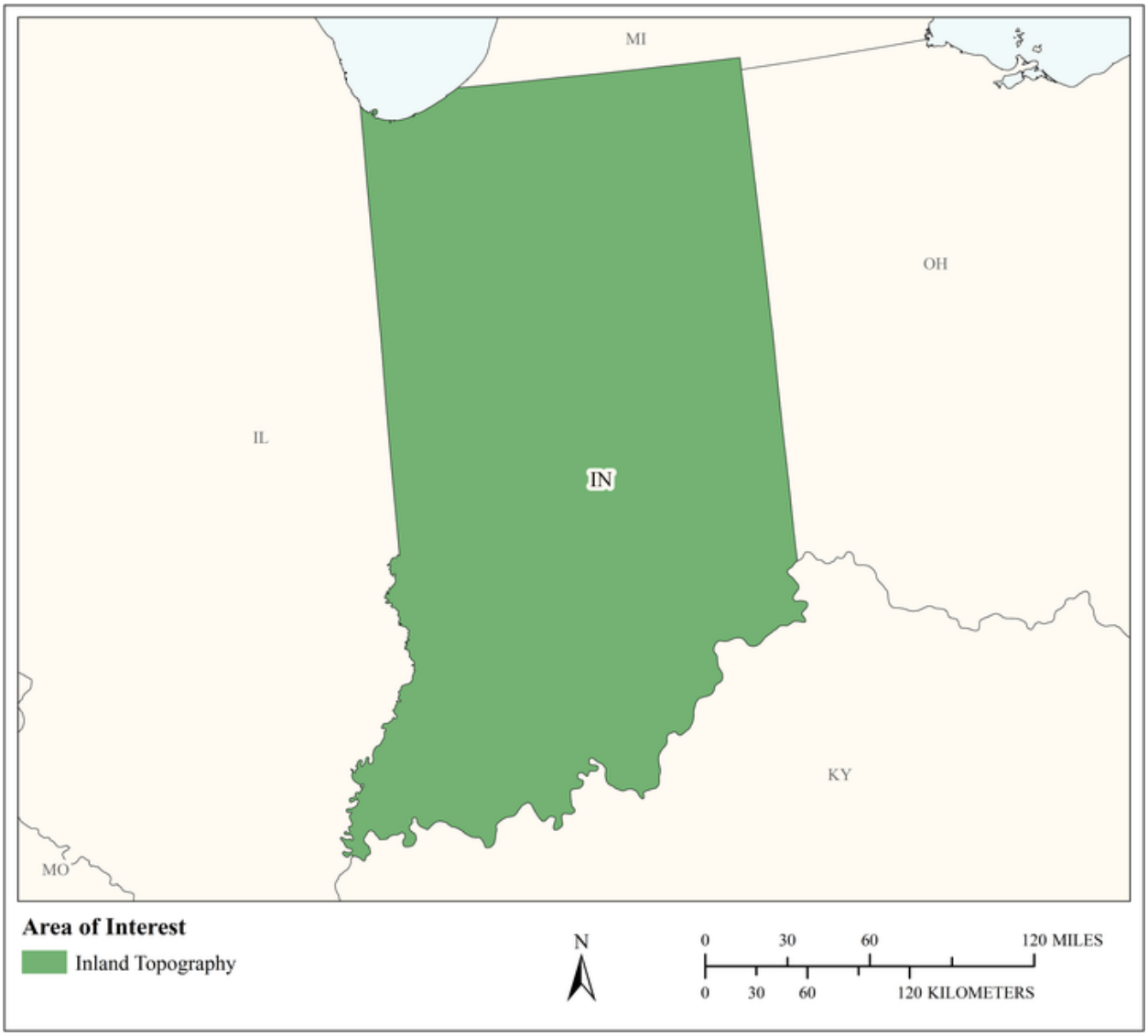
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other	Yes			
Other description	IndianaMap & Indiana Spatial Data Portal			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Minor	
Cost savings/cost reduction	Major	Minor	Minor	
Cost avoidance	Major	Minor	Minor	
Increased revenues	Major	Minor	None	
Mission-driven performance improvements	Major	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Minor	
Improved response or timeliness	Major	Minor	Minor	
Improved customer experience	Moderate	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	Minor	
Environmental	Minor	Minor	Minor	
Public safety, including life and property	None	Minor	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	I don't know	Unable to provide		Major	Unable to provide		Minor	Unable to provide				
Cost avoidance	I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	I don't know	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$9,735,469		Annual dollars saved/ realized	$396,508		Annual dollars saved/ realized	$7,071			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	I don't know	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,123,964		Annual dollars saved/ realized	$501,617		Annual dollars saved/ realized	$7,459			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			Moderate			Moderate					
Environmental	I don't know			Moderate			Moderate					
Public safety, including life and property	I don't know			Major			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	
Hillshades	Yes		Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Health and Human Services



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Health emergency response. Habitat modeling and disease prevention. Defining boundaries for health advisories for swimming and fishing. Marine-based bioproducts and pharmaceuticals. Public health and safety. Prevention of waterborne diseases.
MCA Title	Health and Human Services
MCA ID	60163
Organization Type	State or U.S. Territorial government
Organization Name	State of Indiana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 24 - Health and Human Services
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Not required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required			
DTM	Required			
DEM	Highly desirable			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Nice to have			
Wetlands	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Not required			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			

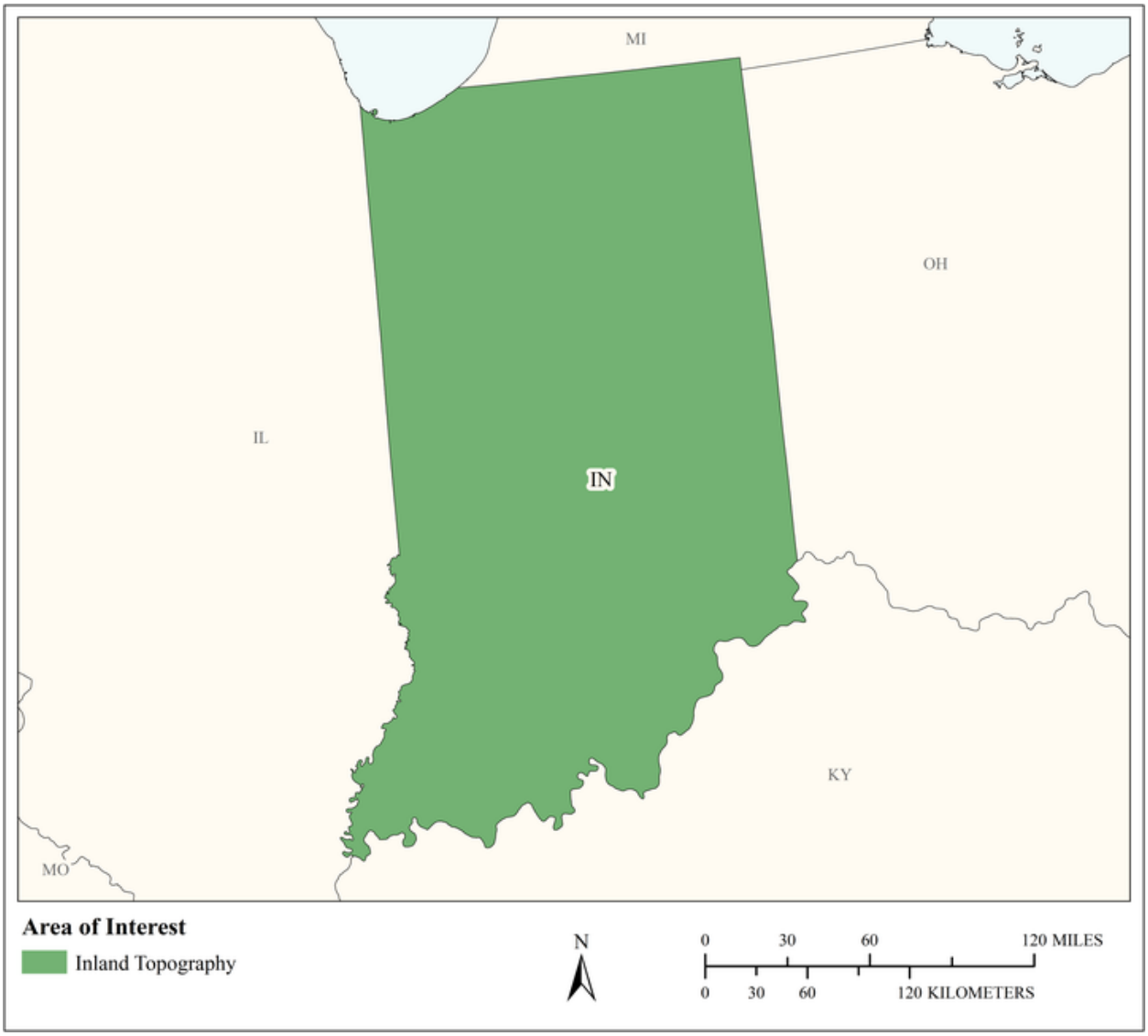
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Moderate			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$12,910									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide										
Improved response or timeliness	Minor	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Moderate											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Real Estate, Banking, Mortgage, and Insurance



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Assessment of risk for natural hazards (e.g., sinkholes, flooding) to inform insurance policy rates and the determination of mandatory insurance. Building permit compliance.
MCA Title	Real Estate, Banking, Mortgage, and Insurance
MCA ID	60164
Organization Type	State or U.S. Territorial government
Organization Name	State of Indiana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 25 - Real Estate, Banking, Mortgage, and Insurance
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

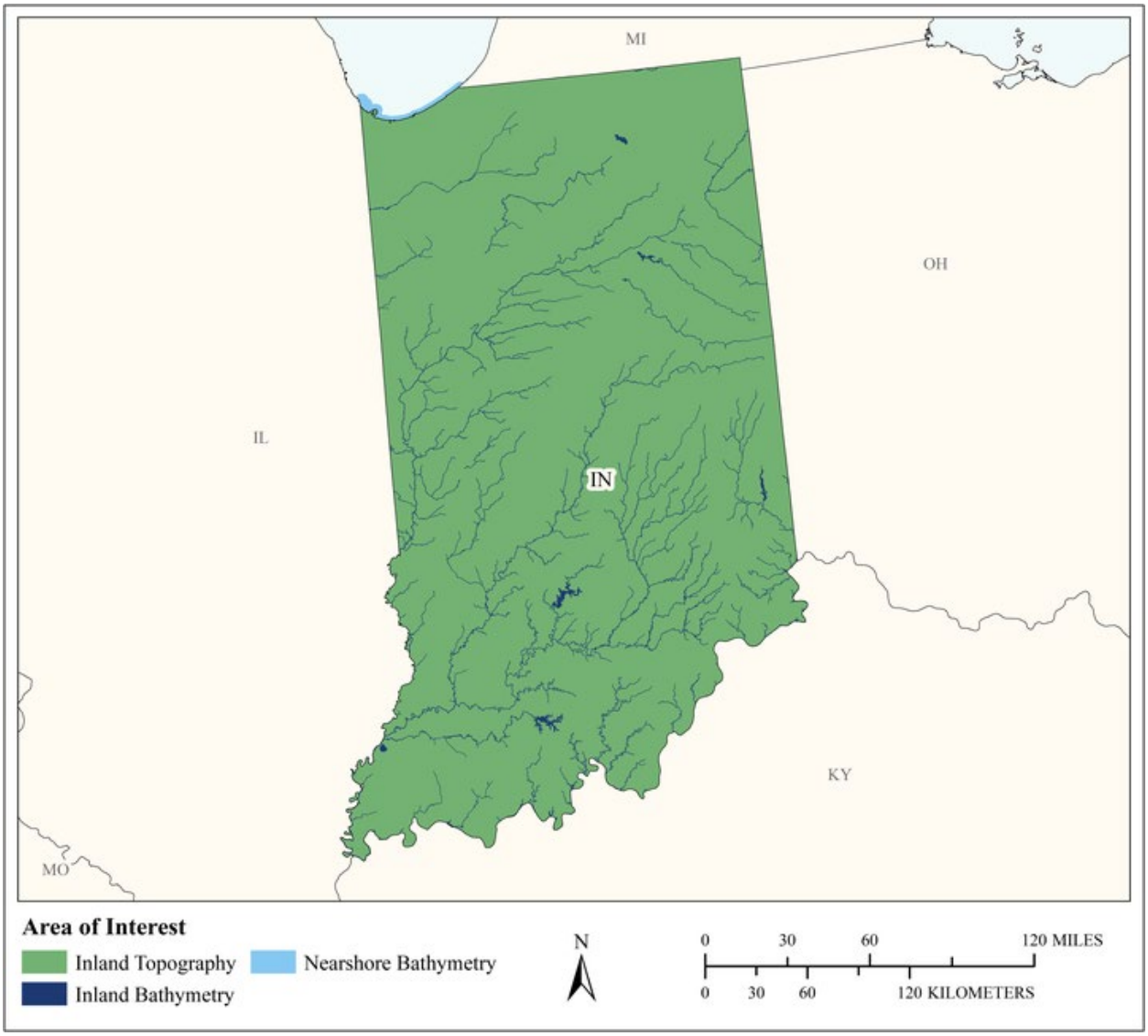
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Moderate			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,257,197									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Fisheries Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Creation of bathymetry maps and potentially vegetation height maps/use in the future for purposes of serving our organization's management and public service needs, use by other agencies, and for use by the general public.
MCA Title	Fisheries Management
MCA ID	50000
Organization Type	State or U.S. Territorial government
Organization Name	Indiana Department of Natural Resources
Sub-Agency or Division	Division of Fish and Wildlife
Organization Mission	The mission of the Indiana Department of Natural Resources is to protect, enhance, preserve, and wisely use natural, cultural, and recreational resources for the benefit of Indiana's citizens through professional leadership, management, and education. The Division of Fish and Wildlife manages the state's fish and wildlife thorough professional research, regulation of hunting, fishing and trapping, and restoration of rare species. The fish and wildlife division also stocks fish in public waters, offers hunting, fishing and wildlife watching on division properties, provides access to public lakes and rivers, and offers advice and incentives to landowners for development of wildlife habitat. Hunting, fishing, horseback riding, hiking, trapping, camping, and even photography are some of the adventures to be found at F&W properties scattered throughout the State. Staff relies heavily on citizen input to design and apply professional wildlife practices to both public and private lands to improve habitat, promote wildlife management, and increase recreational opportunities. Additional Business Uses include BU 06 – Natural Resources Conservation and BU 26 – Education.
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 27 - Recreation
Secondary Business Use	BU 09 - Fisheries Management and Aquaculture
Tertiary Business Use	BU 02 - Riverine Ecosystem Management

What Needs to be Measured in 3D	Response
Bare earth ground	Not required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)

General Geographic Area and Size	
Description of smallest 3D features	The smallest features are typically small inland lakes less than 10 acres, but on occasion may use items much smaller (~250 sq. ft.).

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL1B	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter	Up to 1 meter	
Acceptable Vertical Error	Up to 30 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed			I don't know	
How far down the beach profile needed	Not applicable		I don't know	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required	Highly desirable		Not required	Not required
Entire AOI under same environmental conditions	Required	Not required	Highly desirable		Not required	Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Nice to have		Nice to have	Not required
DEM for entire AOI needs to be seamless	Required	Nice to have	Nice to have		Nice to have	Not required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Required	
DTM	Not required	Not required	Not required	
DEM	Nice to have	Nice to have	Nice to have	
Raw point cloud data	Not required	Not required	Not required	
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ				
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Not required	Not required	
Ground control/ground truthing	Not required	Not required	Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required	Required	Not required	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Not required	Highly desirable	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Not required	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Not required	Highly desirable	Highly desirable	
Land use/land cover	Nice to have	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Not required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Indiana 2011 - 2013 Statewide QL3 Lidar & DEM data available from a custom OpenTopography site (http://bit.ly/Xwy86P). QL2 data statewide is currently being acquired through 2018 for delivery in 2019	None statewide, some project specific data was collected for lakes and rivers by USGS	Best available	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	
NCEI				
Open Topography	Yes			
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	IndianaMap & Indiana Spatial Data Portal			

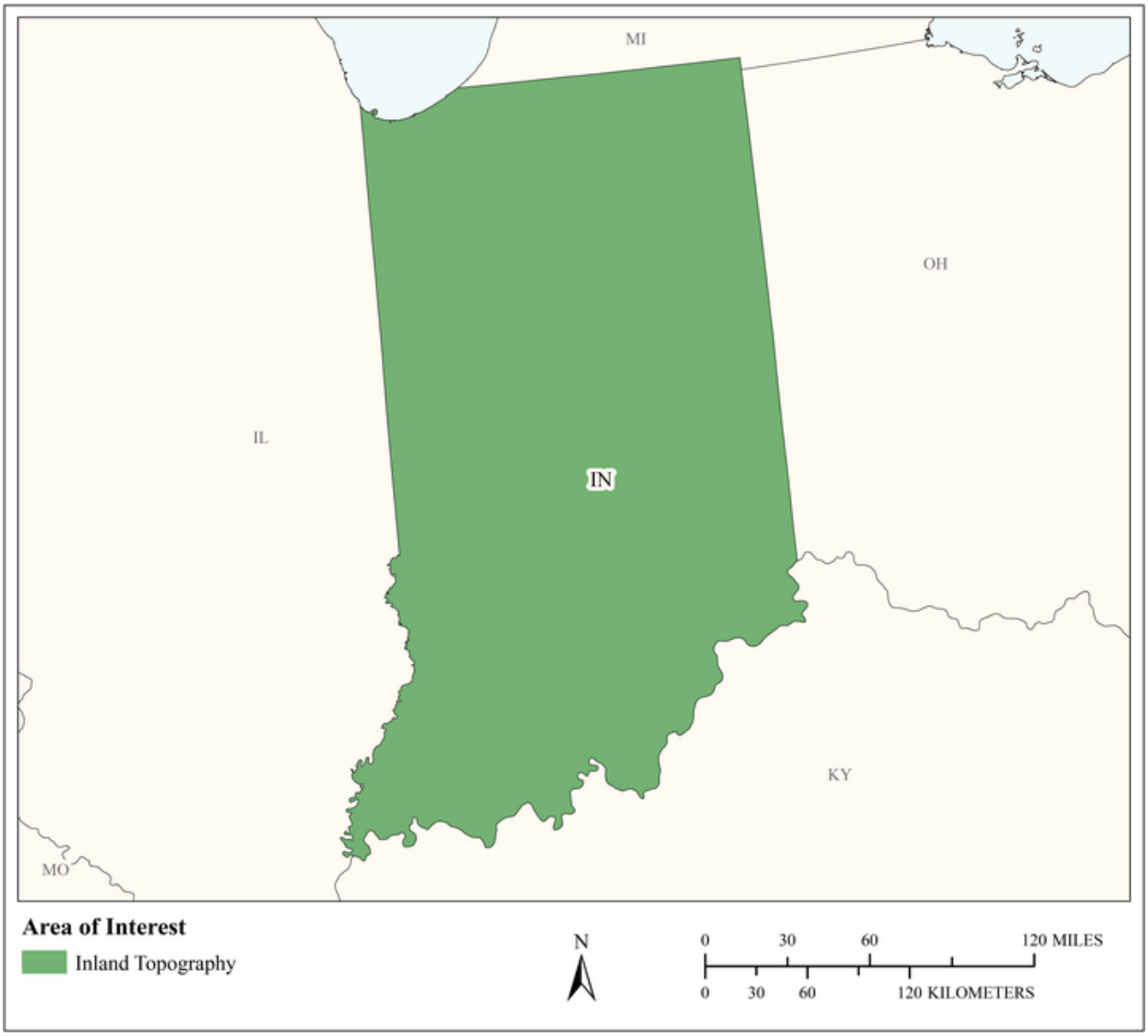
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other	Yes	Yes	Yes	
Other description	IndianaMap & Indiana Spatial Data Portal	Individual agencies that collected data	Northwest Regional Planning Commission resources, Et al.	
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know	I don't know	I don't know	
Cost savings/cost reduction	I don't know	I don't know	I don't know	
Cost avoidance	I don't know	I don't know	I don't know	
Increased revenues	I don't know	I don't know	I don't know	
Mission-driven performance improvements	I don't know	I don't know	I don't know	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know	I don't know	I don't know	
Improved response or timeliness	I don't know	I don't know	I don't know	
Improved customer experience	I don't know	I don't know	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	I don't know	I don't know	
Environmental	I don't know	I don't know	I don't know	
Public safety, including life and property	I don't know	I don't know	I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Annual dollars saved/realized	$10,000 to $19,000	Major	Unable to provide		Major	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Other operational benefits				Major	Annual dollars saved/realized	$5,000 to $9,999	Major	Annual dollars saved/realized	$5,000 to $9,999			
Other operational benefits description												
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate					
Environmental	Minor			Minor			Minor					
Public safety, including life and property	None			None			None					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Telecommunications



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Telecommunication tower site selection. Design of radio and radar systems. Interference analysis. Path profiles. Undersea telecommunication route selection and deployment.
MCA Title	Telecommunications
MCA ID	60165
Organization Type	State or U.S. Territorial government
Organization Name	State of Indiana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 28 - Telecommunications
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Highly desirable			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

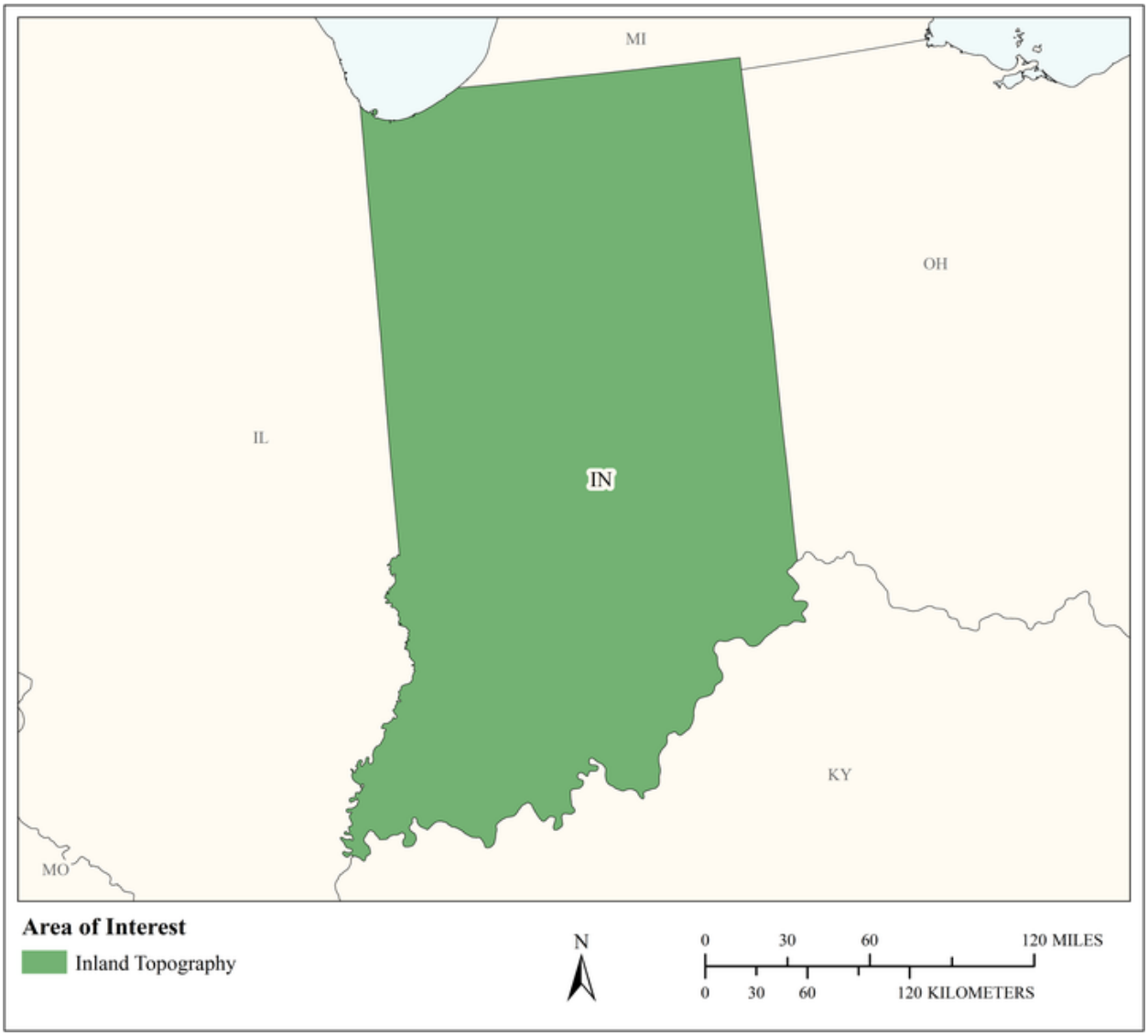
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Military



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Tactical military operations. Strategic defense. Amphibious landings and logistics over-the-shore. Operation of ships and submarines. Weapons system testing. Management of flight facilities and offshore launch or target areas.
MCA Title	Military
MCA ID	60166
Organization Type	State or U.S. Territorial government
Organization Name	State of Indiana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 29 - Military
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	I don't know
Tops of vegetation	I don't know
Tops of submerged structures, objects	I don't know
Tops of submerged vegetation	I don't know
Subcanopy of vegetation/understory	I don't know
River/lake bottom	I don't know
Nearshore elevation (<10 m deep)	I don't know
Sea surface	I don't know
Ocean/sea bottom (>10 m deep)	I don't know

General Geographic Area and Size	
Average geographic extent of day-to-day area	
Smallest 3D features needed	
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	I don't know			
Update Frequency	I don't know			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	I don't know			
Acceptable Vertical Error	I don't know			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	I don't know
Hydro-enforcement	I don't know
Hydro-conditioning	I don't know
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	I don't know					
Entire AOI under same environmental conditions	I don't know					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	I don't know					
DEM for entire AOI needs to be seamless	I don't know					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	I don't know			
DTM	I don't know			
DEM	I don't know			
Raw point cloud data	I don't know			
Classified point cloud	I don't know			
Edited/cube XYZ				
Full waveform	I don't know			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	I don't know			
Additional breaklines for hydro-enforcement of culverts	I don't know			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	I don't know			
Ground control/ground truthing	I don't know			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	I don't know			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	I don't know			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	I don't know			
Land use/land cover	I don't know			
Wetlands	I don't know			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	I don't know			
Bridges/culverts	I don't know			
Landmark features	I don't know			
Cultural resources	I don't know			
Coastal and riverine structures	I don't know			
Overhead structures				
Lowest Floor Elevation of Buildings	I don't know			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know			
Cost savings/cost reduction	I don't know			
Cost avoidance	I don't know			
Increased revenues	I don't know			
Mission-driven performance improvements	I don't know			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know			

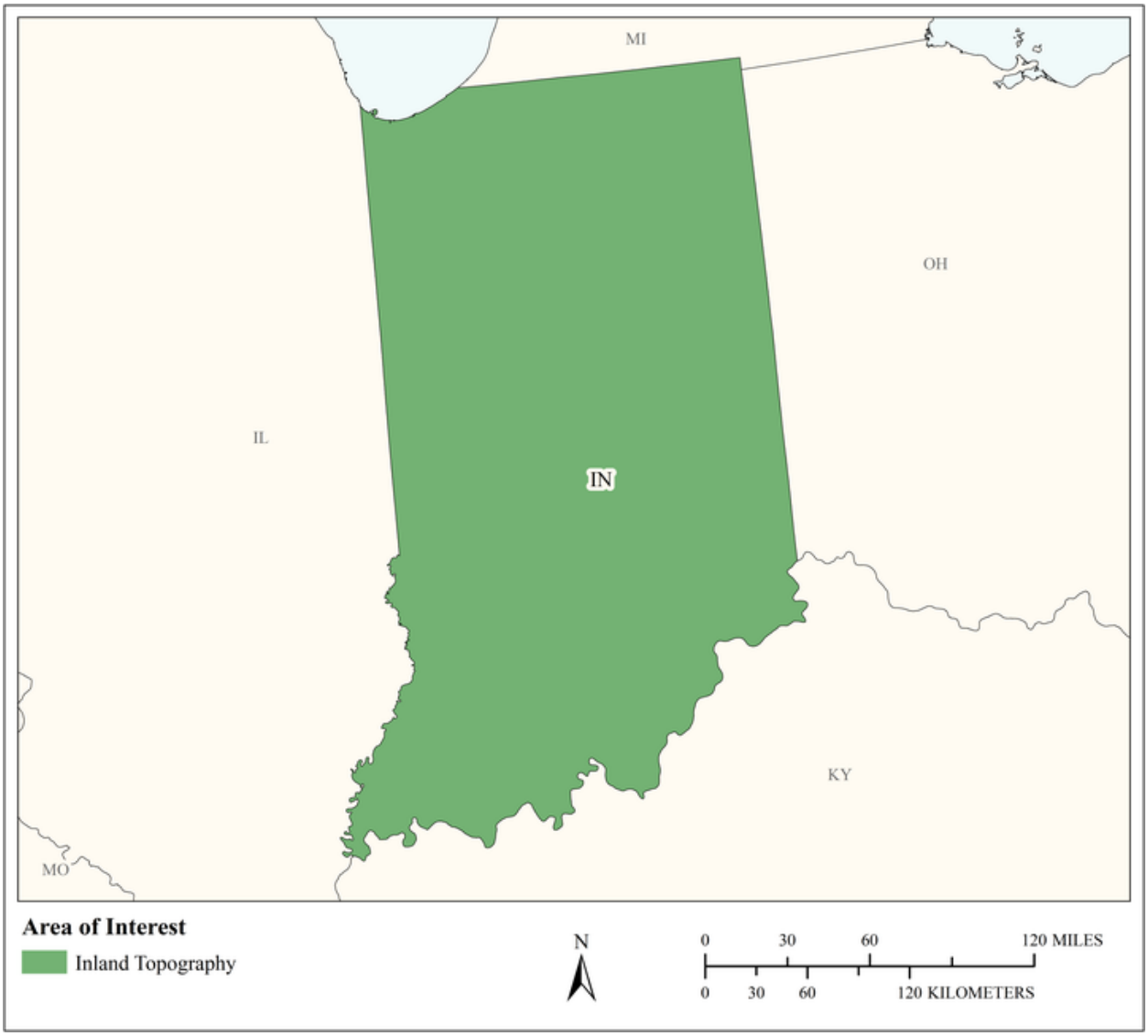
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	I don't know			
Improved customer experience	I don't know			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know			
Environmental	I don't know			
Public safety, including life and property	I don't know			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide										
Cost savings/cost reduction	I don't know	Unable to provide										
Cost avoidance	I don't know	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	I don't know	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide										
Improved response or timeliness	I don't know	Unable to provide										
Improved customer experience	I don't know	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Maritime and Land Boundary Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Delimitation of legal and other coastal boundaries, inland boundaries, and ordinary high water lines (OHWL).
MCA Title	Maritime and Land Boundary Management
MCA ID	60167
Organization Type	State or U.S. Territorial government
Organization Name	State of Indiana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 30 - Maritime and Land Boundary Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Highly desirable			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Moderate	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$40,715									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$156,105									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Minor											
Public safety, including life and property	None											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

Iowa

The USGS and NOAA 3D Nation Elevation Requirements and Benefits Study (3D Nation Survey) for the State of Iowa identifies the need for statewide Quality Level 1 (QL1) topographic lidar based on the current USGS 3D Elevation Program (3DEP) specification. This document provides a high-level summary of Iowa's requirements and uses of statewide lidar data products.

Current status of elevation data for Iowa

The State of Iowa currently has available elevation data that is more than 10 years old and was acquired prior to implementation of 3DEP lidar specifications. Iowa lidar is more or less equivalent to a QL3 or QL4 product using current specifications for comparison. While these data are useful, many communities and counties, as well as the State of Iowa Flood Plain Program and the NRCS have the need for a higher resolution and updated elevation dataset. Data were initially acquired through a cooperative funding through the State of Iowa (Transportation and Natural Resources) and federally through the USDA-NRCS.

An elevation planning committee was formed in the fall of 2018 to plan for future lidar acquisition. The State of Iowa Elevation Plan (Lidar for Iowa) lidar was developed and published in February 2019 and is available here: https://geodata.iowa.gov/story/lidar-iowa. Updates to the plan will be available. The State of Iowa is awaiting initial acquisition of a multi-year program to have the entire state covered by QL2 data. The initial phase is for acquisition of 14,750 square miles, which is 25% of the state. The goal is to have 100% coverage within the next five years. Anticipated future funding sources include the Iowa NRCS, State of Iowa, federal government, and local government. In 2019, the NRCS Iowa Office committed to funding acquisition in 24 counties in Eastern Iowa. A Broad Agency Announcement proposal was submitted and awarded to Iowa (NRCS) to assist in the acquisition for spring 2019. Lidar has been collected for 72 of 99 counties, and partially collected for an additional 7 counties as of July 2020. We are currently seeking funding partners to acquire the remaining 20 counties with a target acquisition date of Spring 2021. The major funding sources for all data collected so far have included FEMA, NRCS and USGS with minor funding through the state of Iowa. For an updated status map see: https://bit.ly/3gs4jQ2

The lidar plan also includes the need for a hydro-enforced product. Iowa is anticipating funding for that portion of the project will need to come from state and local sources rather than federal partners. Inland bathymetry has been suggested by many partners as a desired product but most likely out of reach because of cost and limitations with technologies to collect in an automated manner. The Iowa DNR is collecting low resolution bathymetry data on major lakes and reservoir as time and budgets permit using boat mounted sonar.

Importance of elevation data to Iowa

Elevation data are used by the Iowa Department of Natural Resources, Iowa Geological Survey, Iowa Department of Transportation, and the Iowa Department of Homeland Security and Emergency Management among many other agencies within the state. Many private contractors and local agencies also utilize the elevation data. Information collected through the lidar acquisition plan include the following use cases for the lidar-derived elevation data.

Table 1. Iowa Lidar-Derived Elevation Data Use Cases

Category	Description	Use Case/Examples
Agriculture	Tasks associated primarily with supporting agricultural activities or the conservation of soil and other resources important to agriculture	• Erosion assessment • Conservation practice modeling • Agricultural Conservation Planning Framework (ACPF) inputs • Topographic survey replacement • Precision agriculture
Natural Resources	Activities used within the management of natural resources and conservation	• Floodplain determination and permitting • Surface mine remediation • Wetland mitigation planning • Land cover classification • Soils mapping • Solar radiation potential modeling
Infrastructure Management	Transportation, telecommunication, utility and construction related functions	• Floodplain determination and permitting • Analysis of alternatives for transportation corridor studies • Culvert design based on watershed size and potential loading • Siting and design of utility infrastructure • Preliminary cultural and natural resource analysis prior to construction • Telecommunications, fixed wireless line of sight modeling • Project concept development with improved cost estimates • Soils slide analysis and improvement plan • Hydraulic modeling for structure design
Land Use and Urban Planning	Land use, urban and built environment related planning activities	• Floodplain determination and permitting • Landfill monitoring • Impervious surface and stormwater modeling • Site analysis • Line of site analysis • Trail and recreation planning • Historic preservation • Urban watershed modeling and stormwater modeling • Building shadow and line of site modeling in urban environments • Urban forestry applications such as canopy analysis for temperature, water, and air quality models to calculate energy savings and stormwater impact • Stormwater infrastructure determination • Surface visualization using digital elevation model and hillshade models
Flood Risk Management	Management of water and risks associated with landscapes at risk for flooding	• Hydrologic modeling • Floodplain mapping and modeling • DFIRM generation and revisions

High-level summary of elevation data requirements

The Statewide High Resolution Elevation Plan for Iowa adheres closely to USGS 3DEP lidar data specifications for collection and products. Iowa is seeking to acquire QL2 data or better for the entire state. In general, Iowa requires QL1 inland topography updated every 4-5 years and QL1B inland bathymetry updated every 6-10 years. Data will be used to generate a variety of point-cloud derived products and make these available widely to the general public. The products, at a minimum, will include point cloud data, 1-meter bare-earth digital elevation model, 2-foot contours, and a hydro-enforced elevation model.

With higher quality elevation data, agencies would see major benefits in the form of time and cost savings and customer service. The emergency response sector will benefit from improved data through enhanced visualization of flood-prone areas, higher quality modeling, forecasting, and analysis of flood impacts. The improved data will also benefit the transportation industry that uses the data for infrastructure and construction management and bridge location and design.

Additional comments

Iowa's main goal over the next five years will be to complete the collection of lidar data for the entire state as well as keep the data current in areas of rapid change.

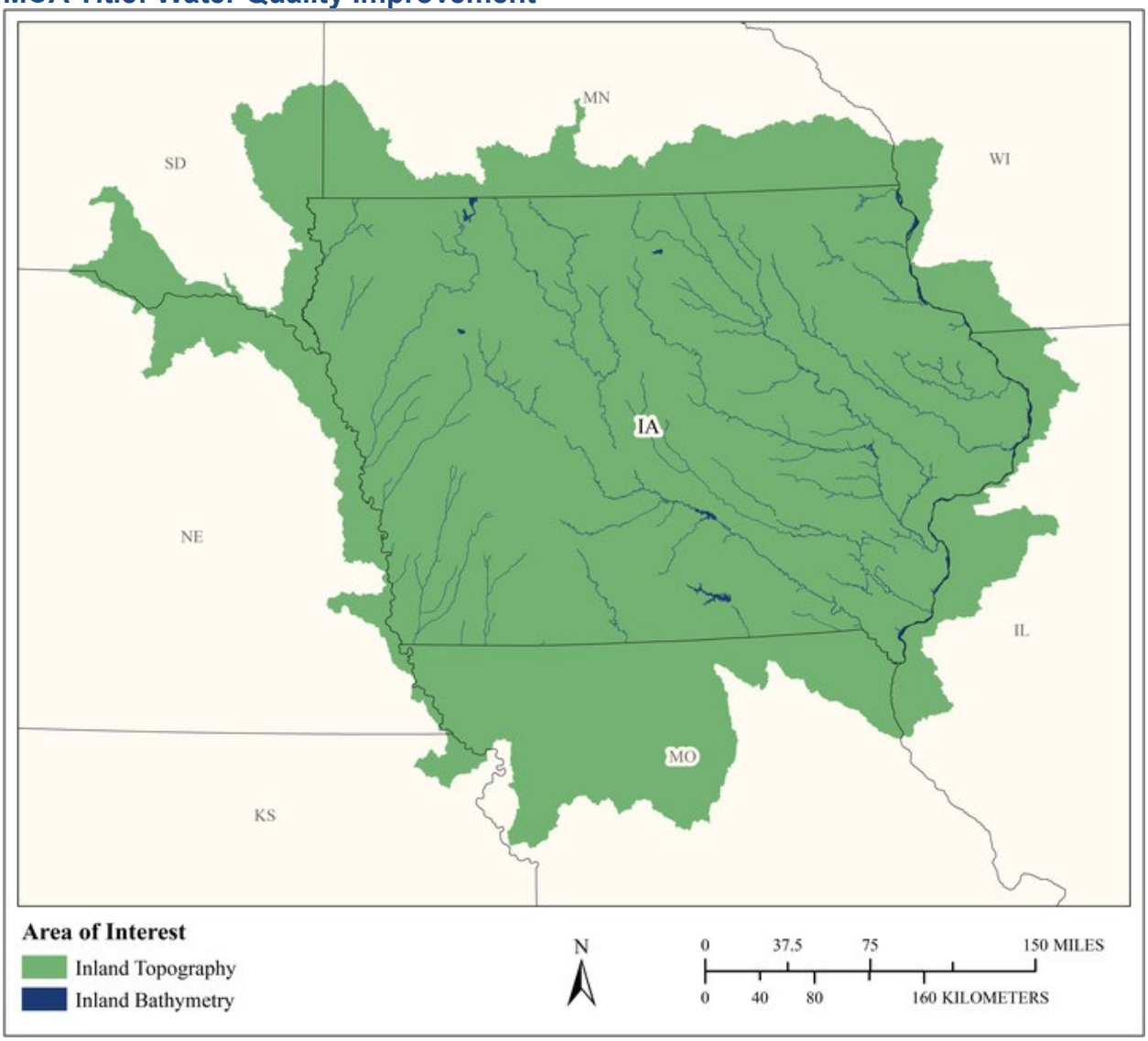
The State of Iowa has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	Iowa DNR	22442	Water Quality Improvement	Inland Topo	QL1	>10 years	$721,708	$473,664	I don't know	Moderate	Moderate
				Inland Bathy	Cross sections and/or transects meet needs	>10 years	$1,349,773	$141,056	Moderate	Major	Moderate
BU 02 – Riverine Ecosystem Management	State of Iowa	60168	Riverine Ecosystem Management	Inland Topo	QL1 HD	6-10 years	$86,132	$8,603	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$45,850	$3,233	Major	Major	Major
BU 04 – Forest Resource Management	State of Iowa	60170	Forest Resources Management	Inland Topo	QL1	2-3 years	$222,489	$322,525	Major	Major	Major
BU 05 – Rangeland Management	State of Iowa	60171	Rangeland Management	Inland Topo	QL2	Annually	Unable to quantify	Unable to quantify	Minor	Major	I don't know
BU 06 – Natural Resource Management	Iowa Department of Natural Resources	1247	Geographic Information Systems for Natural Resources	Inland Topo	QL2	6-10 years	$2,207,161	$8,105,368	Moderate	Major	Major
				Inland Bathy	Cross sections and/or transects meet needs	6-10 years	$299,155	$13,467	Moderate	Moderate	Major
BU 07 – Wildlife and Habitat Management	State of Iowa	60172	Wildlife and Habitat Management	Inland Topo	QL2	4-5 years	$13,404	$38,715	Moderate	Major	Moderate
				Inland Bathy	QL2B	4-5 years	$107,425	$64,932	Moderate	Moderate	Moderate
BU 08 – Agriculture	State of Iowa	60173	Agriculture and Precision Farming	Inland Topo	QL2	2-3 years	$65,151	$51,649	Major	Major	Minor
				Inland Bathy	QL4B	4-5 years	$114,145	$51,649	Moderate	Major	Major
BU 09 – Fisheries Management and Aquaculture	State of Iowa	60174	Fisheries Management and Aquaculture	Inland Bathy	QL0B	6-10 years	$112,595	$51,246	Major	Major	Moderate
BU 10 – Geologic Assessment	State of Iowa	60175	Geologic Assessment and Hazard Mitigation	Inland Topo	QL1	4-5 years	$11,878,503	$208,527	Major	Major	Major
BU 12 – Renewable Energy Resources	State of Iowa	60176	Renewable Energy Resources	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	None

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 14 – Cultural Resource Management	State of Iowa	60177	Cultural Resources Preservation and Management	Inland Topo	QL1	4-5 years	$10,314	$9,017	Minor	Minor	Minor
BU 15 – Flood Risk Management	University of Iowa	1286	Floodplain Mapping; Hydrologic Forecasting; and Engineering Design and Analysis	Inland Topo	QL1 HD	6-10 years	$3,950,999	$691,181	Major	Moderate	Major
				Inland Bathy	QL0B	>10 years	$274,415	$308,099	Moderate	Moderate	Major
BU 15 – Flood Risk Management	Iowa Department of Natural Resources	21771	Iowa Flood Risk Management	Inland Topo	QL2	4-5 years	$3,950,635	$691,237	Moderate	Moderate	Major
				Inland Bathy	I don't know	6-10 years	$274,438	$308,123	I don't know	I don't know	I don't know
BU 18 – Homeland Security	State of Iowa	60178	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management	Inland Topo	QL2	4-5 years	$1,660,040	$29,340	Major	Moderate	Major
BU 19 – Land Navigation	Iowa Dept. of Transportation	21582	Transportation Planning, Design, and Construction	Inland Topo	QL0 HD	2-3 years	$728,971	$58,868	I don't know	I don't know	I don't know
				Inland Bathy	QL0B	2-3 years	$31,093	$321	Minor	Minor	Minor
BU 22 – Infrastructure Management	State of Iowa	60179	Infrastructure and Construction Management	Inland Topo	QL0 HD	4-5 years	$2,528,860	$7,441,925	Minor	Moderate	Major
				Inland Bathy	QL0B	4-5 years	$852,013	$88,471	Minor	Moderate	Moderate
BU 23 – Urban and Regional Planning	State of Iowa	60180	Urban and Regional Planning	Inland Topo	QL1	4-5 years	$15,140,671	$1,747,997	Moderate	Major	Major
				Inland Bathy	QL1B	6-10 years	$616,653	$780,119	Moderate	Moderate	Major
BU 26 – Education and Basic Research	Office of the CIO, State of Iowa	1285	Iowa Geospatial Clearinghouse	Inland Topo	QL2	6-10 years	$296,312	$707,147	Moderate	Major	Major
				Inland Bathy	Cross sections and/or transects meet needs	6-10 years	$77,339	Unable to quantify	I don't know	I don't know	I don't know
BU 27 – Recreation	State of Iowa	60181	Recreation	Inland Topo	QL1	4-5 years	$12,912	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	4-5 years	$7,776	Unable to quantify	Major	Major	Moderate
BU 28 – Telecom-munications	State of Iowa	60182	Telecommunications	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

MCA Title: Water Quality Improvement



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Highly desirable		
Geographic Area Requirements	One or more Hydrologic Units (HUC8s)	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Water quality improvement. Elevation data are used for watershed modeling, H&H modeling, environmental assessments, Phase 1 investigations of contaminated sites, water quality programs, water flow modeling, and conservation. Inland bathy data is highly desirable.
MCA Title	Water Quality Improvement
MCA ID	22442
Organization Type	State or U.S. Territorial government
Organization Name	Iowa DNR
Sub-Agency or Division	
Organization Mission	Protect and enhance natural resources of Iowa
Program Name	Water Quality Bureau
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 07 - Wildlife and Habitat Management
Tertiary Business Use	BU 15 - Flood Risk Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Ground surface features that direct water flow - plow lines would be an example

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	Cross sections and/or transects meet needs		
Update Frequency	>10 years	>10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 40 cm	Up to 1 meter		
Acceptable Vertical Error	Up to 10 cm	Up to 40 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs		Yes		
Cross section/transect requirement		Whatever density is needed to achieve a 40cm vert accuracy		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have			Nice to have	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Required	Nice to have		
Classified point cloud	Highly desirable	Highly desirable		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Nice to have		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Required		
Land use/land cover	Highly desirable	Nice to have		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Required		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have		
Cultural resources	Not required	Not required		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Iowa LiDAR project data from 2005 - 18.5/37 cm bare ground/veg vert, 1.0m horiz. Spring 2019 QL2 data collection planned	Currently do not have any data available that I am aware of		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	Iowa DNR GIS Library	Iowa DNR GIS Library		
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor	Inland bathy data not available		
Cost savings/cost reduction	Minor	Inland bathy data not available		

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Cost avoidance	Moderate	Inland bathy data not available		
Increased revenues	None	Inland bathy data not available		
Mission-driven performance improvements	Major	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available		
Improved response or timeliness	Major	Inland bathy data not available		
Improved customer experience	Major	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Inland bathy data not available		
Environmental	Major	Inland bathy data not available		
Public safety, including life and property	Major	Inland bathy data not available		

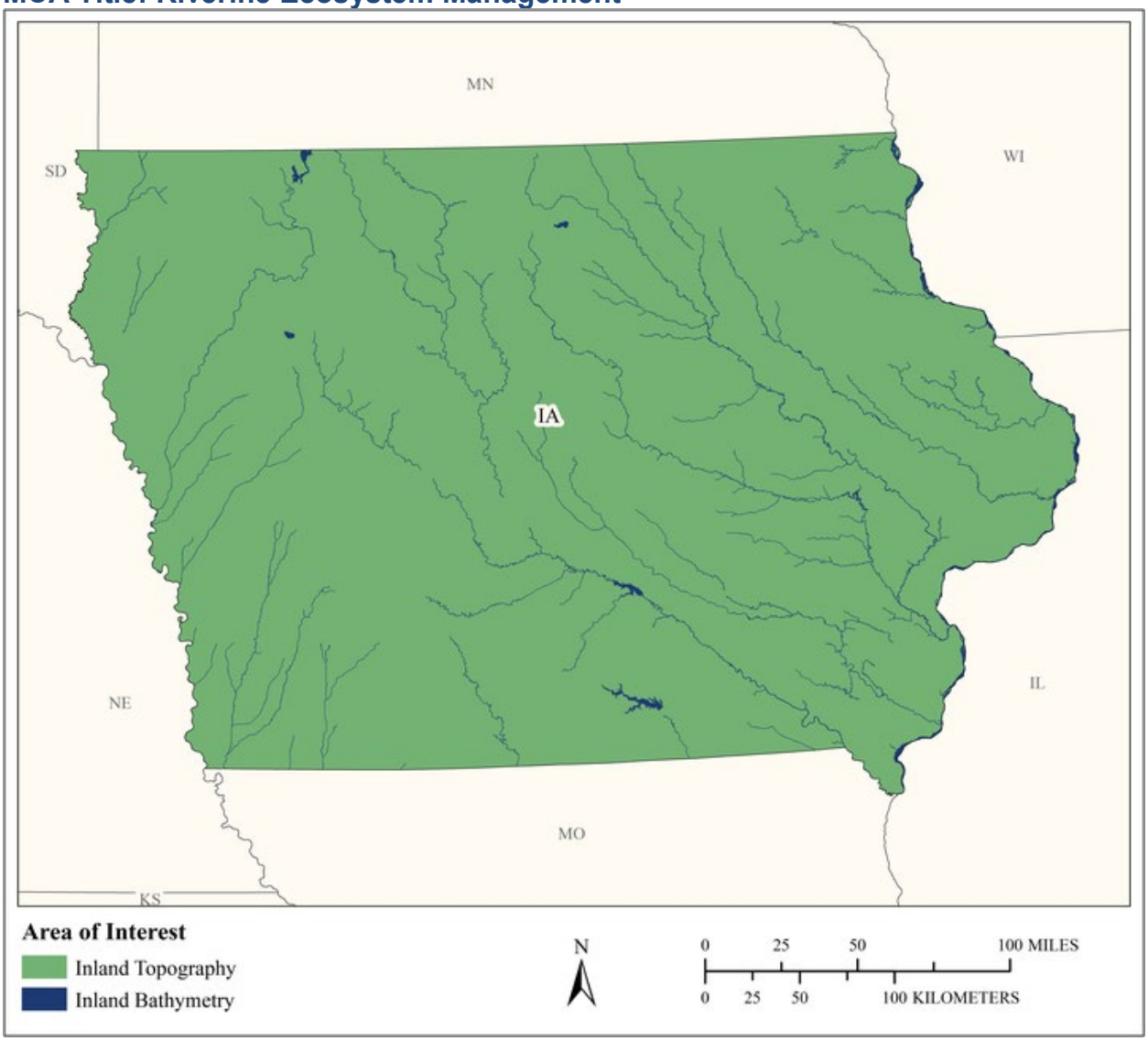
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$21,708	I don't know	Unable to provide							
Time savings description	Typically all needed data is from DNR GIS Library (all compatible).											
Cost savings/cost reduction	Major	Annual dollars saved/realized	$200,000	I don't know	Unable to provide							
Cost savings/cost reduction description	Assuming we would not be purchasing our own elevation data (?).											
Cost avoidance	Major	Annual dollars saved/realized	$500,000	I don't know	Unable to provide							
Cost avoidance description	Assuming multiple staff work on processing a state dataset for several years. How much is annual flood loss damage?.											
Increased revenues	None			I don't know	Unable to provide							
Mission-driven performance improvements	Major	Annual percent improvement	40%	Major	Unable to provide							
Mission-driven performance improvements description	Improved pre-assessments of land acquisitions, water quality bmp choice and placement, etc. Roughly estimated improvement in accuracy of water quality models.			See above. Flood plain mapping would be vastly improved if accurate channel dimensions were available across the state. Lake restoration efforts could be planned more effectively if silt loads could be calculated in house.								
Future annual operational benefits added during validation					Annual dollars saved/ realized	$1,349,773						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Value added to products or services description	We were not doing these things prior to the data being available so are actually spending more on staff. We are spending more because we are able to do more with data that was formerly not available (e.g. floodplain mapping).											
Improved response or timeliness	Major	Annual dollars saved/realized	$473,664	I don't know	Unable to provide							
Improved response or timeliness description	See above. E.g. floodplain reviews - fewer staff, faster turnarounds, etc. Faster turnarounds and more permits = happier customers.											
Improved customer experience	Major	Unable to provide		I don't know	Unable to provide							
Improved customer experience description	LiDAR accuracy is hard to argue with (again, floodplain maps are a good example). We have realized many new applications for examining landscapes for WQ, wetland restoration, BMP mapping, etc.											
Future annual customer service benefits added during validation					Annual dollars saved/ realized	$141,056						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			Moderate								

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Environmental	Moderate	Major		
Environmental description	We will continue to improve water quality and wildlife habitat through the use of these data			
Public safety, including life and property	Moderate	Moderate		
Public safety, including life and property description	Flood plain maps will continue to be updated and improved			

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Riverine Ecosystem Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Stream channel analysis and mapping. Stream bank erosion analysis. Aquatic and terrestrial species habitat management. Environmental management.
MCA Title	Riverine Ecosystem Management
MCA ID	60168
Organization Type	State or U.S. Territorial government
Organization Name	State of Iowa
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B		
Update Frequency	6-10 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Required			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Required	Highly desirable		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Highly desirable	Nice to have		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Moderate	Minor		
Cost avoidance	Moderate	None		
Increased revenues	None	None		
Mission-driven performance improvements	Major	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		

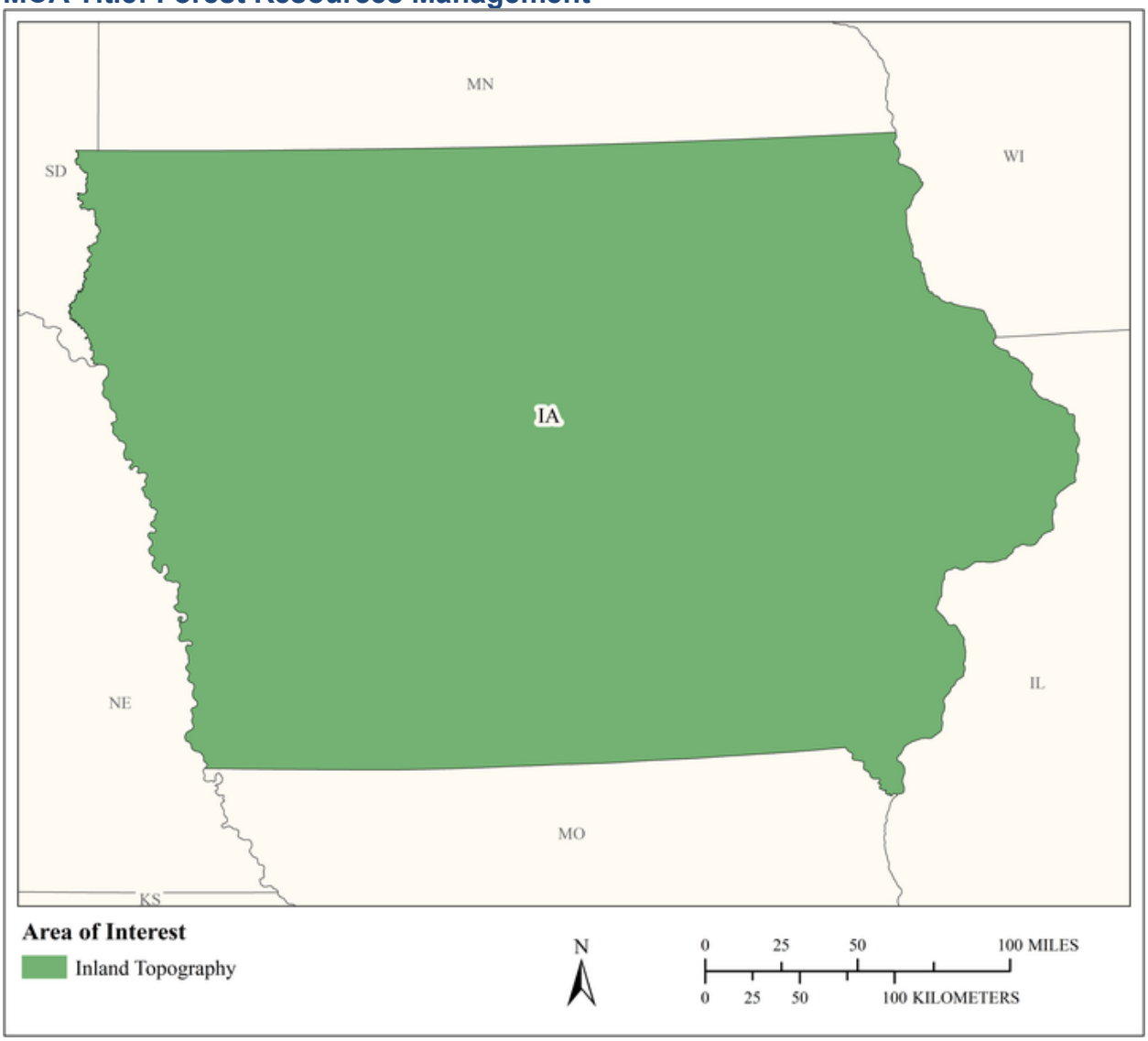
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Moderate		
Improved customer experience	Major	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate		
Environmental	Major	Major		
Public safety, including life and property	Major	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$86,132		Annual dollars saved/ realized	$45,850						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$8,603		Annual dollars saved/ realized	$3,233						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Major			Major								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Forest Resources Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Forest health assessment. Determination of standing inventory of forest resources. Prescribed burn planning. Analysis of carbon stocks for trade. Harvest systems planning.
MCA Title	Forest Resources Management
MCA ID	60170
Organization Type	State or U.S. Territorial government
Organization Name	State of Iowa
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Highly desirable			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

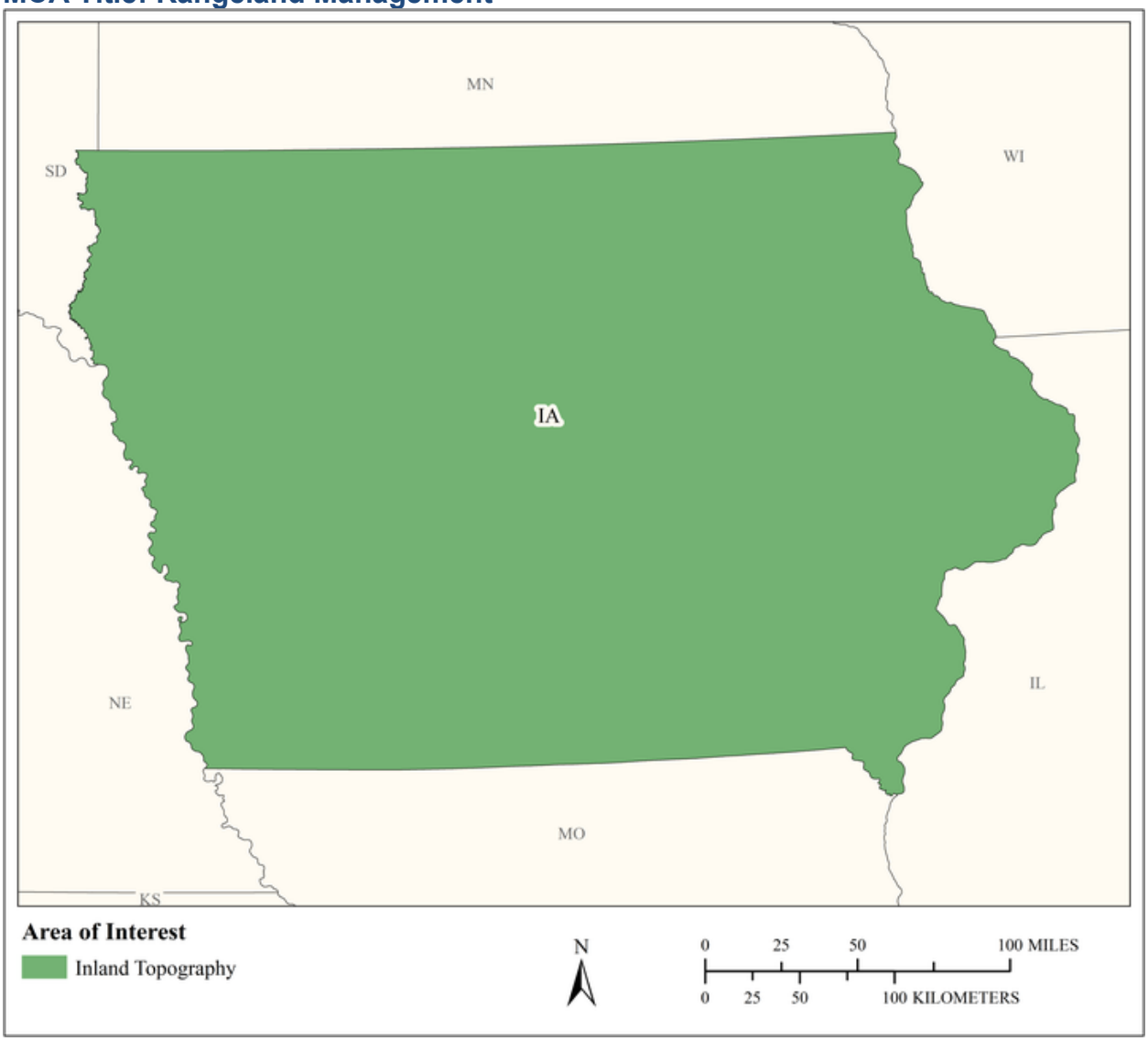
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$222,489									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$322,525									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Rangeland Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Assessment of rangeland health. Mapping for soil erosion potential due to grazing.
MCA Title	Rangeland Management
MCA ID	60171
Organization Type	State or U.S. Territorial government
Organization Name	State of Iowa
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 05 - Rangeland Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Highly desirable			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Not required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None			
Cost savings/cost reduction	None			
Cost avoidance	None			
Increased revenues	None			
Mission-driven performance improvements	None			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None			

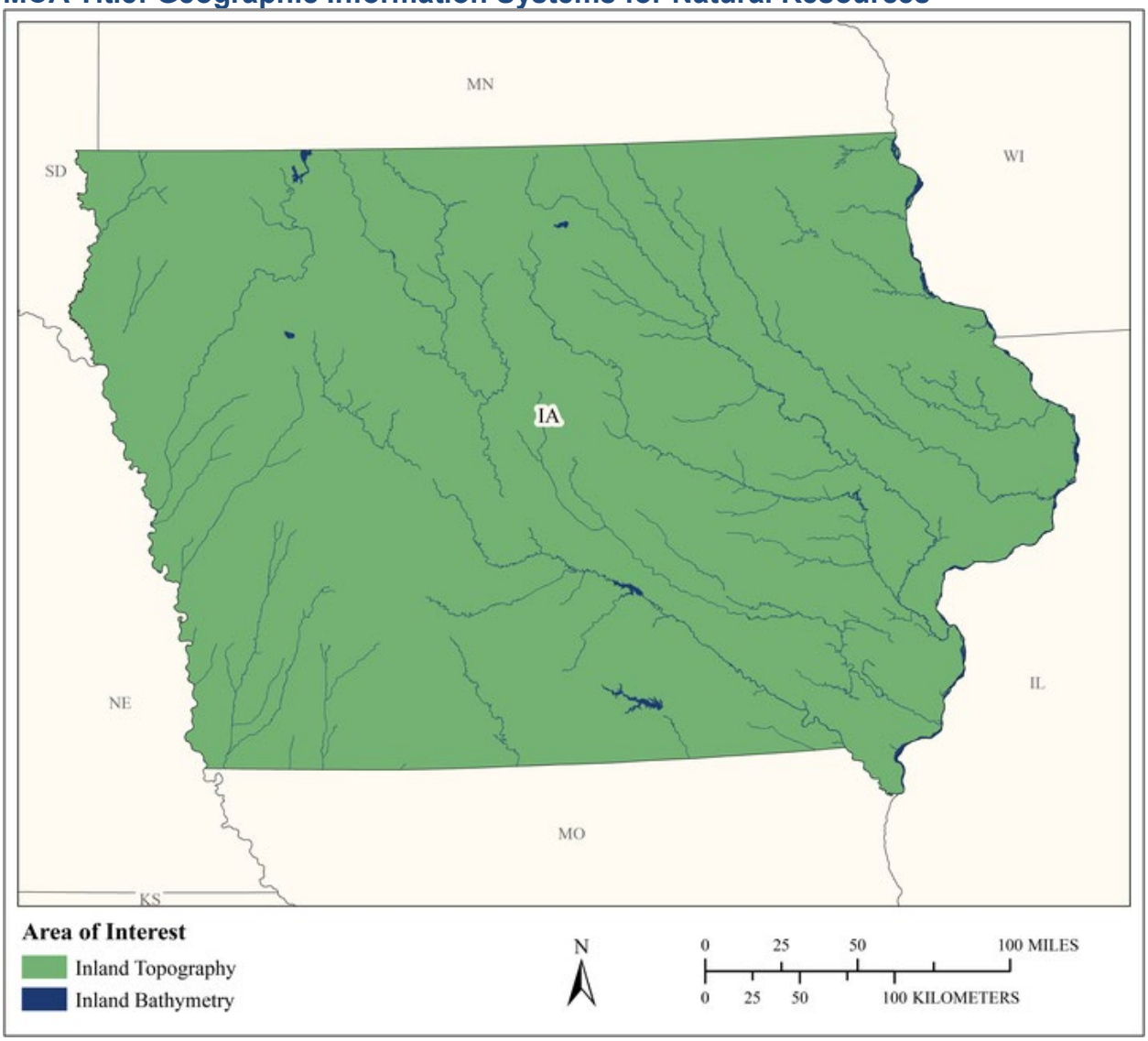
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	None			
Improved customer experience	None			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	None			
Public safety, including life and property	None			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	None											
Cost avoidance	Minor	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Geographic Information Systems for Natural Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Highly desirable		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Geographic Information Systems for Natural Resources. Elevation data are used for floodplain mapping, watershed modeling, H&H modeling, land cover development, environmental assessments, Phase 1 investigations of contaminated sites, solid waste, water quality programs, water flow modeling, floodplain permitting programs, conservation and recreation, and law enforcement within parks and wildlife areas (e.g. line of sight, boating, etc.). Inland bathy data is highly desirable, depending on the data quality that could be acquired (higher quality is more important).
MCA Title	Geographic Information Systems for Natural Resources
MCA ID	1247
Organization Type	State or U.S. Territorial government
Organization Name	Iowa Department of Natural Resources
Sub-Agency or Division	
Organization Mission	To conserve and enhance our natural resources in cooperation with individuals and organizations to improve the quality of life in Iowa and ensure a legacy for future generations.
Program Name	Floodplain Mapping, Conservation and Recreation, Environmental Services
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 07 - Wildlife and Habitat Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Trees. Underwater contours and small features.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required

Inland Bathy Feature Size Requirements	Response
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	Cross sections and/or transects meet needs		
Update Frequency	6-10 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 40 cm	Up to 1 meter		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs		Yes		
Cross section/transect requirement		I don't know		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Required			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to triple the required TVU at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable		
DTM	Highly desirable	Nice to have		
DEM	Required	Required		
Raw point cloud data	Required	Nice to have		
Classified point cloud	Highly desirable	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Highly desirable		
Land use/land cover	Nice to have	Highly desirable		
Wetlands	Nice to have	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Highly desirable		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have		
Cultural resources	Not required	Nice to have		
Coastal and riverine structures	Nice to have	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	State-wide LiDAR, collected between 2007 - 2010, 8 inch vertical accuracy, less than 5 foot collection horizontal spacing. Planned 2019 data collection at QL2.	Bathymetry collected using sonar.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Iowa state-wide LiDAR, Iowa DNR			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other		Yes		
Other description		Sonar collected ad hoc, Stored locally, Some derivatives are on state repository		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Moderate	Minor		
Cost avoidance	Moderate	None		
Increased revenues	None	Moderate		
Mission-driven performance improvements	Major	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		
Improved response or timeliness	Major	Major		
Improved customer experience	Major	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major		
Environmental	Major	Moderate		
Public safety, including life and property	Major	Minor		

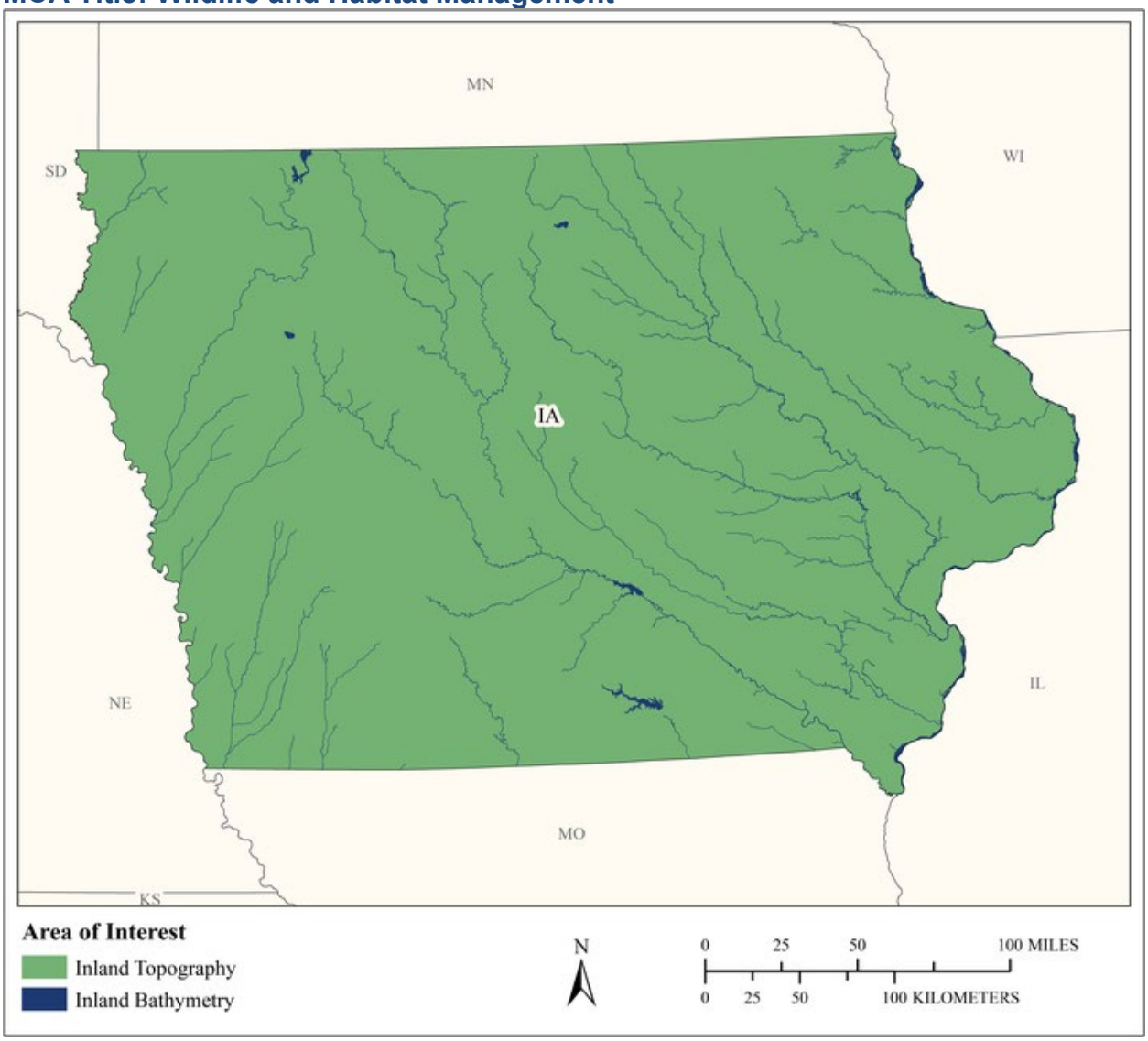
Future Benefits if Elevation Data Requirements Are Met	**Inland Topo**			**Inland Bathy**			**Nearshore Bathy**			**Offshore Bathy**		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Time savings description	Reliable estimates of tree heights, landscape features. More accurate delineation of floodplains, landscape features, easier to assess elevations. Better information for project planning. Eliminate time spent estimating elevation with lower quality data. Better estimates of building types, better floodplain elevation data.			About the same. Hours saved for fisheries biologists who currently process sonar data. Hours saved for fisheries biologists who now conduct sonar data collection. Consistent data manipulation would be an advantage.								
Cost savings/cost reduction	Major	Unable to provide		Moderate	Unable to provide							
Cost savings/cost reduction description	Some sonar data would not need to be collected. Labor or contractor costs for pond construction, buildings in parks, roads.			Probably less expensive than sonar.								
Cost avoidance	Major	Annual dollars saved/realized	$75,000	Moderate	Unable to provide							
Cost avoidance description	Loss of property in floodplains with newer, better elevation data. Pay-outs on insurance claims for potentially dangerous areas. Technical staff to process point cloud data.			Avoid costs of accidents on rivers and lakes due to obstructions for lakes where there is no sonar data.								
Increased revenues	Moderate	Unable to provide		Moderate	Unable to provide							
Increased revenues description	Timber harvests.			Increased number of fishing licenses because of better information for all lakes.								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements description	Better floodplain permitting, forest management, fisheries management. More accurate mapping in general.			Updated, complete bathymetry for the state would expand the extent of data and information.								
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,132,161		Annual dollars saved/ realized	$299,155						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Value added to products or services description	Just updates to existing apps. Updated elevation data would allow for better mapping.			Better, and more, data would allow for better maps and services. Enhanced existing apps.								
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness description	Changes since last LiDAR can be incorporated. There may be some benefit to having newer data for parks and recreation areas. Changes since last LiDAR can be incorporated will allow our existing processes to continue.			More and better maps. Allows our customers to describe things and communicate better. Better idea of potential hazards in lakes. Updated data may make this better.								
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide							
Improved customer experience description	No real difference. More recent data would reinforce confidence in existing procedures.			Consistent, available data. Improve existing apps. Updated data is helpful in continued confidence.								
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$8,105,368		Annual dollars saved/ realized	$13,467						

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Societal Benefits	**Benefits**	**Benefits**	**Benefits**	**Benefits**
Education or outreach	Moderate	Moderate		
Education or outreach description	Updated data is nice for maintaining existing programs	Data for the entire state would increase the reach of educational efforts		
Environmental	Major	Moderate		
Environmental description	Updated data is critical for maintaining existing programs	Better fisheries management because data would be available for the entire state		
Public safety, including life and property	Major	Major		
Public safety, including life and property description	Updated data is critical for maintaining existing programs	Data for the entire state would help		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Wildlife and Habitat Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation planning for wildlife refuges and marine sanctuaries. Conservation of critical habitats. Management of diverse migratory bird habitats, coral reef and coral communities, marine mammals, protected fish species, and trust resources.
MCA Title	Wildlife and Habitat Management
MCA ID	60172
Organization Type	State or U.S. Territorial government
Organization Name	State of Iowa
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Highly desirable	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Nice to have		
Classified point cloud	Highly desirable	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Highly desirable		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Nice to have	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	Major	Minor		
Increased revenues	None	Minor		
Mission-driven performance improvements	Moderate	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate		

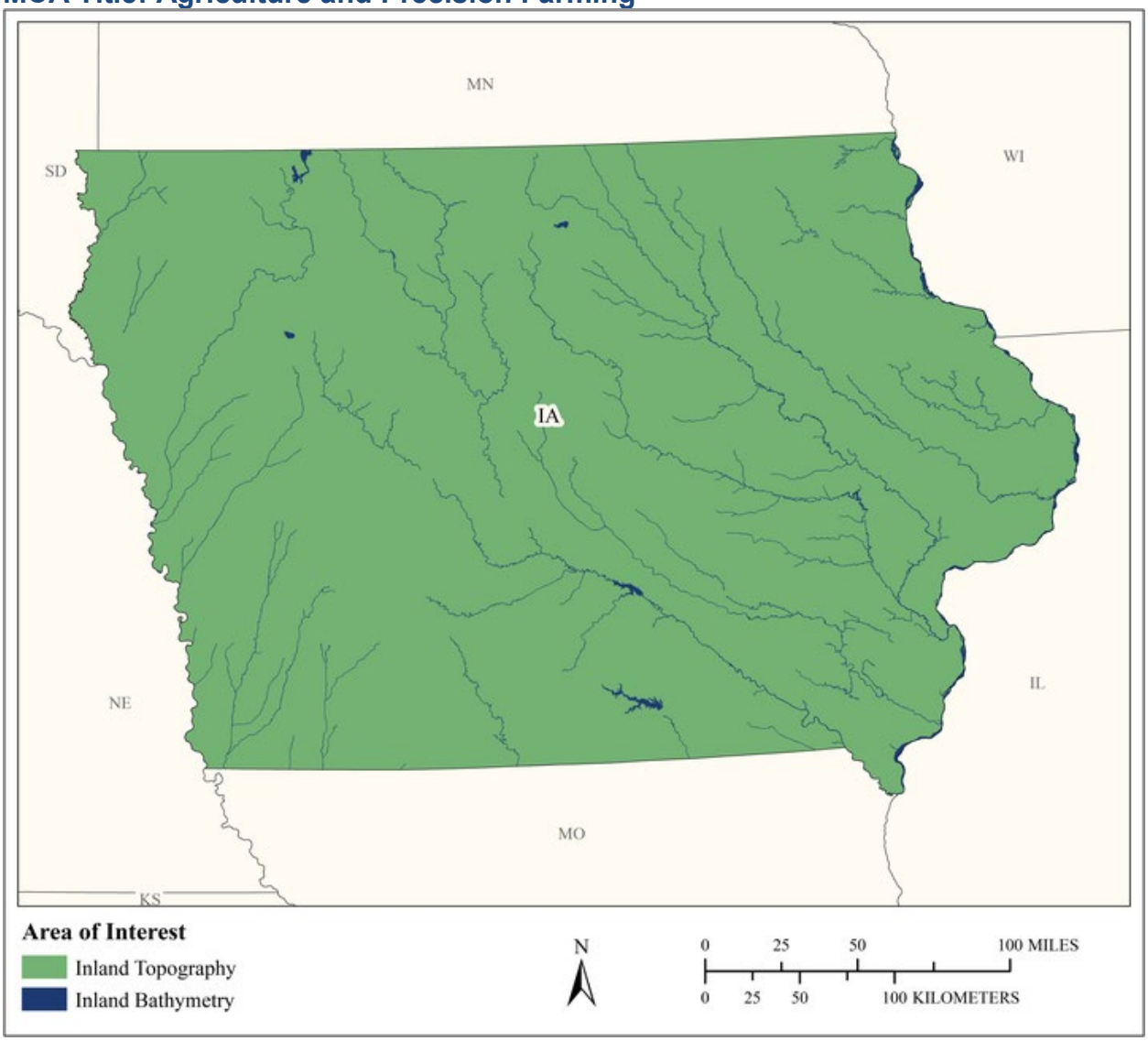
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Minor	Minor		
Improved customer experience	Minor	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Moderate		
Environmental	Moderate	Moderate		
Public safety, including life and property	Minor	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$13,404		Annual dollars saved/ realized	$107,425						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide							
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$38,715		Annual dollars saved/ realized	$64,932						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate								
Environmental	Major			Moderate								
Public safety, including life and property	Moderate			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Agriculture and Precision Farming



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Farm pond design. Irrigation system design. Detailed site analysis to support precision farming. Analysis of farm sedimentation and runoff. Calibration of fertilizer application, fertilizer management, and irrigation planning. Optimized terraforming.
MCA Title	Agriculture and Precision Farming
MCA ID	60173
Organization Type	State or U.S. Territorial government
Organization Name	State of Iowa
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 08 - Agriculture and Precision Farming
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Nice to have
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL4B		
Update Frequency	2-3 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 10 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 50 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required			Not required	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Not required	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Not required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level			Up to double the required TVU at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Nice to have	Nice to have		
Edited/cube XYZ		Highly desirable		
Full waveform	Nice to have	Highly desirable		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Required	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Highly desirable		
Land use/land cover	Highly desirable	Required		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Nice to have	Required		
Cultural resources	Nice to have	Highly desirable		
Coastal and riverine structures	Highly desirable	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	None		
Cost savings/cost reduction	Major	I don't know		
Cost avoidance	Major	Moderate		
Increased revenues	None	I don't know		
Mission-driven performance improvements	Moderate	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None		

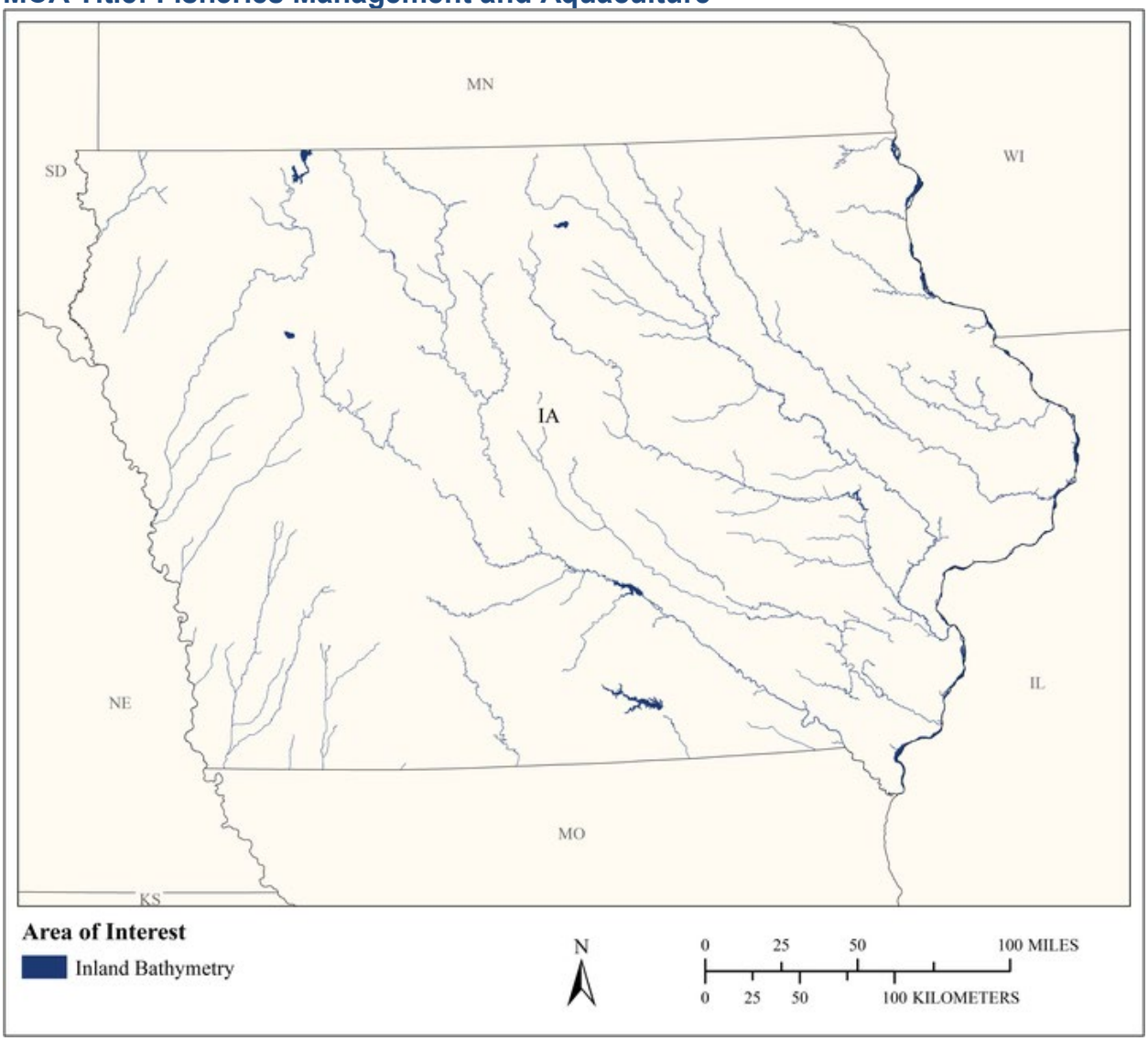
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	None		
Improved customer experience	Moderate	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	None		
Environmental	Major	I don't know		
Public safety, including life and property	Moderate	I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$65,151		Annual dollars saved/ realized	$114,145						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$51,649		Annual dollars saved/ realized	$51,649						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate								
Environmental	Major			Major								
Public safety, including life and property	Minor			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps				
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps		Yes		
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Fisheries Management and Aquaculture



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type		Required		
Geographic Area Requirements		One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Management of fisheries. Sustainable aquaculture.
MCA Title	Fisheries Management and Aquaculture
MCA ID	60174
Organization Type	State or U.S. Territorial government
Organization Name	State of Iowa
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Nice to have
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order		QL0B		
Update Frequency		6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error		Up to 2 meters		
Acceptable Vertical Error		Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season		Highly desirable				
Entire AOI under same environmental conditions		Highly desirable				
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless		Highly desirable				
DEM for entire AOI needs to be seamless		Required				
Amount of acceptable vertical manipulation to achieve spatial seamlessness		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM		Highly desirable		
DTM		Highly desirable		
DEM		Required		
Raw point cloud data		Nice to have		
Classified point cloud		Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform		Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening		Highly desirable		
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery		Nice to have		
Ground control/ground truthing		Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery		Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data		Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates		Highly desirable		
Land use/land cover		Highly desirable		
Wetlands		Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features		Required		
Bridges/culverts		Highly desirable		
Landmark features		Nice to have		
Cultural resources		Nice to have		
Coastal and riverine structures		Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings		Major		
Cost savings/cost reduction		Moderate		
Cost avoidance		Moderate		
Increased revenues		Moderate		
Mission-driven performance improvements		Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services		Major		

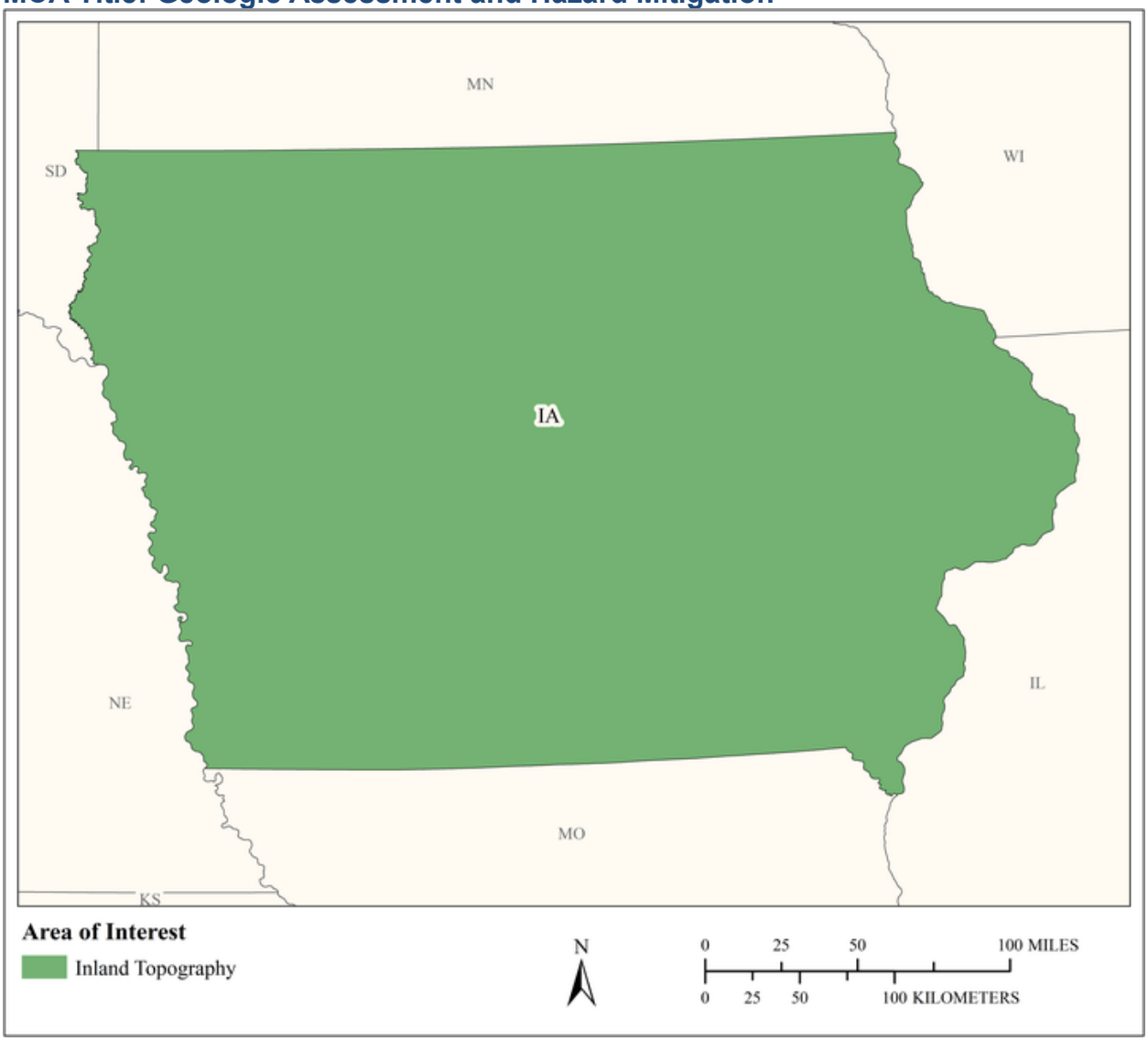
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness		Major		
Improved customer experience		Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach		Minor		
Environmental		Moderate		
Public safety, including life and property		Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings				Major	Unable to provide							
Cost savings/cost reduction				Major	Unable to provide							
Cost avoidance				Major	Unable to provide							
Increased revenues				None								
Mission-driven performance improvements				Major	Unable to provide							
Future annual operational benefits added during validation					Annual dollars saved/ realized	$112,595						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services				Major	Unable to provide							
Improved response or timeliness				Major	Unable to provide							
Improved customer experience				Major	Unable to provide							
Future annual customer service benefits added during validation					Annual dollars saved/ realized	$51,246						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach				Major								
Environmental				Major								
Public safety, including life and property				Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours		Yes		
Hillshades		Yes		
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic Assessment and Hazard Mitigation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Geologic mapping and analysis. Sinkhole and steephead mapping, monitoring, and analysis. Identification of geomorphologic units. Landslide hazard mapping and assessment. Karst mapping, including springs and caves. Aquifer recharge.
MCA Title	Geologic Assessment and Hazard Mitigation
MCA ID	60175
Organization Type	State or U.S. Territorial government
Organization Name	State of Iowa
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

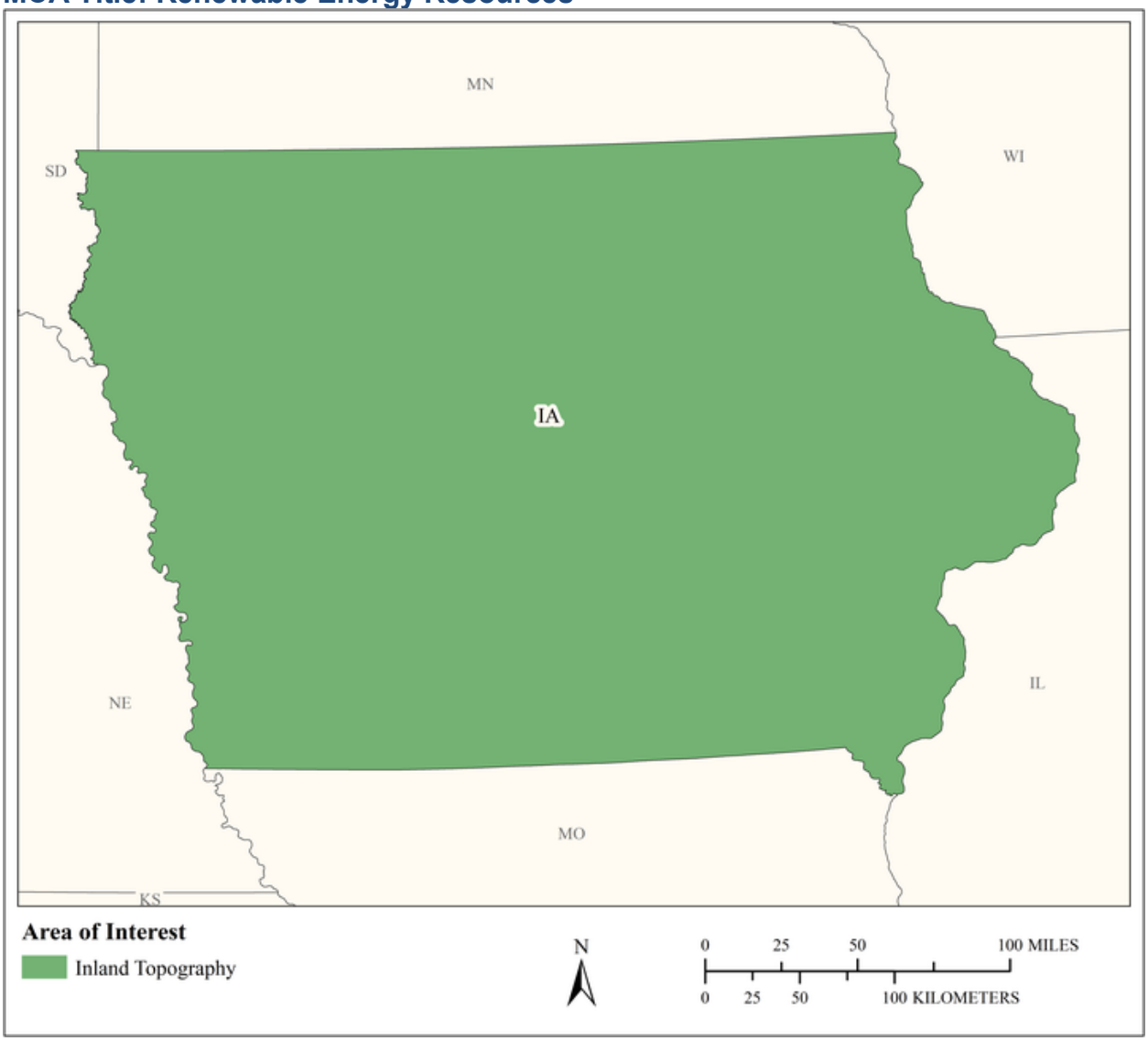
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$11,878,503									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$208,527									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Renewable Energy Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Alternate energy development – solar, tidal, wind, wave, and ocean current. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Low head power potential for hydropower.
MCA Title	Renewable Energy Resources
MCA ID	60176
Organization Type	State or U.S. Territorial government
Organization Name	State of Iowa
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Not required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Minor			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor			

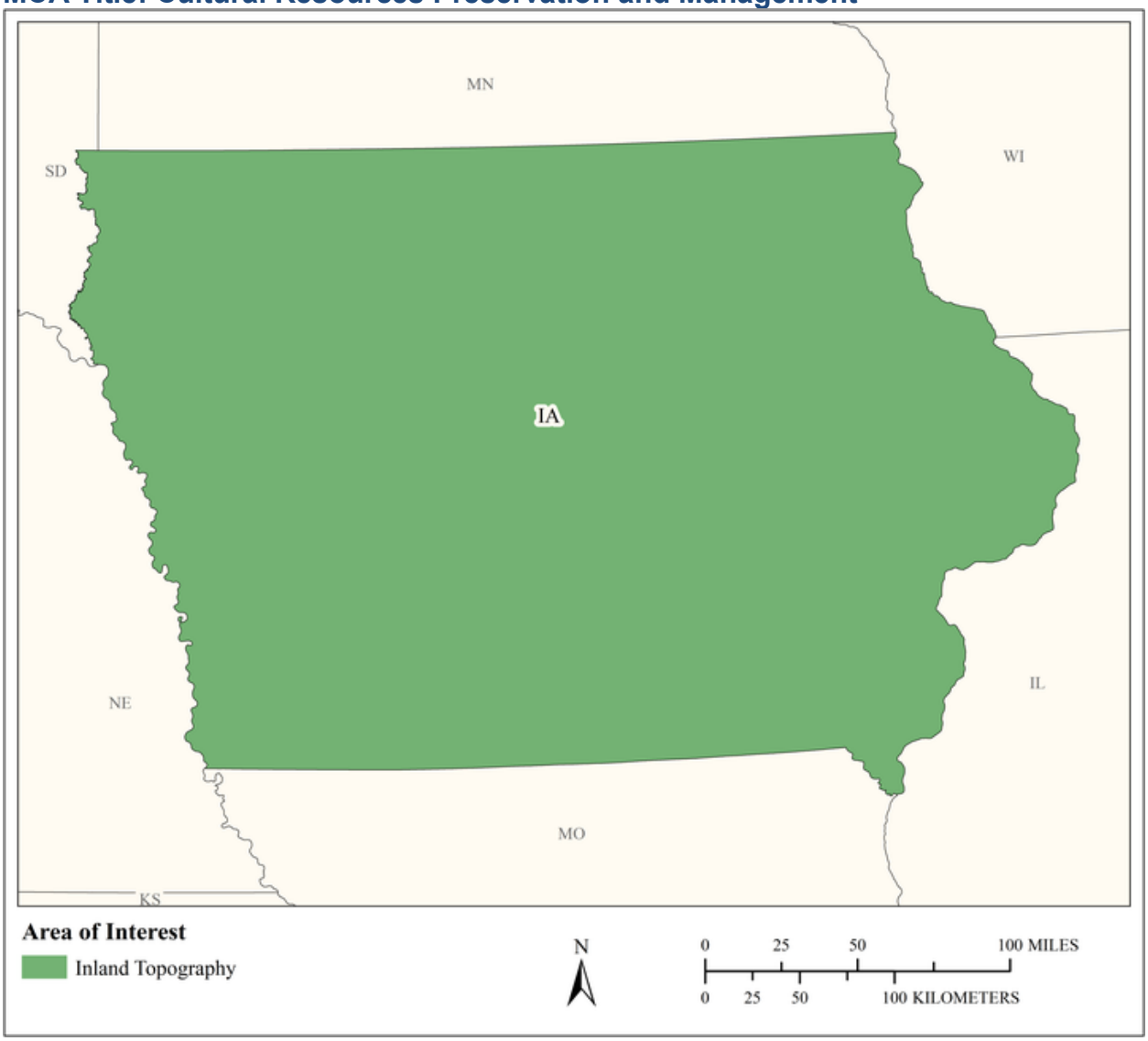
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Minor			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	None											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Cultural Resources Preservation and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Discovery and analysis of underwater archaeological and historical cultural sites. Site protection and preservation planning. Discovery and analysis of Native American and other historical cultural sites and subsistence activities.
MCA Title	Cultural Resources Preservation and Management
MCA ID	60177
Organization Type	State or U.S. Territorial government
Organization Name	State of Iowa
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Nice to have					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have					
DEM for entire AOI needs to be seamless	Nice to have					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Moderate			
Cost avoidance	Minor			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			

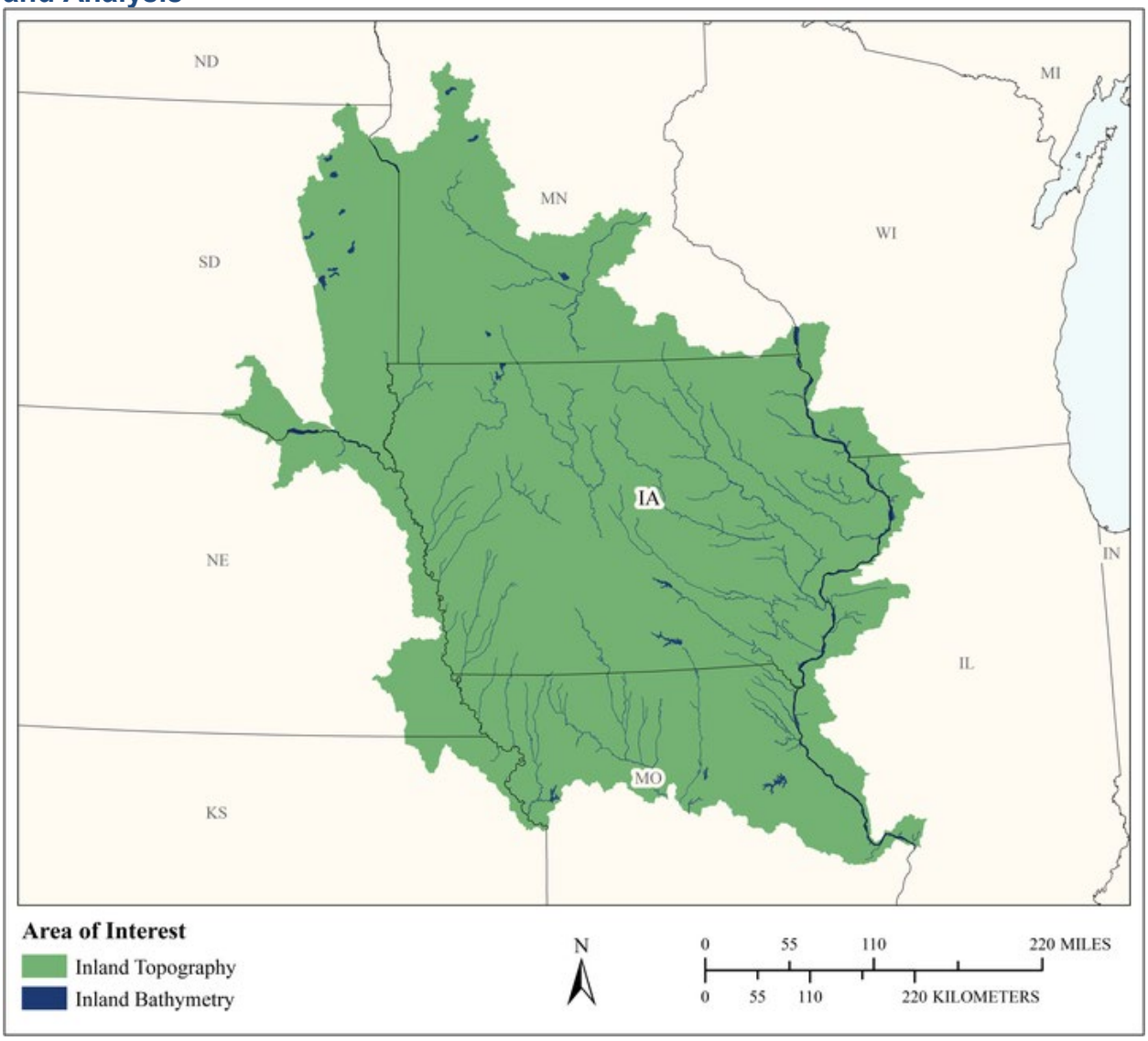
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Cost savings/cost reduction	Minor	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Moderate	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$10,314									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$9,017									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	Minor											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Floodplain Mapping; Hydrologic Forecasting; and Engineering Design and Analysis



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)	One or more Hydrologic Units (HUC4s)		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Floodplain mapping; hydrologic forecasting; engineering design and analysis
MCA Title	Floodplain Mapping; Hydrologic Forecasting; and Engineering Design and Analysis
MCA ID	1286
Organization Type	Academic or Not-for-Profit
Organization Name	University of Iowa
Sub-Agency or Division	
Organization Mission	IIHR's mission is to be a leader in fluids-related fundamental and applied research; to provide interdisciplinary education for future leaders in science and engineering; and to advance knowledge in support of sustainable natural and engineered systems.
Program Name	Iowa Flood Center
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 01 - Water Supply and Quality
Tertiary Business Use	BU 02 - Riverine Ecosystem Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Any feature that can significantly affect the flow of water over the land surface or within a stream or river.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable

Inland Bathy Feature Size Requirements	Response
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B		
Update Frequency	6-10 years	>10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need		
Acceptable Vertical Error	Up to 10 cm	Less than 10 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs		Partial		
Cross section/transect requirement		Required data accuracy and continuity are project dependent. In many cases, cross-sectional data at relatively coarse horizontal resolution are sufficient to characterize the shape of the water body.		

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required			Highly desirable	
Entire AOI under same environmental conditions	Required	Not required			Not required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Highly desirable	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Not required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Nice to have		
Ground control/ground truthing	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Required		
Land use/land cover	Required	Required		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Nice to have		
Cultural resources	Highly desirable	Nice to have		
Coastal and riverine structures	Required	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Using a LH Systems ALS50 Light Detection And Ranging (LiDAR) system, flight lines of standard density (1.4 meter ground sample distance) data were collected over areas in Iowa. Multiple returns were recorded for each laser pulse along with an intensity value for each return. Standard LiDAR Specifications: +/- 18 cm Bare Earth: 18.5 cm RMSE Vegetation: 37 cm RMSE	Survey-grade single- and multibeam sonar data.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Iowa Statewide LiDAR dataset available from several outlets, including GeoTree, housed at the University of Northern Iowa.			
Other		Yes		
Other description		In house		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	None		
Cost savings/cost reduction	Major	None		
Cost avoidance	Major	None		
Increased revenues	None	None		
Mission-driven performance improvements	Major	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		
Improved response or timeliness	Major	None		
Improved customer experience	Major	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor		
Environmental	Major	Moderate		
Public safety, including life and property	Major	Major		

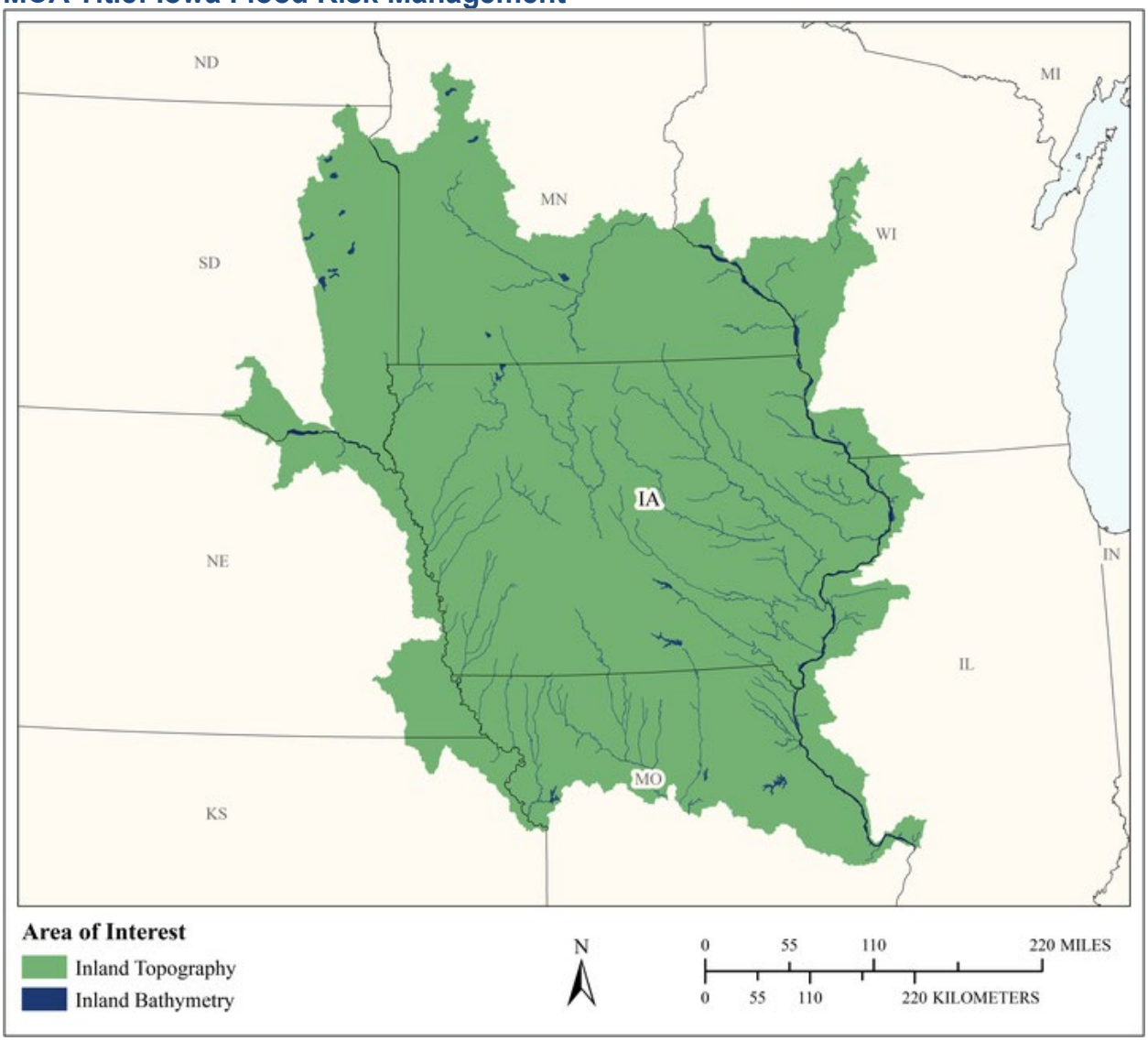
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$33,165	Major	Unable to provide							
Time savings description	Streamlined model development. No need for topographic surveying. If products are hydro-enforced.			No need to perform bathymetric surveys.								
Cost savings/cost reduction	Moderate	Annual dollars saved/realized	$30,000	Major	Unable to provide							
Cost savings/cost reduction description	Estimated topographic surveying costs.			No need to perform bathymetric surveys.								
Cost avoidance	Major	Annual dollars saved/realized	$50,000	Major	Unable to provide							
Cost avoidance description	Estimated cost for hydro-enforcement for annual products. More accurate flood hazard and risk information. Improved flood forecasting and risk estimation.			Improved model accuracy. No need to perform bathymetric surveys.								
Increased revenues	None			None								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements description				Greater availability of bathymetric data would improve model accuracy.								
Future annual operational benefits added during validation		Annual dollars saved/ realized	$3,837,834		Annual dollars saved/ realized	$274,415						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Value added to products or services description	More accurate forecasting and flood risk assessment. New and/or improved models and tools based on better topographic data.			Better models and visualization. Greater availability of bathymetric data would improve model accuracy.								
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness description	More accurate forecasting and flood risk identification. Better modeling and visualization. Flood hazard delineations based on current topographic information.			More current data would produce more accurate simulations. Greater availability of bathymetric data would improve model accuracy. New ways to visualize data.								
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Improved customer experience description	Increased confidence and forecasts better match observations. Better modeling and visualization.			Perceived improvement in model accuracy. Greater model accuracy, greater convenience. New ways to visualize data.								
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$691,181		Annual dollars saved/ realized	$308,099						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate								
Education or outreach description	Improved visualization, opportunity to develop new communication tools			Better visualization tools to communicate to the public								
Environmental	Moderate			Moderate								
Environmental description	Improved modeling contributes to watershed and stream corridor planning/restoration			Improved river corridor management, water quality modeling								

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Public safety, including life and property	Major	Major		
Public safety, including life and property description	Improved forecasting and risk identification	Improved flood forecasting and risk identification		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Iowa Flood Risk Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Highly desirable		
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)	One or more Hydrologic Units (HUC4s)		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Provide flood hazard risk information to the people of Iowa for use in wise development and flood hazard mitigation. Flood risk modeling and mapping of riverine and coastal areas. Dam/dike/levee safety analysis. Review/permitting of proposed floodplain development. Flood forecasts. 2D hydraulic modeling.
MCA Title	Iowa Flood Risk Management
MCA ID	21771
Organization Type	State or U.S. Territorial government
Organization Name	Iowa Department of Natural Resources
Sub-Agency or Division	
Organization Mission	To conserve and enhance our natural resources in cooperation with individuals and organizations to improve the quality of life in Iowa and ensure a legacy for future generations.
Program Name	Flood Plain Permitting
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	We like to know what is on the ground as well as have the bare earth for use in land classification in order to assign appropriate Mannings N values for roughness coefficients. Buildings.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Not required
5.1 – 10 acres	Not required
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	I don't know		
Update Frequency	4-5 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	I don't know		
Acceptable Vertical Error	Up to 10 cm	I don't know		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Not required			Not required	
Entire AOI under same environmental conditions	Required	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Required		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Required	Required		
Classified point cloud	Required	Required		
Edited/cube XYZ		Required		
Full waveform	Highly desirable	Highly desirable		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Nice to have		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Not required		
Land use/land cover	Highly desirable	Required		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We are using data from the Iowa LiDAR collection effort. Dates range from 2008-2010 for the bulk of it. Vertical Bare earth accuracy 18.5 cm RMS or better Vertical in Vegetation accuracy 37 cm RMS or better Horizontal 1m RMS. Some areas were reflown in 2014 in NE due to tree interference during the original collection. This would probably be considered along the QL2 spectrum for quality of data.	None available		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	We are using data from the Iowa LiDAR collection effort. Dates range from 2008-2010 for the bulk of it. Some areas were reflown in 2014 in NE due to tree interference during the original collection. This would probably be considered along the QL2 spectrum for quality of data.			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available		
Cost savings/cost reduction	Major	Inland bathy data not available		
Cost avoidance	Moderate	Inland bathy data not available		
Increased revenues	None	Inland bathy data not available		
Mission-driven performance improvements	Major	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available		
Improved response or timeliness	Major	Inland bathy data not available		
Improved customer experience	Major	Inland bathy data not available		

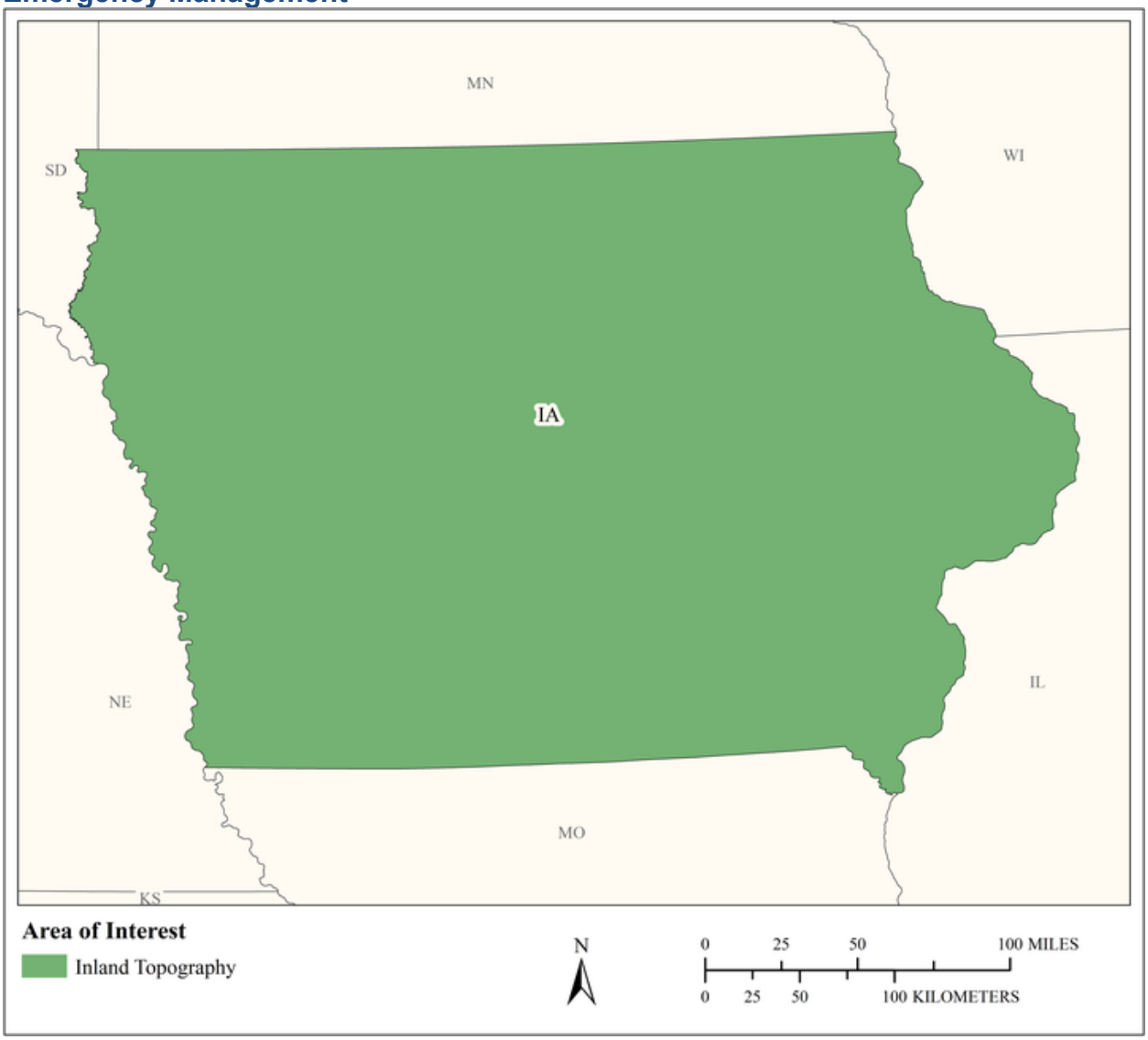
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Inland bathy data not available		
Environmental	Major	Inland bathy data not available		
Public safety, including life and property	Major	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		I don't know	Unable to provide							
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide							
Increased revenues	Moderate	Unable to provide		None								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$3,950,635		Annual dollars saved/ realized	$274,438						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$691,237		Annual dollars saved/ realized	$308,123						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			I don't know								
Education or outreach description	Data is used to back up our modeling at public outreach meetings											
Environmental	Moderate			I don't know								
Environmental description	Data is used to help discover mitigation opportunities easily in reach											
Public safety, including life and property	Major			I don't know								
Public safety, including life and property description	Data is integral to our modeling of floodplains, used to convey risk											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Homeland Security, Law Enforcement, Disaster Response, and Emergency Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Infrastructure and border protection. Coastal search and rescue. Population dynamics. Emergency fuel supply and movement. Line of sight analysis in urban areas. Disaster response. Flood risk analysis resulting from acts of terrorism.
MCA Title	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
MCA ID	60178
Organization Type	State or U.S. Territorial government
Organization Name	State of Iowa
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

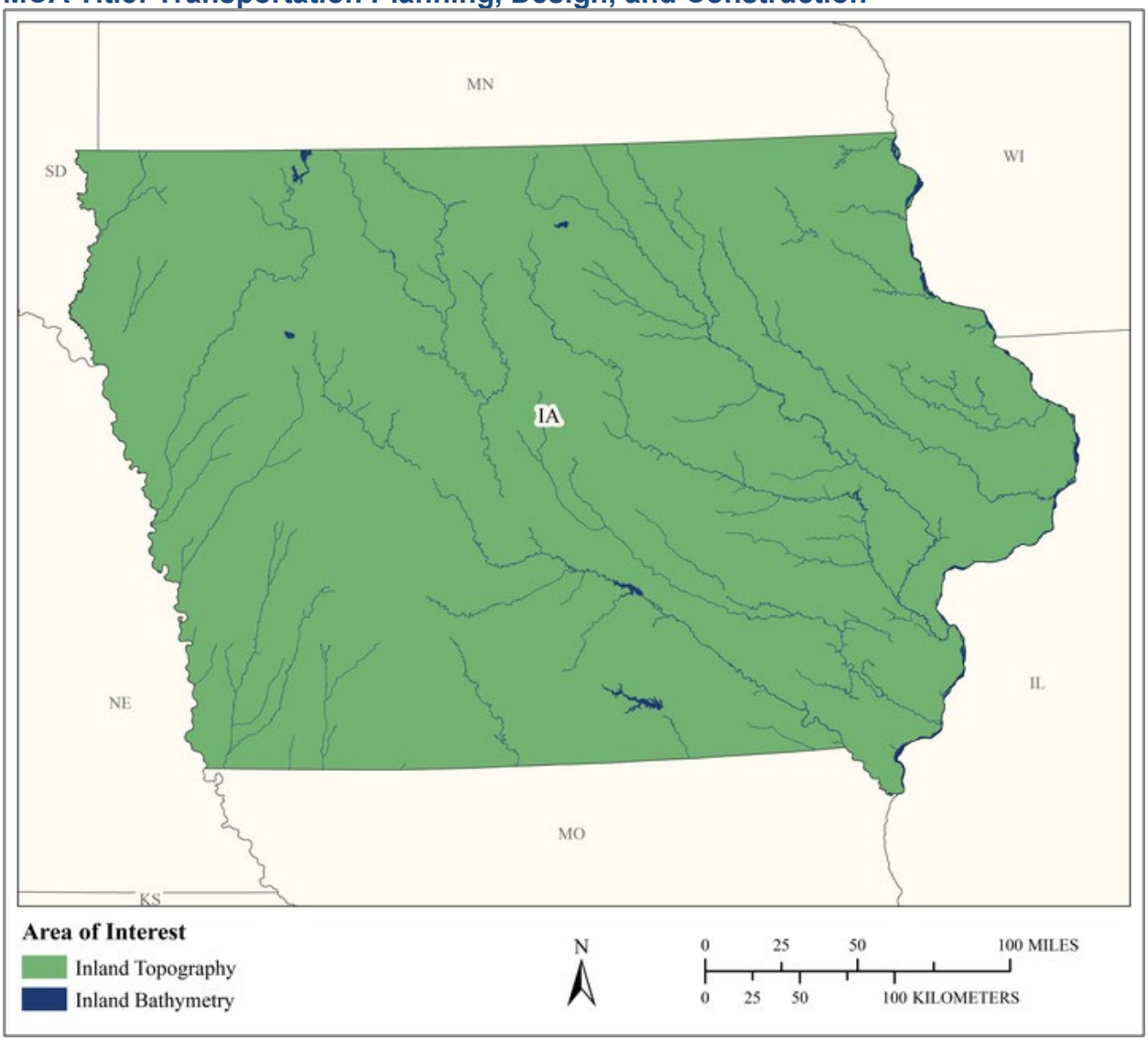
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Minor			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,660,040									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$29,340									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Moderate											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Transportation Planning, Design, and Construction



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Highway design and construction Bridge design and construction Highway asset management Highway traffic control and safety Highway maintenance Right of Way management Delivers services that promote and enhance a healthy air transportation system Delivers services that promote and enhance a healthy rail transportation system
MCA Title	Transportation Planning, Design, and Construction
MCA ID	21582
Organization Type	State or U.S. Territorial government
Organization Name	Iowa Dept. of Transportation
Sub-Agency or Division	
Organization Mission	Getting you there safely, efficiently, and conveniently.
Program Name	Transportation
Total Annual Program Budget	
Primary Business Use	BU 19 - Land Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Bridge detail, Roadway surface above ground utility features (manholes, etc.)

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Highly desirable

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B		
Update Frequency	2-3 years	2-3 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need		
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Highly desirable

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Nice to have			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Nice to have	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have		
DTM	Required	Required		
DEM	Nice to have	Highly desirable		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Highly desirable	Required		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Not required		
Bathymetric Attributed Grid (BAG)		Not required		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Not required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Highly desirable	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required	Nice to have		
Land use/land cover	Nice to have	Nice to have		
Wetlands	Highly desirable	Highly desirable		
Estuaries				
Inland surface water features	Highly desirable	Highly desirable		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Nice to have	Highly desirable		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Highest quality level is 5 cm vertical point cloud data for individual highway corridors. There is statewide point cloud data available at 20cm accuracy.	Acquiring single beam echo c sounding data ourselves.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	http://www.geotree.uni.edu/lidar/			

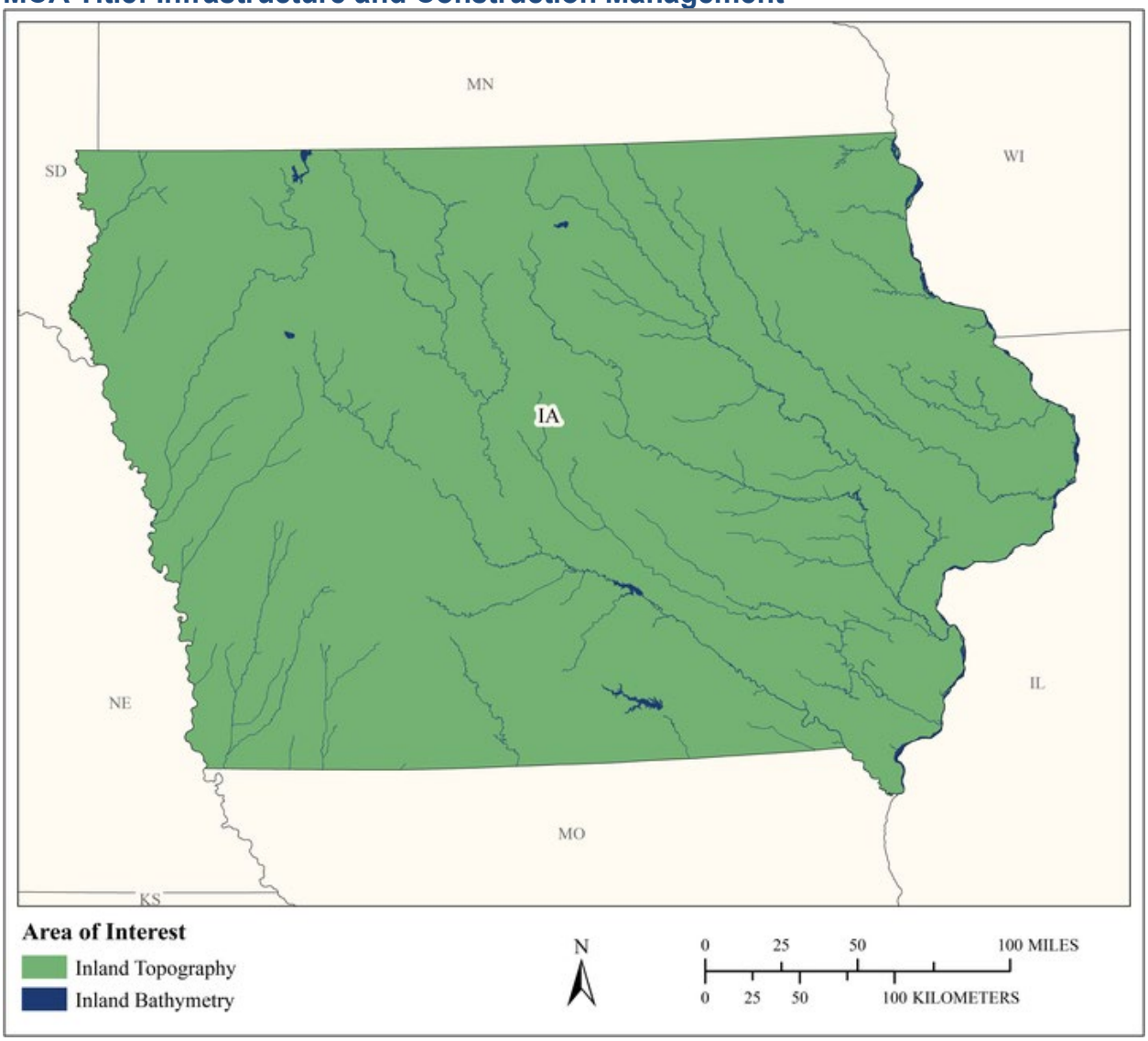
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other	Yes			
Other description	Iowa Lidar Mapping Project			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	Major	None		
Increased revenues	I don't know	None		
Mission-driven performance improvements	Major	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate		
Improved response or timeliness	Major	Minor		
Improved customer experience	Major	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	I don't know		
Environmental	Major	I don't know		
Public safety, including life and property	Major	I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		I don't know	Unable to provide							
Cost avoidance	Minor	Unable to provide		I don't know	Unable to provide							
Increased revenues	None			I don't know	Unable to provide							
Mission-driven performance improvements	Moderate	Unable to provide		I don't know	Unable to provide							
Other operational benefits	Moderate	Unable to provide										
Other operational benefits description	Design quality products.											
Future annual operational benefits added during validation		Annual dollars saved/ realized	$728,971		Annual dollars saved/ realized	$31,093						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	Moderate	Unable to provide		I don't know	Unable to provide							
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$58,868		Annual dollars saved/ realized	$321						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			Minor								
Environmental	I don't know			Minor								
Public safety, including life and property	I don't know			Minor								
Other												
Other benefits				Minor								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes	Yes		
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Infrastructure and Construction Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Marine construction. Bridge design and construction. Engineering and construction of dams, levees, dikes, reservoirs, and coastal structures. Shipyard and port construction. Water, sewer, or power line planning and vegetation analysis. Pump, drain, and well placement. Stormwater modeling. Cut and fill analysis for earth-moving. Building site analysis. Road infrastructure. Infrastructure hardening or mitigation for climate change effects, e.g. sea level change.
MCA Title	Infrastructure and Construction Management
MCA ID	60179
Organization Type	State or U.S. Territorial government
Organization Name	State of Iowa
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	Up to 2 meters		
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Nice to have		
Classified point cloud	Required	Highly desirable		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Nice to have		
Coastal and riverine structures	Highly desirable	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Moderate		
Increased revenues	Minor	None		
Mission-driven performance improvements	Moderate	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate		

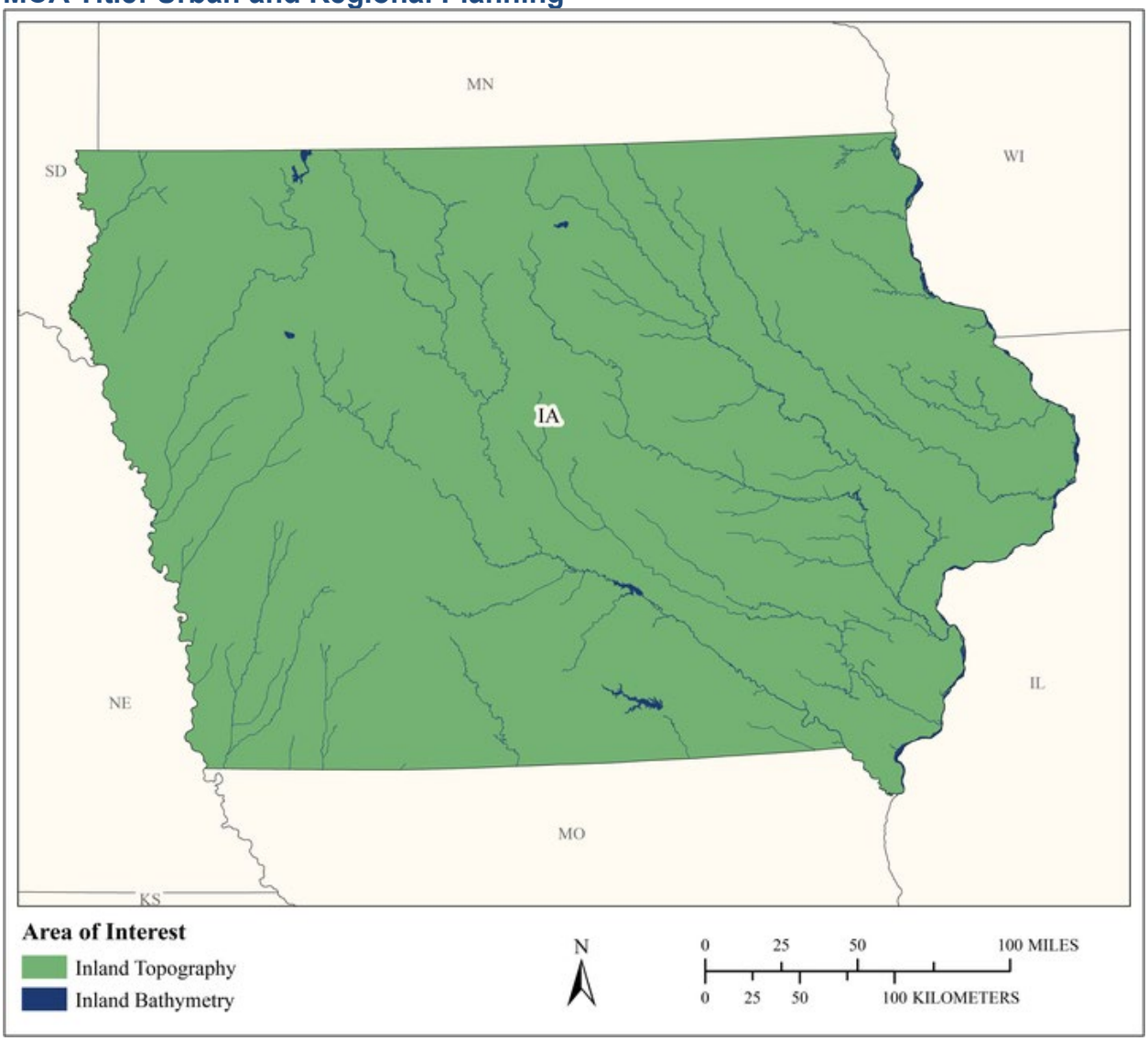
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major		
Improved customer experience	Moderate	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor		
Environmental	Moderate	Minor		
Public safety, including life and property	Moderate	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide							
Increased revenues	None			None								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,528,860		Annual dollars saved/ realized	$852,013						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Minor	Unable to provide							
Improved customer experience	Major	Unable to provide		Minor	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$7,441,925		Annual dollars saved/ realized	$88,471						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor								
Environmental	Moderate			Moderate								
Public safety, including life and property	Major			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Urban and Regional Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Land development and zoning. Municipal mapping of building footprints and elevations. Port resilience planning. Parks and transportation planning. Virtual city creation. Urban ecology planning.
MCA Title	Urban and Regional Planning
MCA ID	60180
Organization Type	State or U.S. Territorial government
Organization Name	State of Iowa
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B		
Update Frequency	4-5 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Required	Nice to have		
Classified point cloud	Required	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Highly desirable		
Land use/land cover	Required	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Nice to have		
Coastal and riverine structures	Highly desirable	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	Major	Minor		
Increased revenues	Minor	Minor		
Mission-driven performance improvements	Major	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		

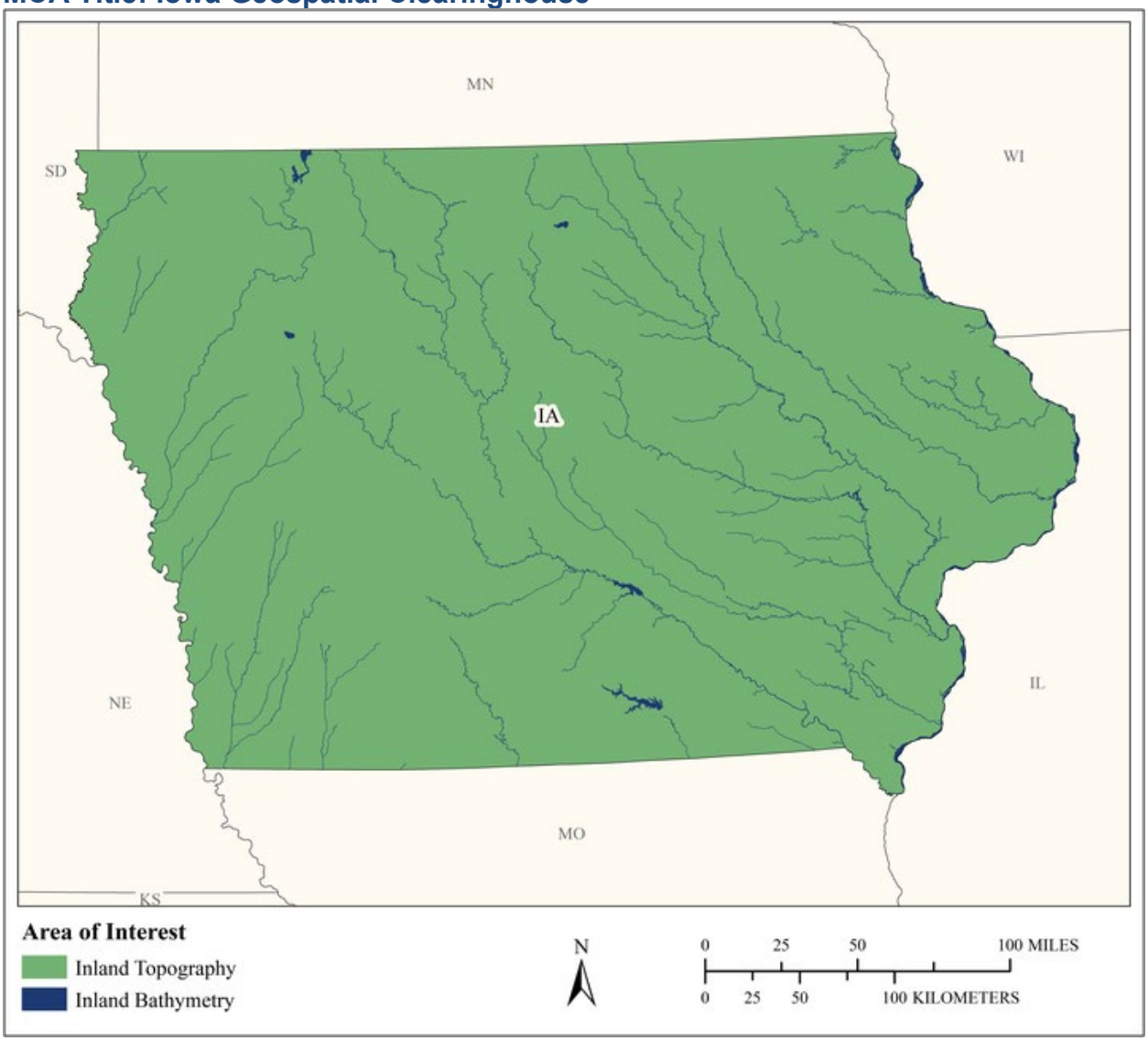
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor		
Improved customer experience	Major	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor		
Environmental	Major	Minor		
Public safety, including life and property	Major	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$15,140,671		Annual dollars saved/ realized	$616,653						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,747,997		Annual dollars saved/ realized	$780,119						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate								
Environmental	Major			Moderate								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Iowa Geospatial Clearinghouse



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Highly desirable		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	The Office of the Chief Information Officer provides geospatial data coordination through the State Geospatial Coordinator. Our organization works with multiple state agencies that benefit from a centralized location for data acquisition, collection and dissemination. The OCIO is not a user of elevation data, but a data provider, and also provides clearinghouse services and data dissemination. The expressed requirements are representative of those provided to the Lidar/Elevation Working Group and the Iowa Geographic Information Council, as well as other user requests.
MCA Title	Iowa Geospatial Clearinghouse
MCA ID	1285
Organization Type	State or U.S. Territorial government
Organization Name	Office of the CIO, State of Iowa
Sub-Agency or Division	
Organization Mission	Provide high-quality, customer-focused information technology services and business solutions to government and to citizens. The state Geospatial Coordinator is housed within this office.
Program Name	Geospatial Coordination
Total Annual Program Budget	
Primary Business Use	BU 26 - Education K12 and Beyond, Basic Research
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Utility infrastructure including towers, wind turbines. Individual tree and tree canopy. Archaeological features.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Not required
51 - 100 ft	Nice to have
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	Cross sections and/or transects meet needs		
Update Frequency	6-10 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Up to 5 meters		
Acceptable Vertical Error	Up to 10 cm	Up to 40 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs		Yes		
Cross section/transect requirement		Unknown		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required			Not required	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Not required		
DTM	Not required	Not required		
DEM	Required	Required		
Raw point cloud data	Required	Required		
Classified point cloud	Required	Required		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Not required		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Not required		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Highly desirable		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Nice to have		
Cultural resources	Nice to have	Not required		
Coastal and riverine structures	Not required	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Pre 3DEP program LiDAR derived DEM. Acquired from 2007-2010. Average equivalent to QL3. NPS 1.4m and Vertical RMSE ~0.16m. Iowa spring 2019 lidar collection planned - QL2 for 24 counties ~1/4 of state, hope for annual collections to complete state. Being done through Iowa NRCS/USGS. Expect delivery ~2020.	Iowa DNR derived sonar data. Data points gridded and interpolated to create DEM. Various dates. No quality information available.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes		

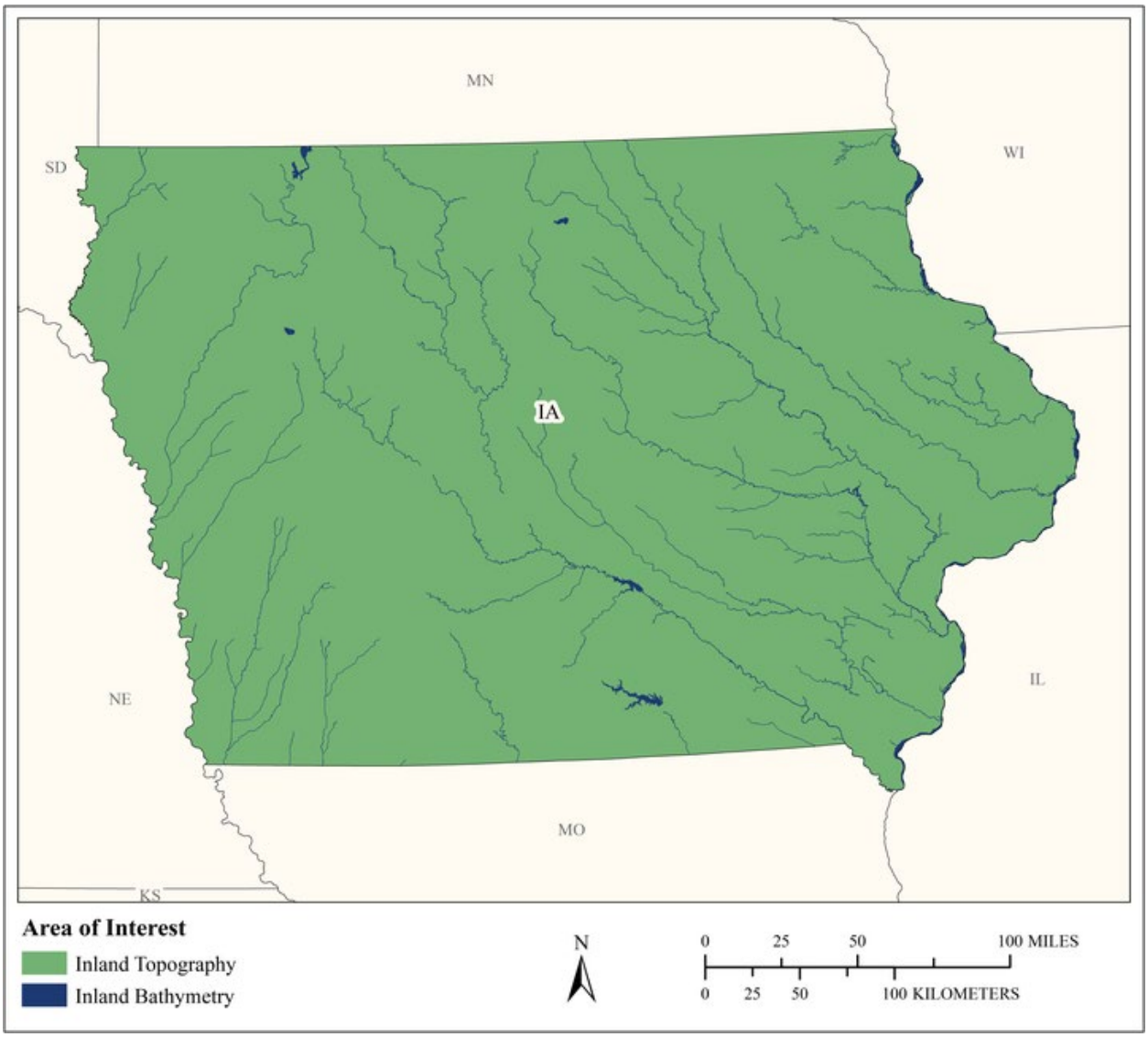
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
State repositories used	PC data available at: http://geotree2.geog.uni.edu/lidar/ Various derived products accessible from https://geodata.iowa.gov	https://geodata.iowa.gov		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	I don't know		
Cost savings/cost reduction	Moderate	I don't know		
Cost avoidance	Moderate	I don't know		
Increased revenues	I don't know	I don't know		
Mission-driven performance improvements	I don't know	I don't know		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	I don't know		
Improved response or timeliness	Moderate	I don't know		
Improved customer experience	Moderate	I don't know		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	I don't know		
Environmental	Moderate	I don't know		
Public safety, including life and property	Major	I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$28,944	Minor	Annual dollars saved/realized	$302						
Time savings description	Having data in one place, clearly described, with efficient distribution methods will reduce data copying. Achieved through standardized products and dissemination methods.											
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide							
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide							
Increased revenues	None			None								
Mission-driven performance improvements	I don't know	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements description				Data acquired for state at some level and available in one place.								
Future annual operational benefits added during validation		Annual dollars saved/ realized	$267,368		Annual dollars saved/ realized	$77,037						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		None								
Value added to products or services description	Customer service will be enhanced. Will get data download statistics on new lidar collection.											
Improved response or timeliness	None			None								
Improved customer experience	Moderate	Annual dollars saved/realized	$14,472	Minor	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$692,675									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			I don't know								
Environmental	Major			I don't know								
Public safety, including life and property	Major			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps				
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Recreation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Planning and development of recreational facilities such as rafting, boating, swimming, diving, and fishing areas; ski slopes; and golf courses. Location- based products and services such as maps and guides. Tourism. Trail and vista site planning. Orienteering.
MCA Title	Recreation
MCA ID	60181
Organization Type	State or U.S. Territorial government
Organization Name	State of Iowa
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 27 - Recreation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required			Not required	
Entire AOI under same environmental conditions	Required	Not required			Not required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have			Nice to have	
DEM for entire AOI needs to be seamless	Required	Nice to have			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required		
DTM	Nice to have	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Highly desirable	Highly desirable		
Edited/cube XYZ		Highly desirable		
Full waveform	Not required	Nice to have		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Nice to have		
Ground control/ground truthing	Nice to have	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Highly desirable		
Land use/land cover	Nice to have	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Not required	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor		
Cost savings/cost reduction	Moderate	Minor		
Cost avoidance	Major	Minor		
Increased revenues	None	Minor		
Mission-driven performance improvements	Major	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor		

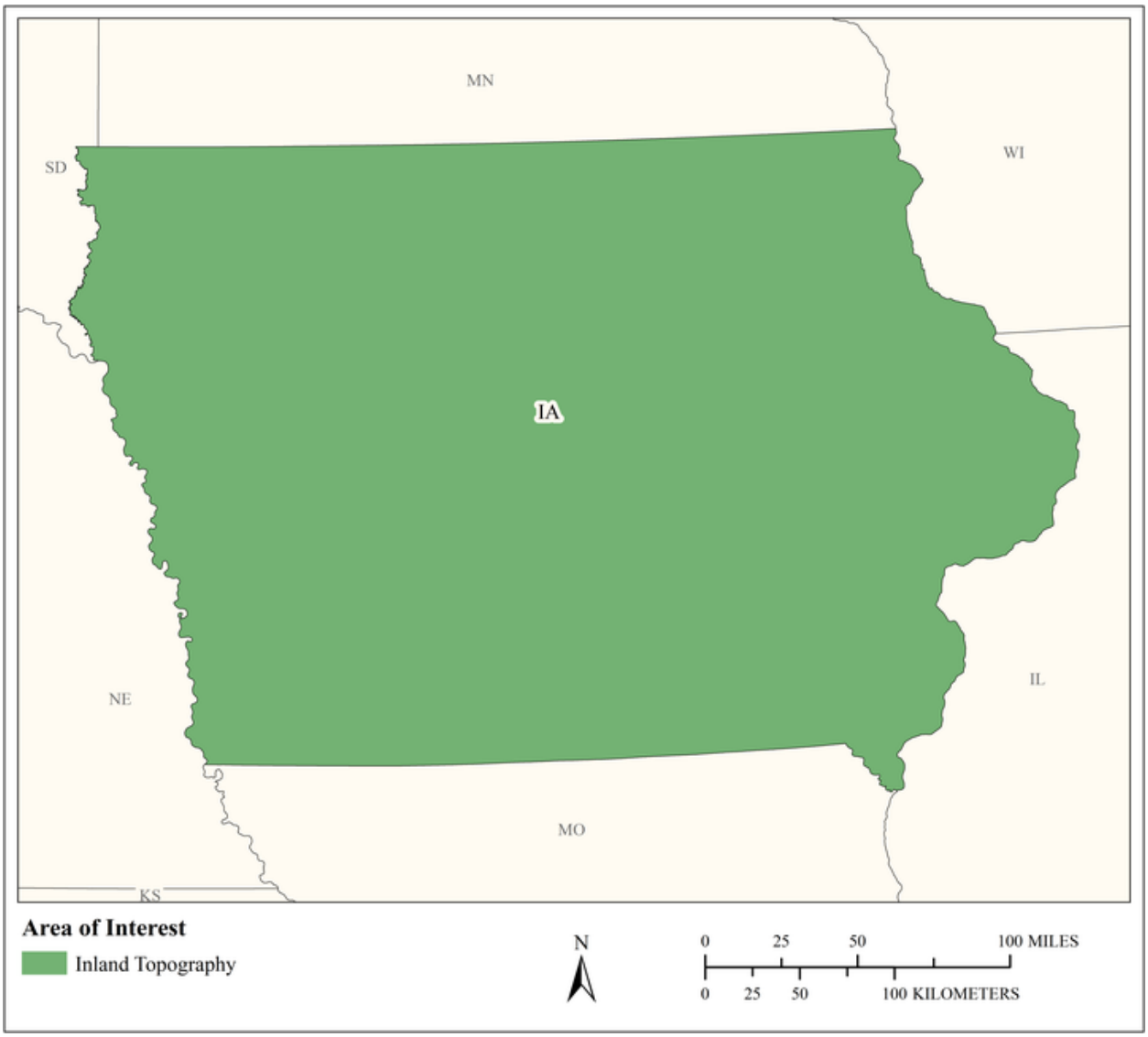
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Minor		
Improved customer experience	Moderate	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor		
Environmental	Major	Minor		
Public safety, including life and property	Major	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	None			Moderate	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$12,912		Annual dollars saved/ realized	$7,776						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Minor	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major								
Environmental	Moderate			Major								
Public safety, including life and property	Moderate			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Telecommunications



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Telecommunication tower site selection. Design of radio and radar systems. Interference analysis. Path profiles. Undersea telecommunication route selection and deployment.
MCA Title	Telecommunications
MCA ID	60182
Organization Type	State or U.S. Territorial government
Organization Name	State of Iowa
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 28 - Telecommunications
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Highly desirable			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

Kansas

Kansas covers 81,759 square miles. Within that area, 87.5% of the land is used for agriculture and 98.1% of it is privately owned. Besides crop and cattle production, the state's chief industries are energy, aviation, and production of non-fuel minerals such as helium, crushed rock, and sand and gravel. About 66% of Kansans live in the 10 most populous of the state's 105 counties. Seven of those are in the Topeka to Kansas City corridor in northeast Kansas or the Wichita area in south-central Kansas. Accurate elevation data is essential in those areas of urban expansion as well as lesser-populated regions for floodplain mapping, inundation and water-quality modeling, water-supply planning, wetland restoration, transportation infrastructure, and energy-resource development. Eastern Kansas depends largely on surface water resources – the Missouri, Kansas, and Arkansas rivers and their tributaries and reservoirs. Kansas has 24 federal reservoirs built for flood control, water supplies, and recreation. Several have been diminished by sedimentation associated with upstream streambank erosion. To address the problem, Kansas water-related agencies coordinated streambank stabilization projects in three high-priority watersheds. In drier western Kansas, water for irrigation and other purposes is drawn mainly from the High Plains aquifer, which in some areas is threatened by depletion. Oil and gas production has been a leading industry for decades in central and western Kansas and, more recently, large windfarms have been established, particularly in the Smoky Hills of central Kansas and the High Plains in the west.

Current status of elevation data for Kansas

The State of Kansas has complete Quality Level 3 (QL3) lidar data collected from 2006 to 2014. A project is currently underway to acquire QL2 data statewide and QL1 data in a two-county pilot area. Both of these efforts are expected to be completed by the end of 2020. Future acquisitions will be required as existing data age beyond the eight-year 3DEP guideline.

Importance of elevation data to Kansas

The Kansas Department of Agriculture has a Mission Critical Activity (MCA) of Flood Risk Modeling, Mapping, Mitigation, and Dam Safety. Current and accurate elevation data are critical to updating the Federal Emergency Management Agency's Flood Insurance Rate Maps. Additionally, Lidar data is used to support the determination of Base Flood Elevations for property owners. These activities are important for public safety to ensure that development occurs away from flood risk areas and provide data to inform technical assistance projects to mitigate flood risk.

Kansas Department of Health and Environment has an MCA of Water Flow Modeling for Remediation Efforts, both contaminated and preventative. Lidar data are needed for modeling to support streambank stabilization, watershed boundary delineation, water quality modeling, point and non-point source pollution modeling, well contamination sampling, contours of groundwater surface, and H&H modeling.

Kansas Water Office uses elevation data to support state water planning initiatives. The Kansas Water Vision and Kansas Water Plan are in place to evaluate water supply and future water use demands to plan for future scenarios. Bathymetric data are vital for accurate volumetric assessment of public water supply reservoirs. Elevation data play a key part in the work to support these Plans: conducting sedimentation analyses upstream of water supply reservoirs, evaluating geomorphic changes, identifying actively eroding streambanks, calculating sediment volumes and land lost, calculating impacts of sediment on water supply quantity and nutrients on water quality in downstream public water supply reservoirs, analysis of erosion from agriculture sites, and identifying sources of nutrients and upstream erosion that cause harmful algal bloom occurrences.

Kansas Geological Survey (KGS) has an MCA of Geologic Mapping and Analysis. Elevation data are used to map geologic hazards, conduct scientific research on landscape histories, identify geomorphic

processes and landforms, identify the distribution and availability of geologic natural resources, assess seismic hazards, assist with stream bank stabilization efforts, and support the USGS STATEMAP geologic mapping program. KGS is currently utilizing Unmanned Aircraft Systems to collect cm-scale elevation data in order to assess the effectiveness of streambank stabilization projects.

The Kansas Biological Survey at the University of Kansas has an MCA of Flood Mapping and Surface Hydrology Research. Elevation data are the basis for the flood inundation library used for rapid flood mapping, and is needed for wetland mapping and assessment, calculating the waterbody shoreline grade for water quality and sedimentation analyses, and suitability analyses for wetland community establishment or restoration. Bathymetric data are needed for erosion studies, mobilization and transport, reservoir sedimentation, and stream morphometry analyses.

Mid-America Regional Council, a metropolitan planning organization for the bi-state Kansas City region, has an MCA of 9-1-1 / Public Safety Support, Transportation Planning, and Hazard Mitigation. Elevation data are used for the purposes of urban and regional planning, and infrastructure and construction management. As a lead agency to identify and solve regional challenges, elevation data are used to assist in development of regional plans for transportation, the environment, and emergency response.

Kansas Department of Transportation (KDOT) uses elevation data for two MCAs within the Business Use of Infrastructure and Construction Management: Highway Safety Improvement Planning and Airspace Protection, and Transportation System Planning and Design. Lidar data can be used for the following applications:

- To calculate the grade on road surface to identify vertical curvature, which affects speed limits, signage requirements, regrading needs, and restrictions on roads;
- To ensure clear zones in the right of way (ROW), identify trees or other obstructions in the ROW;
- For statewide planning initiatives, to identify widening obstacles such as needed ROW acquisition or structures that would prevent widening;
- Within airspace to identify airspace obstructions near airports and air ambulance sites for approaches and clearances;
- Geologic mapping and analysis;
- Karst mapping, monitoring, and analysis, including springs and caves;
- Identification of geomorphologic units;
- Landslide hazard mapping and assessment;
- Bridge design, construction, and maintenance;
- Stormwater modeling;
- Road infrastructure design, construction, and maintenance;
- Cut and fill analysis for earth-moving; and
- H&H modeling and identification of bridge scour.

The state has recognized several Business Uses requiring elevation data that were not addressed in other MCAs. These are forest resource management, natural resource conservation, renewable energy resources, and cultural resource preservation.

High-level summary of elevation data requirements

The data will be used to model water flows for remediation efforts and flood inundation and risk mapping, geologic mapping and identification of geologic hazards, assessment of groundwater, sedimentation analyses, conservation planning, and transportation planning, all utilizing lidar technology.

Topographic lidar at QL2 data suffices for most uses; however, QL1 data provide higher resolution that may be of value when performing change detection and when planning in high risk areas and in areas of low relief that is predominant in much of the state. QL0 HD data was noted as a requirement by KDOT since identification of survey-level features is required. KGS is conducting drone collection of elevation data for some stream bank stabilization projects.

Bathymetric lidar was indicated as a requirement for three MCAs, ranging in quality from QL1B to QL4B. Kansas Water Office indicated that many public water supply reservoirs have had no bathymetric surveys conducted and total volume is unknown. Kansas Biological Survey noted that regularly collected, standardized bathymetry data over more waterbodies and streams than they currently monitor will allow for the development of better sedimentation models and more effective sediment management strategies.

High-level summary of benefits that would come from higher resolution elevation data

With higher quality elevation data, agencies would see major benefits in the form of time and cost savings and customer service. All identified Business Uses will benefit from improved data through enhanced visualization, and higher quality modeling, forecasting, and analysis. The improved data will also benefit agencies that use the data for management, planning, and response.

For the MCA of Flood Mapping and Surface Hydrology Research, it was noted that there would be enormous value in having hydro-enforced elevation data for those engaged in 2D flood inundation modeling. For this to be of maximum benefit, it would have to be done in a thorough and consistent fashion, using yet to be developed standards, protocols, or guidelines. It would be ideal for this to become a regular part of an enhanced, bare earth lidar data preparation process.

Additional Comments

Over the next three to five years, the State of Kansas intends to integrate the new lidar data into their Business Uses for the entire state, evaluate the value of the collected QL1 data, and keep the data current in areas of rapid change. More in depth assessment may be needed to further understand the requirements at the county, city, or watershed level. Various needs for training were expressed by participants to see how others are acquiring and using their data, identify additional opportunities and uses that are not being currently realized, learn about the upcoming vertical datum changes, and learn more about the general use of lidar and its use in a variety of applications.

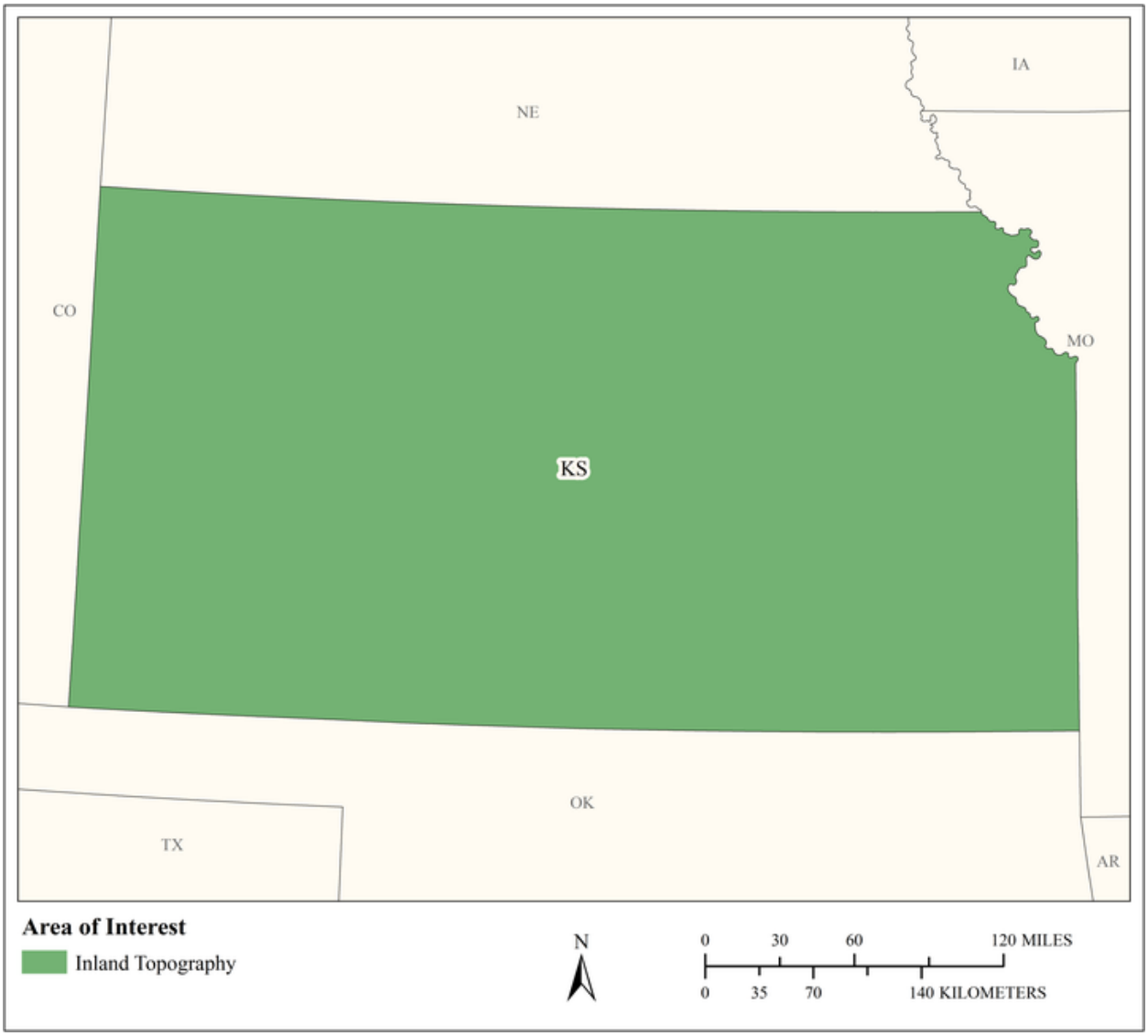
The State of Kansas has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	Kansas Department of Health and Environment (KDHE)	1130	Water Flow Modeling for Remediation Efforts	Inland Topo	QL2	4-5 years	$228,099	$61,097	Minor	Moderate	Moderate
BU 01 – Water Supply and Quality	Kansas Water Office	1274	Elevation Data to Support State Water Planning Initiatives	Inland Topo	QL2	(a) 4-5 years (b) 6-10 years	$228,099	$61,097	Moderate	Major	I don't know
				Inland Bathy	QL2B	4-5 years	$1,973,558	$206,245	Moderate	Major	Minor
BU 04 – Forest Resource Management	State of Kansas	60183	Forest Resources Management	Inland Topo	QL2	2-3 years	$325,311	$471,577	Major	Major	Major
BU 06 – Natural Resource Management	State of Kansas	60184	Natural Resources Conservation	Inland Topo	QL1 HD	4-5 years	$3,227,181	$11,851,192	Major	Major	Major
BU 10 – Geologic Assessment	Kansas Geological Survey	21712	Geologic Mapping and Analysis	Inland Topo	QL1 HD	6-10 years	$17,368,048	$304,896	I don't know	I don't know	Major
BU 12 – Renewable Energy Resources	State of Kansas	60185	Renewable Energy Resources	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	None
BU 14 – Cultural Resource Management	State of Kansas	60186	Cultural Resources Preservation and Management	Inland Topo	QL1	4-5 years	$15,080	$13,185	Minor	Minor	Minor
BU 15 – Flood Risk Management	Kansas Biological Survey, University of Kansas	21702	Flood Mapping and Surface Hydrology Research	Inland Topo	QL2	6-10 years	$168,090	Unable to quantify	Major	Major	Major
				Inland Bathy	QL4B	6-10 years	$129,296	Unable to quantify	Major	Major	Major
BU 15 – Flood Risk Management	Kansas Department of Agriculture	60695	Flood Risk Management	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Major	Moderate	Major
BU 22 – Infrastructure Management	Kansas DOT	22121	Highway Safety Improvement Planning and Airspace Protection	Inland Topo	QL0 HD	Annually	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 22 – Infrastructure Management	Department of Transportation, Kansas	22399	Transportation System Planning and Design	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 23 – Urban and Regional Planning	Mid-America Regional Council	21622	Urban and Regional Planning	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	Moderate	Minor	Moderate
				Inland Bathy	QL2B	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	Moderate

MCA Title: Water Flow Modeling for Remediation Efforts



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Water flow modeling for remediation efforts - both contaminated and preventative. Lidar data are needed for modeling to support stream bank stabilization, watershed boundary delineation, water quality modeling, point and non-point source pollution modeling, well contamination sampling, depth to wells (i.e. contours of groundwater surface), and H&H modeling. Site design requires survey grade elevation data.
MCA Title	Water Flow Modeling for Remediation Efforts
MCA ID	1130
Organization Type	State or U.S. Territorial government
Organization Name	Kansas Department of Health and Environment (KDHE)
Sub-Agency or Division	
Organization Mission	To protect and improve the health and environment of all Kansans
Program Name	Bureau of Remediation - Assessment and restoration. Secondary - Bureau of Water - Watershed Planning, Monitoring and Assessment Section for Public Water Supply
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 02 - Riverine Ecosystem Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Stream banks

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	I don't know			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Vertical Error	I don't know			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have					
DEM for entire AOI needs to be seamless	Nice to have					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Highly desirable			
Raw point cloud data	Not required			
Classified point cloud	Not required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Not required			
Cultural resources	Not required			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL3/QL2 lidar			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	State of Kansas GIS Data Access and Support Center			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	Moderate			
Increased revenues	Minor			
Mission-driven performance improvements	Major			

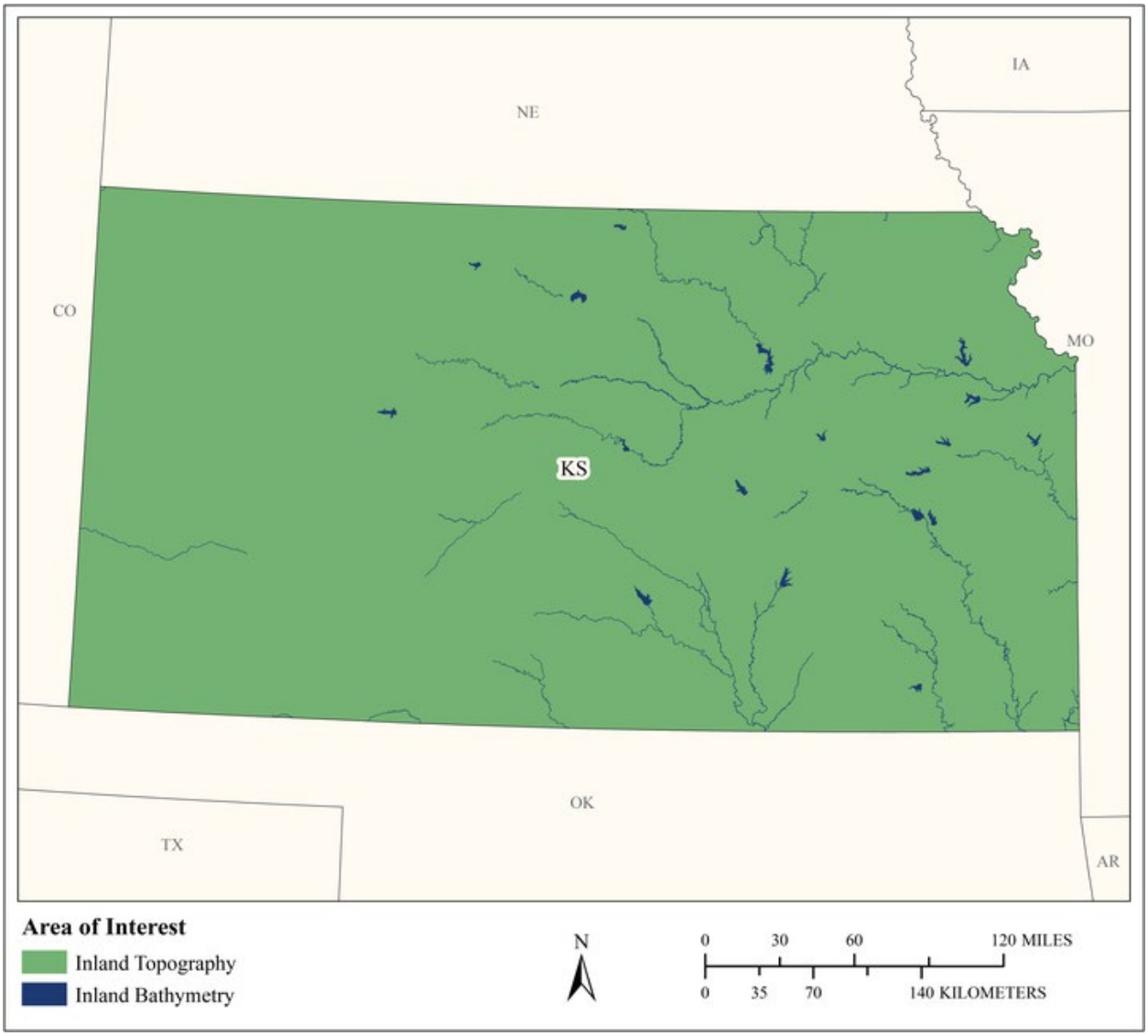
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Moderate			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Minor	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Moderate	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$228,099									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$61,097									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Moderate											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Elevation Data to Support State Water Planning Initiatives



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Area split by varying quality level or update frequency	One or more states, territories, or counties		
Sub Area Requirements	Kansas			

MCA Description	Response
Mission Critical Activity	Kansas Water Vision and Plan, which includes conducting sedimentation analyses upstream of water supply reservoirs, evaluating geomorphic changes, identifying actively eroding streambanks and targeting of state resources to address. Follow up review of impacts of past streambank stabilization projects. Calculating sediment volumes and land lost, calculating impacts of sediment on water supply quantity and nutrients on water quality in downstream public water supply reservoirs. Analysis of erosion from agriculture sites and targeting of state/federal environmental efforts. Targeting of water quality and water quantity projects. With expanding harmful algal bloom occurrences, need to identify sources of nutrients and upstream erosion.
MCA Title	Elevation Data to Support State Water Planning Initiatives
MCA ID	1274
Organization Type	State or U.S. Territorial government
Organization Name	Kansas Water Office
Sub-Agency or Division	
Organization Mission	Water planning, policy, coordination, and marketing agency for state. Collect and compile information pertaining to climate, water and soil as related to the usage of water for agricultural, industrial and municipal purposes and the availability of water supplies in the several watersheds of the state. Evaluate water supplies and future water use demands to plan for future water use scenarios.
Program Name	Kansas Water Vision and Kansas Water Plan
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 02 - Riverine Ecosystem Management
Tertiary Business Use	BU 08 - Agriculture and Precision Farming

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Bridges, roads, culverts, terraces, streambanks. Underwater bottom surface, outlet structures.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have

Inland Bathy Feature Size Requirements	Response
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B		
Update Frequency	(a) 4-5 years (b) 6-10 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI	Western portions of state and areas lacking surface water could have reduced frequency and quality. QL2 every 8 years is OK west of the 100th meridian.			
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter		
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial	Partial		
Cross section/transect requirement	Meeting USGS QL2 standards is sufficient. Frequent and repeated cross sections along stream reaches and around reservoirs needed for hydrologic modelling.	Areas around some federal reservoirs could use frequently repeated cross sections.		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required			Not required	
Entire AOI under same environmental conditions	Highly desirable	Nice to have			Not required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Not required			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have		
DTM	Highly desirable	Nice to have		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Nice to have	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Nice to have	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required	Not required		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		
Estuaries				
Inland surface water features	Required	Highly desirable		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Not required		
Cultural resources	Nice to have	Not required		
Coastal and riverine structures	Nice to have	Not required		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Currently using surface LiDAR that is collected on state contracts, some areas have LiDAR over 10 years old. Contracts have been carried out to do bathymetric surveys on some of the public water supply reservoirs in Kansas, with some federal reservoirs having 1 or 2 surveys conducted thus far in their 50-60 years of use. Many public water supply reservoirs have had no bathymetric surveys conducted and total volume is unknown.	An accumulation of bathymetric surveys conducted by state research institution, some public water supplies have 1 or 2 historical surveys, many reservoirs have no surveys completed.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				

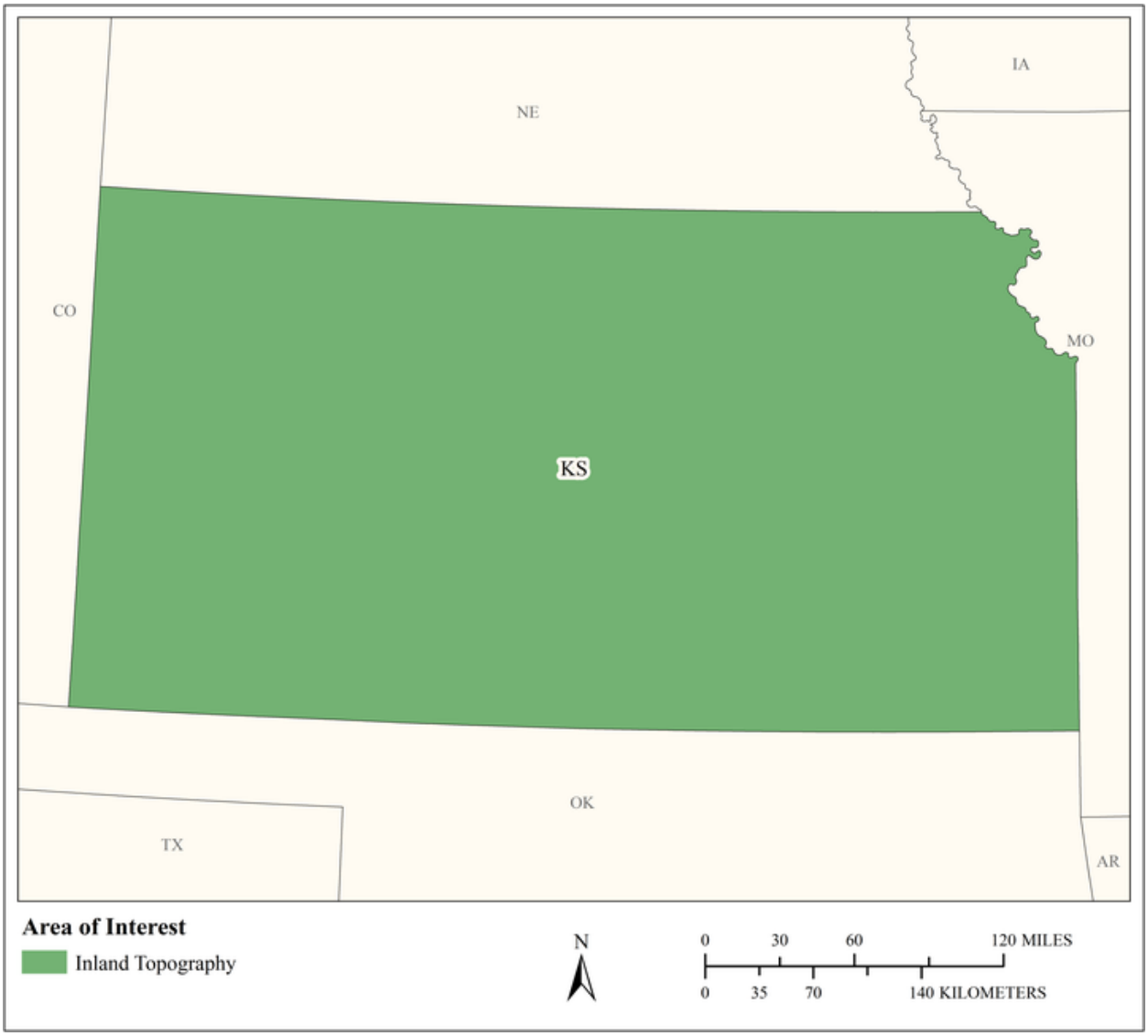
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Kansas Data Access and Support Center			
Other		Yes		
Other description		Various state websites		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Major	None		
Cost avoidance	Moderate	None		
Increased revenues	I don't know	None		
Mission-driven performance improvements	Moderate	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate		
Improved response or timeliness	Moderate	Moderate		
Improved customer experience	Moderate	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate		
Environmental	Major	Moderate		
Public safety, including life and property	Minor	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Minor	Unable to provide		Moderate	Unable to provide							
Increased revenues	I don't know	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$228,099		Annual dollars saved/ realized	$1,973,558						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness	Moderate	Unable to provide		Moderate	Unable to provide							
Improved customer experience	Minor	Unable to provide		Moderate	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$61,097		Annual dollars saved/ realized	$206,245						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate								
Education or outreach description	Ability to create more detailed maps for public presentation and information dissemination.			Could better educate communities and their leaders of their water supply future, allow more informed decision making process.								
Environmental	Major			Major								
Environmental description	Increased ability to identify sediment/nutrient source locations and areas with land changes.			Could better identify areas of infilling, loss of storage volume, and monitoring of nutrient rich sediments that could lead to increased harmful algal blooms. Calculating sediment starving of water bodies after reservoir construction.								
Public safety, including life and property	I don't know			Minor								
Public safety, including life and property description				Better flood mapping and hydrologic modelling potential.								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	1
Update frequency	3

MCA Title: Forest Resources Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Forest health assessment. Determination of standing inventory of forest resources. Prescribed burn planning. Analysis of carbon stocks for trade. Harvest systems planning.
MCA Title	Forest Resources Management
MCA ID	60183
Organization Type	State or U.S. Territorial government
Organization Name	State of Kansas
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Highly desirable			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

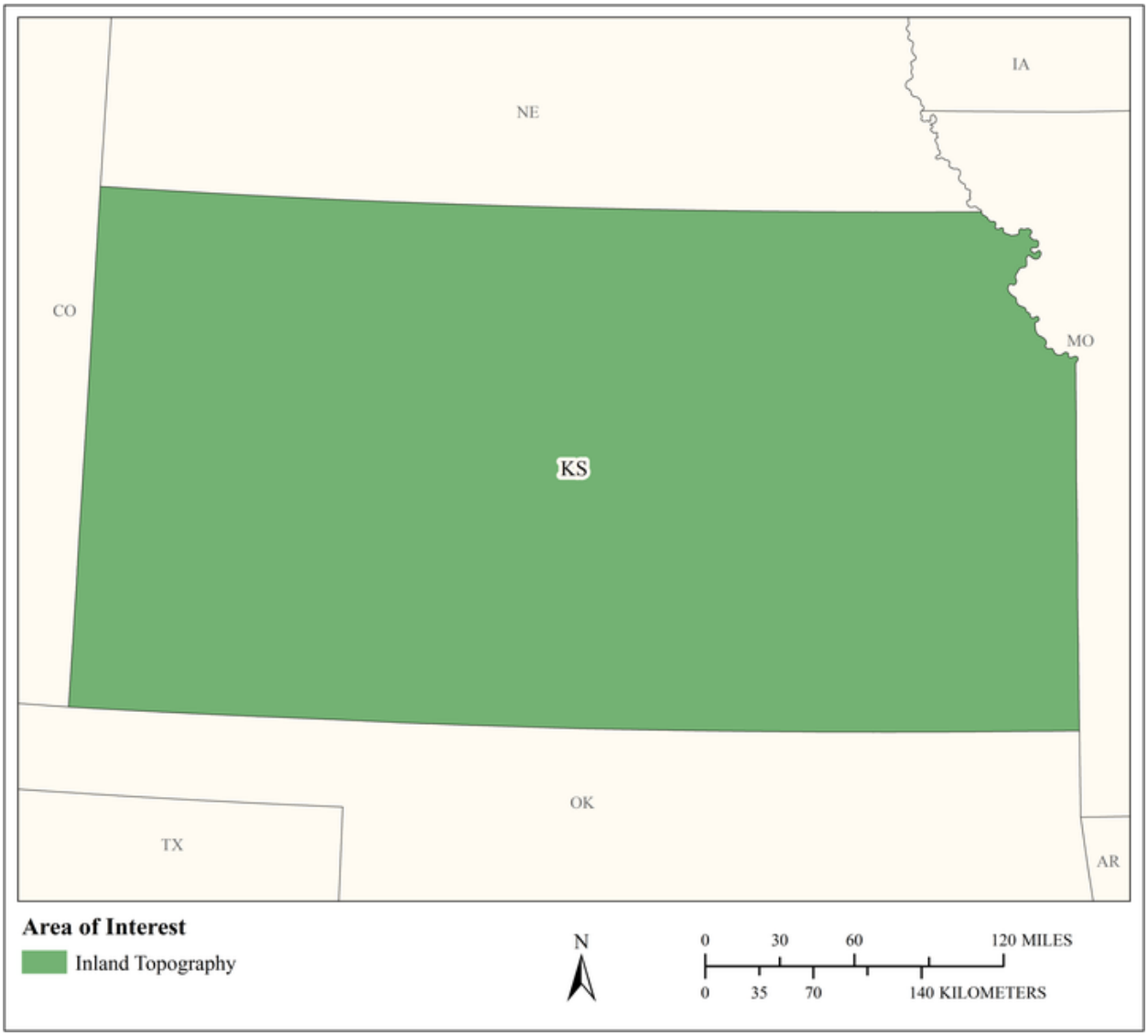
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$325,311									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$471,577									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Natural Resources Conservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation engineering. Soils and wetlands mapping and characterization. Modeling of biological and ecological systems. Erosion control. Rainfall penetration studies, impervious surfaces. Assessment of blue carbon stocks.
MCA Title	Natural Resources Conservation
MCA ID	60184
Organization Type	State or U.S. Territorial government
Organization Name	State of Kansas
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

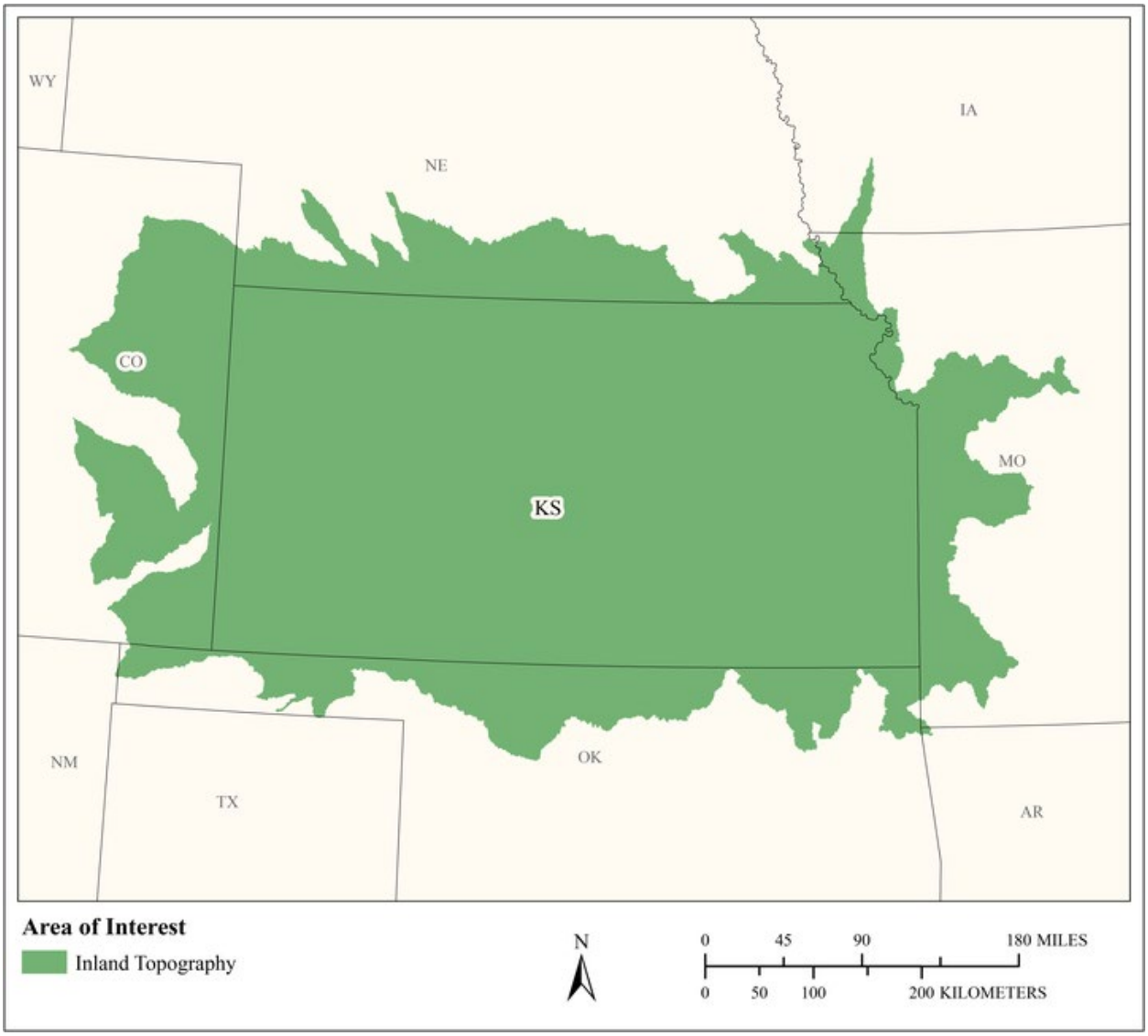
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$3,227,181									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$11,851,192									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic Mapping and Analysis



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more Hydrologic Units (HUC8s)			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Geologic mapping and analysis. Scientific research on landscape evolution, identification of geomorphic processes and units, geologic hazards, and the distribution and availability of geologic natural resources. Aquifer recharge and behavior. Assessment of groundwater availability, quality and quantity. Mapping geologic hazards, base mapping, supporting state map activities, and field collection. Drone collection of elevation data is being done for some stream bank stabilization projects.
MCA Title	Geologic Mapping and Analysis
MCA ID	21712
Organization Type	State or U.S. Territorial government
Organization Name	Kansas Geological Survey
Sub-Agency or Division	
Organization Mission	Research and outreach; Mission Statement is taken from legislative language establishing the KGS: "conduct geological studies and research and ... collect, correlate, preserve, and disseminate information leading to a better understanding of the geology of Kansas, with special emphasis on natural resources of economic value, water quality and quantity, and geologic hazards."
Program Name	Annual participation by Kansas in the USGS-funded STATEMAP geologic mapping program. Earthquake monitoring and seismic hazard assessment in south-central Kansas. Streambank stabilization assessment.
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 11 - Geologic Resource Mining and Extraction
Tertiary Business Use	BU 01 - Water Supply and Quality

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Ground fault, project areas require centimeter grade accuracy along stream corridors

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	6-10 years			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Depending on location, a combination of QL1 and QL2 LiDAR data has been collected for the state of Kansas. The standard set of product deliverables are raw LAS, classified LAS, bare earth DEM, first return DEM, intensity image, and hydro polygon and line features. Statewide QL3 available, QL2 coming statewide, 2 counties are pilots for QL1 (collected, not processed),			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				

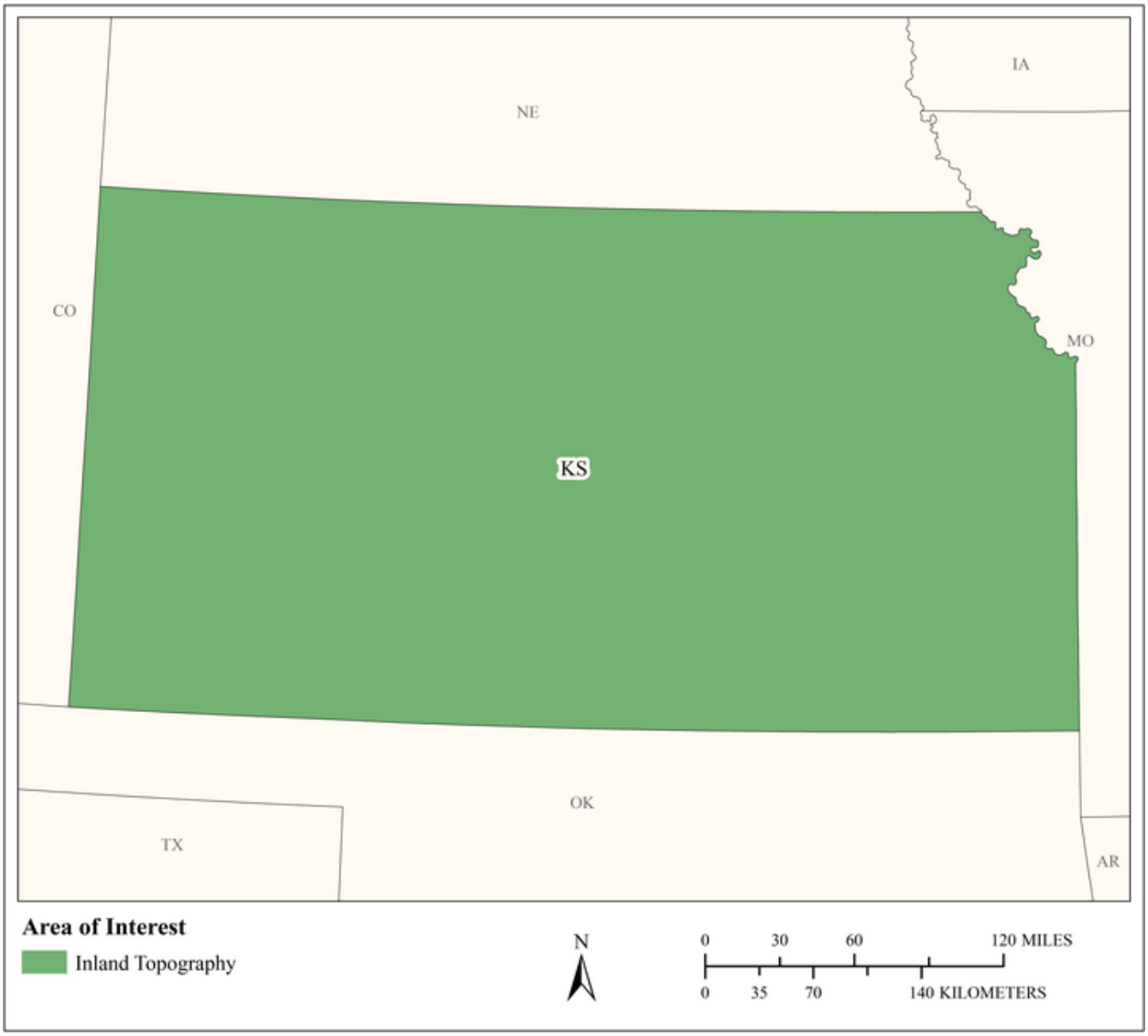
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Kansas Data Access and Support Center			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Moderate			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Cost savings/cost reduction	Minor	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	Moderate	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$17,368,048									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	I don't know	Unable to provide										
Improved customer experience	I don't know	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$304,896									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps				
Aspect maps				
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Renewable Energy Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Alternate energy development – solar, tidal, wind, wave, and ocean current. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Low head power potential for hydropower.
MCA Title	Renewable Energy Resources
MCA ID	60185
Organization Type	State or U.S. Territorial government
Organization Name	State of Kansas
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Not required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Minor			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor			

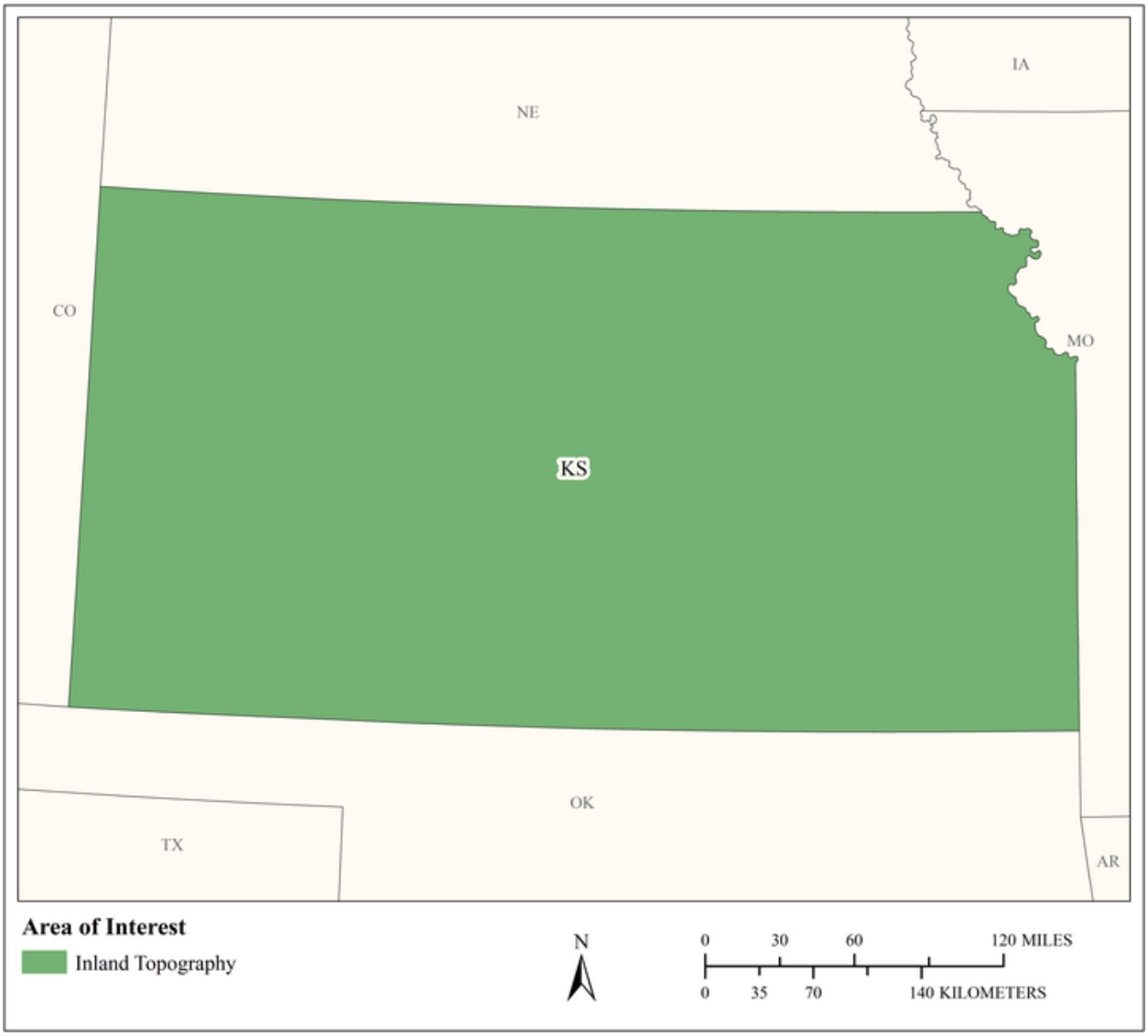
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	None											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Cultural Resources Preservation and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Discovery and analysis of underwater archaeological and historical cultural sites. Site protection and preservation planning. Discovery and analysis of Native American and other historical cultural sites and subsistence activities.
MCA Title	Cultural Resources Preservation and Management
MCA ID	60186
Organization Type	State or U.S. Territorial government
Organization Name	State of Kansas
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Nice to have					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have					
DEM for entire AOI needs to be seamless	Nice to have					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Moderate			
Cost avoidance	Minor			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			

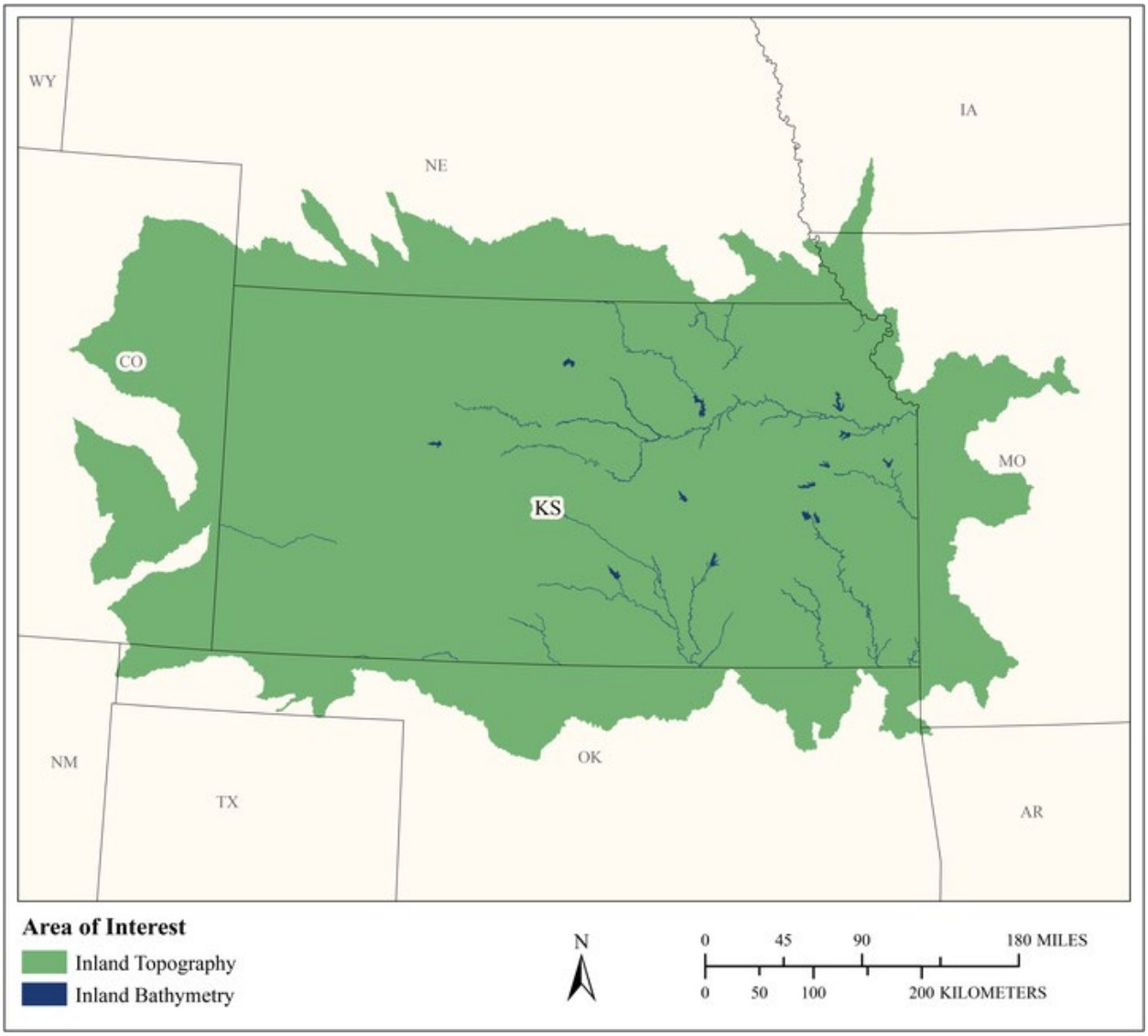
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Cost savings/cost reduction	Minor	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Moderate	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$15,080									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$13,185									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	Minor											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Flood Mapping and Surface Hydrology Research



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Highly desirable		
Geographic Area Requirements	One or more Hydrologic Units (HUC8s)	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Flood inundation and risk mapping, surface hydrology research (wetland mapping & assessment, lake/pond catchment and shoreline evaluations, erosion studies, etc.). Elevation data is the basis for the flood inundation library used for rapid flood mapping, and is needed for wetland mapping and assessment, calculating the waterbody shoreline grade for water quality and sedimentation analyses, and suitability analyses for wetland community establishment or restoration. Bathymetry is needed for erosion studies, mobilization and transport, reservoir sedimentation, and stream morphometry analyses. In addition to surface water-related uses for 3D data, we also heavily utilize vegetation structure and volume information typically determined by differencing DSM data from DTM data. There is great value provided by hydro-enforced data to 2D flood inundation modeling. Hopefully this aspect of data preparation will soon receive the attention it deserves and become a regular part of an enhanced, bare-earth lidar data preparation process.
MCA Title	Flood Mapping and Surface Hydrology Research
MCA ID	21702
Organization Type	State or U.S. Territorial government
Organization Name	Kansas Biological Survey, University of Kansas
Sub-Agency or Division	
Organization Mission	From http://biosurvey.ku.edu/about/overview: The Kansas Biological Survey is a KU research center with more than 50 scientists, including joint-appointment KU faculty, affiliated KU faculty, staff scientists, postdoctoral researchers and graduate students. Each semester we also engage 35-50 undergraduates directly as members of individual labs or as employees. The Survey also is a nonregulatory agency of the State of Kansas. In addition, we manage the University of Kansas Field Station, which covers more than 3,700 acres over four sites in northeastern Kansas. Our programs and activities meet mission-oriented goals relevant to state, regional, national, and global environmental and biological issues. The legislatively mandated mission of the Survey is to gather, by field census and other means, information on the kinds, distribution, and abundance of plants and animals; compile, analyze and interpret this information; and distribute this information. Our scope of activities has expanded over time to embrace both interdisciplinary and multi-investigator research initiatives that focus on a wide range of related activities, including: - holistic environmental analyses; - fundamental community and ecosystem ecology; - conservation and rehabilitation of ecosystems; - and remote sensing/GIS sciences (including systems analyses and data archiving). To complement our official state mission and expanded research activities, the Survey maintains an active role in traditional and public education, especially through the formal classes and research mentorship its scientists offer to undergraduate and graduate students at KU and through diverse activities at the KU Field Station. Survey scientists and staff also contribute to public outreach and service activities. While these activities focus on environmental issues important to the state of Kansas and Great Plains ecosystems, our scientific research extends to the Midwestern region, as well as national and global environments.
Program Name	Applied research and analysis of surface water quantity, quality, and environment for the benefit of the state and its citizens
Total Annual Program Budget	

Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 02 - Riverine Ecosystem Management
Tertiary Business Use	BU 01 - Water Supply and Quality

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Ideally we need to be able to identify the smallest features relevant to surface water storage and flow. For example, this includes things like culvert openings (to determine, at minimum, culvert presence), inlet & outlet structure locations, and the smallest of wetlands.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL4B		
Update Frequency	6-10 years	6-10 years		
Event type(s)				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 10 meters		
Acceptable Vertical Error	Up to 10 cm	Up to 60 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs		Partial		
Cross section/transect requirement		60 cm TVU would be great. Transect spacing will depend on the size of the feature. E.g. 100-200 m for large reservoirs (>1000 ac), 10-50 m for smaller reservoirs (<100 ac). For streams, transect spacing roughly equal to stream width would be a good starting point.		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Not required	
Entire AOI under same environmental conditions	Highly desirable	Nice to have			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level			Up to double the required TVU at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Nice to have	Highly desirable		
Classified point cloud	Highly desirable	Highly desirable		
Edited/cube XYZ		Highly desirable		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Nice to have		
Ground control/ground truthing	Nice to have	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Required		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Required	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	My state (KS) has complete LiDAR coverage consisting mostly of QL3 LiDAR collected during 2006-2014. An acquisition effort is underway to re-acquire LiDAR covering the majority of the state at QL2 and a county-sized test area at QL1; when complete, the entire state will have QL2 LiDAR. We work with LiDAR from other states as well, particularly from neighboring states (CO, NE, MO, OK) and also IA (which is in the same EPA region). In addition, we work across the country on a project-by-project basis utilizing best-available elevation for flood inundation library development. These data have included old NED data, IfSAR data (early 2000s), photogrammetrically-determined elevation (mostly from 1998), and LiDAR data of various ages (2003 being the oldest).	We currently use different kinds of bathymetry data. For waterbodies approximately > 10 ac in size, we use dual-frequency echosounder data to help identify current bottom and pre-impoundment bottom (so we can make inferences about sediment thickness and volume). Coring excursions are usually performed at the same time to provide depth spot-checks and to procure sediment samples for analysis. In small ponds we use a basic rod-based probe to measure both depth and sediment thickness. We have very little channel-bottom data for the state's many streams, but this information (especially if repeated over time) would be very useful for channel erosion and stream evolution studies that have implications for downstream reservoir sedimentation, which is a major problem in the Kansas.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	DASC in KS, MSDIS in MO, NE-DNR in NE, to name a few. When data are needed, we seek online resources but also reach out to appropriate parties or stewards to determine if better (or more conveniently accessed) data are available.	Mainly we use data we collect ourselves (Kansas Biological Survey), some of which are available through our data portal or through the Kansas Water Office reservoir data portal		
Other		Yes		
Other description		Personal communications with USACE, USBOR, And USGS		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	I don't know		
Cost savings/cost reduction	Moderate	I don't know		
Cost avoidance	Major	I don't know		
Increased revenues	Moderate	Major		
Mission-driven performance improvements	Major	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		
Improved response or timeliness	Major	Major		
Improved customer experience	Major	Major		

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major		
Environmental	Major	Major		
Public safety, including life and property	Major	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$18,090	Major	Annual dollars saved/realized	$19,296						
Time savings description	Discovery of data errors is meticulous, time-consuming, and annoying, especially midway through a project/process and a restart is warranted. Seamless data would save substantial time with data merge and QA; hydro-flattening and hydro-enforcement (if done well) are huge time-savers with regard to data preparation for surface flow studies. Occasionally we receive outside requests for information that greatly benefit from high quality elevation data. Difficult to estimate because site visits & surveys are expensive in time and money and would preclude much of the work we do now. Increased data accuracy, seamlessness, and dependability will improve efficiency of model development and execution, and also lead to outreach products that have better face value (more informative and less questionable). Project planning & specification is much more efficient because data availability and accuracy concerns would be minimized.			This could be more or less significant, depending on the parameters of the FUTURE data products. Map development and GIS data analysis currently conducted in-house. If someone else is developing the data, then we do not have to plan for these activities. Currently we do most of our own bathymetric survey work, mostly in support of state priorities for inventorying surface water quantity and quality. This could be more or less significant, depending on the quality of the FUTURE data products.								
Cost savings/cost reduction	Minor	Unable to provide		Major	Annual dollars saved/realized	$100,000						
Cost savings/cost reduction description	This category likely will become more relevant to us in the future, as we expect to get further involved with pond/wetland/channel/floodplain modification or restoration projects. Due to high costs, we typically avoid projects necessitating new data development using aerially-collected elevation data at a scale beyond UAV practicality.			This value is approximate, meant to account for contributed internal funding beyond our typical annual project revenues. This value approximately represents upkeep/upgrade costs of equipment and software we maintain in support of bathymetric mapping.								
Cost avoidance	I don't know	Unable to provide		Minor	Annual dollars saved/realized	$10,000						
Cost avoidance description	End-users of our inundation maps could experience savings of this nature, but we are unable to pinpoint an amount. Not applicable to the work we do. See "Time Savings", which could be converted to "Cost Avoidance" (generally we would do all this work in-house).			Since we do our own bathymetric mapping & data processing, this savings applies only to external datasets that we acquire. We typically do not deal with these kinds of costs.								
Increased revenues	Major	Annual dollars saved/realized	$150,000	Moderate	Unable to provide							
Increased revenues description	Potentially useful for vegetation height & volume inventory (if have both DSM & DTM) and estimation of agricultural aptitude (via slope information). Based on recent projects & services, LiDAR data have opened multiple new mapping & modeling opportunities for us. Not applicable to the work we do.			New pure and applied research opportunities will be opened up with new data.								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							

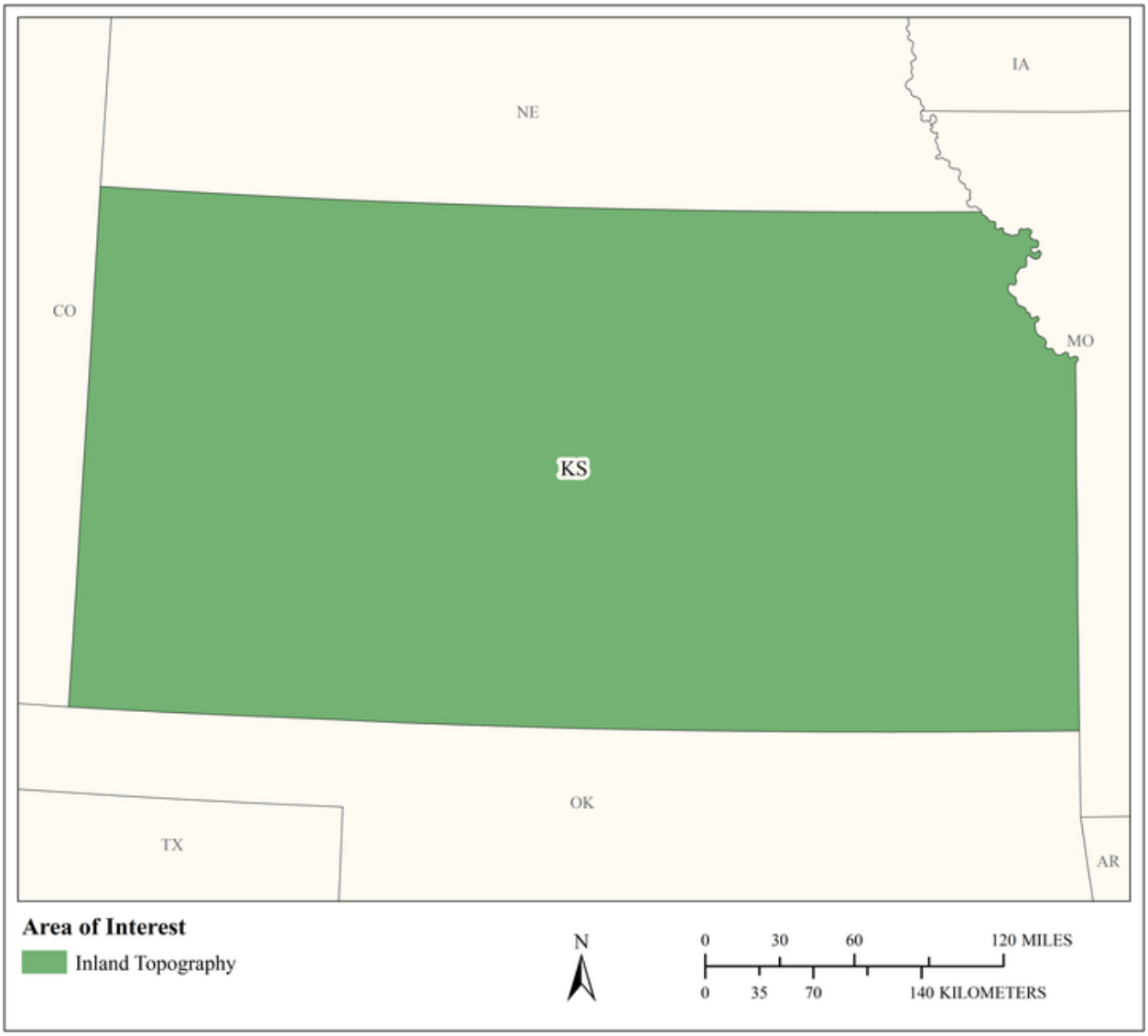
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Mission-driven performance improvements description	Vastly improved our inundation mapping, wetland identification, and other surface hydrologic analyses. More complete and accurate data products, and also higher-confidence conclusions and recommendations.			Regularly collected, standardized bathymetry data over more waterbodies and streams than we currently monitor will allow for the development of better sedimentation models and more effective sediment management strategies.								
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Value added to products or services description	Emergency management savings from improved flood mapping tools; new tools for holistic watershed management that provide improved capability for location optimization for conservation treatments. Emergency management savings from improved situational awareness; high H&V resolution permit more detailed and precise studies of watershed characteristics.			Repeated bathymetric data will allow us to better quantify in situ changes to topography below surface waters, which will be particularly useful for prioritization of potential remediation sites. Sport fishermen will benefit from more current, accurate, and widely available bathymetry, which could be accessed and disseminated through our web mapping services and applications and data portal.								
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness description	Improved accuracy and timeliness of inundation maps improves emergency response efficiency. Optimal site prioritization for holistic watershed assessment will maximize the impacts of conservation activities. Wetland and watershed maps and assessments, which we develop, are more accurate and defensible. Obvious benefits in rapidly changing systems, such as those including new or modified built structures as well as natural environments such as shifting stream channels. Trustworthy data can be depended upon for providing a common operating picture (everyone using the same good information). Improved damaged area assessments will facilitate more accurate estimation when applying for FEMA assistance.			End users will be better served with more comprehensive and more up-to-date standardized, bathymetry data. In the event of a spill emergency into the drainage system, better knowledge of underlying topography should help with response and recovery efforts. More comprehensive and more frequent standardized data will improve our understanding of sedimentation dynamics, which will improve subsequent mitigating actions. End users will be better served with more comprehensive and more up-to-date, standardized bathymetry data. If repeat time for survey is more frequent than our current data, we will better be able to relate sedimentation dynamics to streamflow hydrology. More timely assessments of reservoir sedimentation rates and patterns should both promote and expedite proposed remediation efforts.								
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Improved customer experience description	Web map services and applications gain increased functionality (and generally become more useful) with better & faster-accessed data. Better inundation mapping will lead to increased opportunities. New tools will support high-detail examination of surface drainage/flow characteristics, allowing for a more thorough examination & optimization of conservation opportunities.			Standardized data products of better quality than we are accustomed to will result in greater use of these data. With better data will come greater interest, giving us opportunities to enhance our current web services and applications to meat end-user needs. Faster, centralized, and more comprehensive data will promote greater interest and use of these data.								
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Education or outreach description	More can be communicated, and it can be communicated better			A more informed public will make better decisions regarding the short and long-term health of the their surface water supply								
Environmental	Major			Major								

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Environmental description	These data allow for large-scale monitoring and evaluation projects previously not possible or prohibitively expensive	With better bathymetry data comes better sediment management, which will help extend the usable lifetime of our reservoirs and thus provide increased stability to reservoir ecosystems		
Public safety, including life and property	Major	Major		
Public safety, including life and property description	These data allow for more accurate and dependable inundation mapping, substantially improving emergency response efforts	With better bathymetry data comes better sediment management, which improves both public water quantity and quality		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Flood Risk Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Flood risk modeling and mapping of riverine and coastal areas. Dam/dike/levee safety analysis. Emergency management. Flood forecasts.
MCA Title	Flood Risk Management
MCA ID	60695
Organization Type	State or U.S. Territorial government
Organization Name	Kansas Department of Agriculture
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

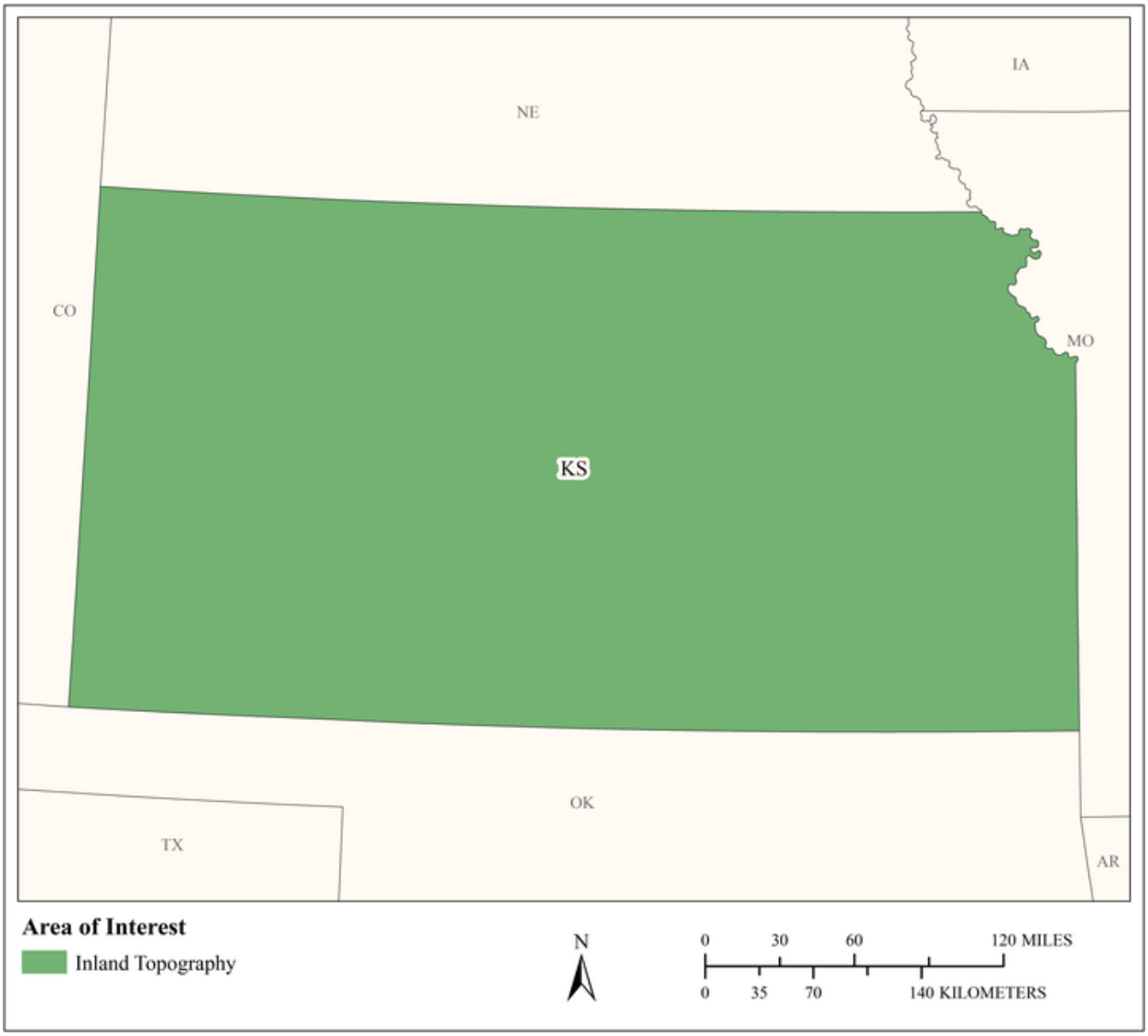
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Moderate											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Highway Safety Improvement Planning and Airspace Protection



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	We support most of the items on this list other than those that involve the Coast or the Ocean. Lidar data can be used to calculate the grade on road surface to identify vertical curvature, which affects speed limits, signage requirements, regrading needs, and restrictions on roads. The standard for 3D data for transportation Right-of-Ways (ROWs) is more restrictive than that for flood modeling. Lidar can also be used to ensure clear zones in the ROW, identify trees or other obstructions in the ROW. For statewide planning initiatives, lidar can be used to identify widening obstacles such as needed ROW acquisition or structures that would prevent widening. Within the airspace, lidar can be used to identify airspace obstructions near airports and air ambulance sites. Planning activities can be done using lidar, but design and construction require survey grade elevation data. Inland bathymetry is typically self-collected as needed for projects. BU 29 – Military would be an additional Business Use.
MCA Title	Highway Safety Improvement Planning and Airspace Protection
MCA ID	22121
Organization Type	State or U.S. Territorial government
Organization Name	Kansas DOT
Sub-Agency or Division	
Organization Mission	To provide a statewide transportation system to meet the needs of Kansas.
Program Name	Many various evolving Transportation Programs - MAP21, SAFETEA, and sub-programs for National Highway System, TRB, AASHTO and FHWA.
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 23 - Urban and Regional Planning
Tertiary Business Use	BU 21 - Aviation Navigation and Safety

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required
Other	Required
Other description	Traffic Controls and Pavement Markings

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Cracks in pavement

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI	Right of Way and clear sight zone more frequently as needed for projects			
Acceptable Horizontal Error	Less than 20 cm			
Acceptable Vertical Error	Less than 5 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Required					
Other	Required					
Other description	An AOI = a highway ROW or 20 mi from an airport statewide					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required			
Ground control/ground truthing	Required			
Other	Required			
Other description	Object Recognition and feature extraction			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	LiDAR data available in Kansas, Dates and quality levels vary but its mostly level 2.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				

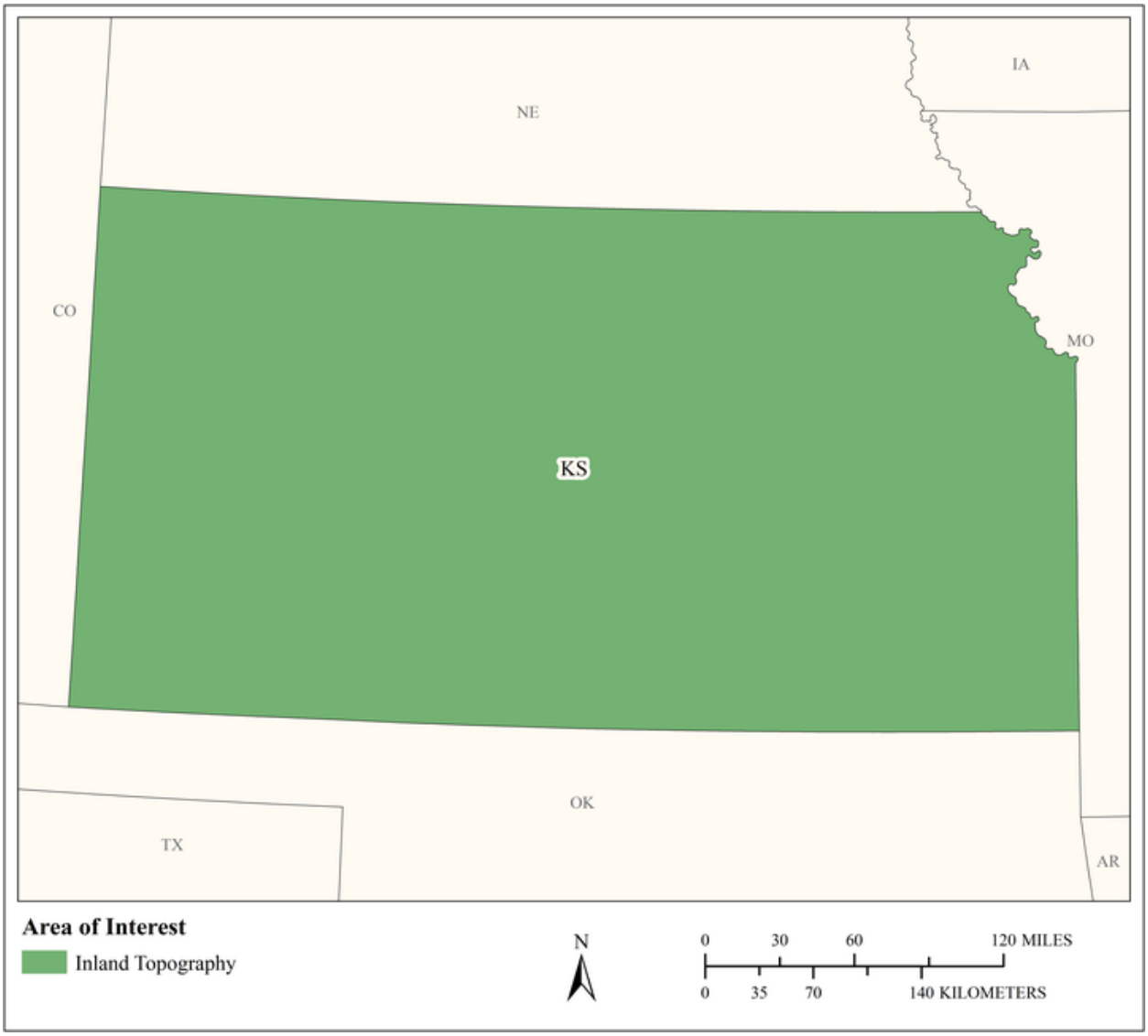
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	DASC			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Minor			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Moderate			
Public safety, including life and property	Moderate			
Other Current Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other	Major			
Other description	UAS Program, Highway Technology			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Moderate											
Public safety, including life and property	Moderate											
Other												
Other benefits	Minor											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Transportation System Planning and Design



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Geologic mapping and analysis. Sinkhole mapping, monitoring, and analysis. Identification of geomorphologic units. Landslide hazard mapping and assessment. Karst mapping, including springs and caves. Bridge design, construction and maintenance. Stormwater modeling. Road infrastructure design, construction and maintenance. Cut and fill analysis for earth-moving. The Kansas DOT is responsible for the state's highways, railroads, and airports. Lidar can be used for transportation planning and preliminary design. Actual construction requires survey grade elevation data. Elevation data are used for H&H modeling and identification of bridge scour. Lidar can also be used to analyze aviation airport approaches and clearances. Analysis of railroad grade crossings and their slope may require field surveys.
MCA Title	Transportation System Planning and Design
MCA ID	22399
Organization Type	State or U.S. Territorial government
Organization Name	Department of Transportation, Kansas
Sub-Agency or Division	
Organization Mission	The mission statement for KDOT is to provide a statewide transportation system to meet the needs of Kansas.
Program Name	Highway Program.
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 21 - Aviation Navigation and Safety
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Roadway surface.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	6-10 years			
Event type(s)				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI	Urban areas need more frequent updates – not sure how much more frequent			
Acceptable Horizontal Error	Less than 20 cm			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial			
Cross section/transect requirement	Cross sections every 100-500 Feet.			

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Not required					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Highly desirable			
Landmark features	Not required			
Cultural resources	Not required			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Ql3/QL2 lidar, self-collected field survey data			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Aerial photography and roadway view photography.			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	None			

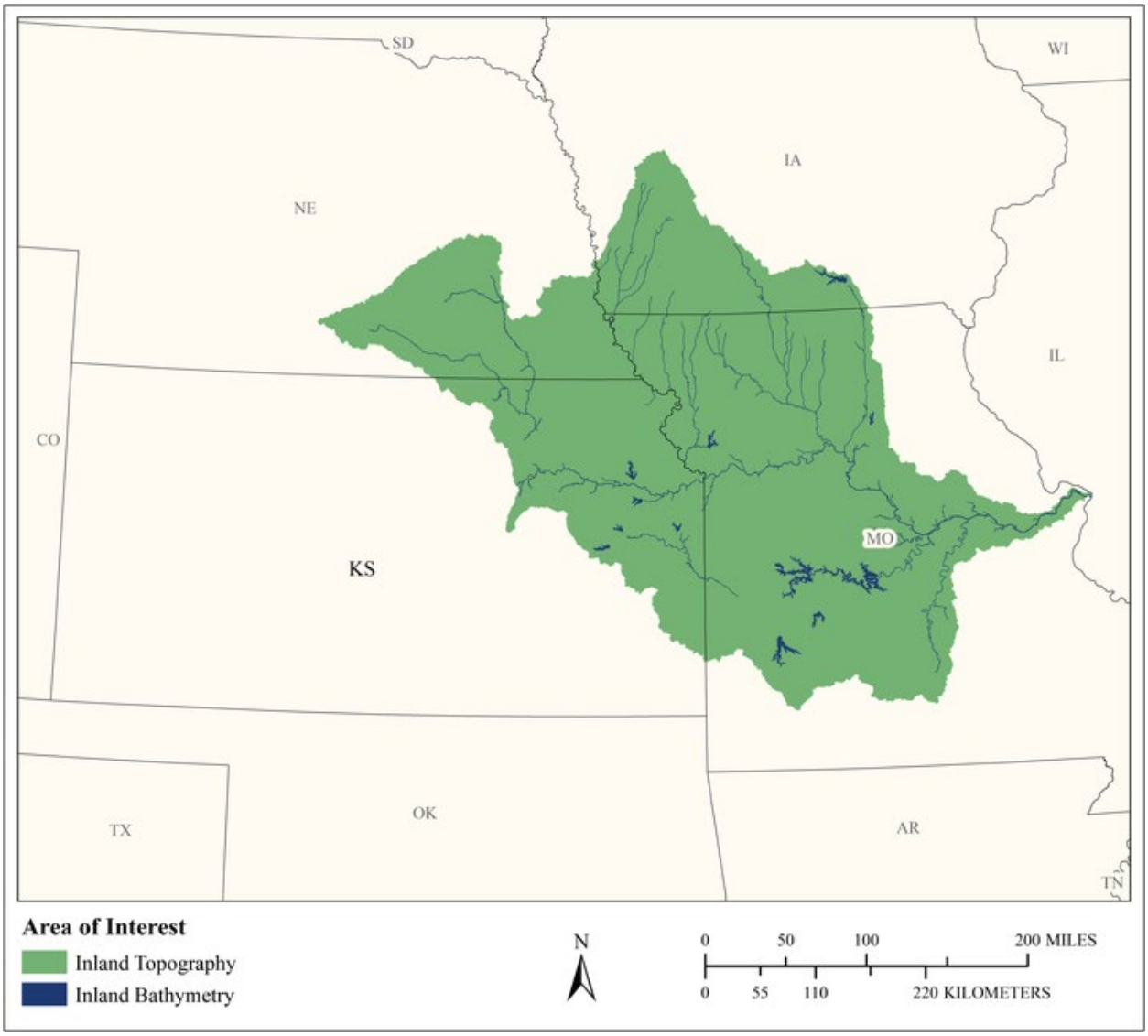
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			
Improved response or timeliness	Moderate			
Improved customer experience	None			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Moderate			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide										
Cost savings/cost reduction	I don't know	Unable to provide										
Cost avoidance	I don't know	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	I don't know	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide										
Improved response or timeliness	I don't know	Unable to provide										
Improved customer experience	I don't know	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	1
Update frequency	3

MCA Title: Urban and Regional Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)	One or more Hydrologic Units (HUC4s)		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	9-1-1 / Public Safety Support, Transportation Planning, Hazard Mitigation.
MCA Title	Urban and Regional Planning
MCA ID	21622
Organization Type	Regional, County, City, or other local government
Organization Name	Mid-America Regional Council
Sub-Agency or Division	
Organization Mission	Who we are: MARC is a nonprofit association of city and county governments and the metropolitan planning organization for the bi-state Kansas City region. Governed by a Board of Directors made up of local elected officials, we serve nine counties and 119 cities. We provide a forum for the region to work together to advance social, economic and environmental progress. MARC is funded by federal, state and private grants, local contributions and earned income. A major portion of our budget is passed through to local governments and other agencies for programs and services. What we do The Mid-America Regional Council promotes regional cooperation and develops innovative solutions through leadership, planning and action. Leadership Identify regional challenges and act as a problem-solving forum. Promote consensus and commitment to regional solutions. Educate and engage the public in decision-making processes. Planning Coordinate policies that guide progress in the region. Develop regional plans for transportation, the environment, emergency response and more. Conduct research and provide technical support to local leaders. Action Advocate for regional issues at the state and federal levels. Provide cooperative services between local governments. Allocate resources for regional systems. Our Planning Framework In 2009, the MARC Board of Directors adopted a Strategic Planning Framework to guide MARC's work. The framework includes a regional vision, key sustainability principles and program goals for environment, transportation, community development, education, public safety, community services and effective government. MARC also developed strategies for each of these program goals Our Regional Vision "Greater Kansas City is a sustainable region that increases the vitality of our society, economy and environment for current residents and future generations."
Program Name	Mid-America Regional Council
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 22 - Infrastructure and Construction Management
Tertiary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Houses, buildings. Lidar classified point cloud, DEM, DTM

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Required			Required	
Entire AOI under same environmental conditions	Required	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Required	Required		
Classified point cloud	Required	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Nice to have		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required	Required		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required	Not required		
Land use/land cover	Required	Highly desirable		
Wetlands	Highly desirable	Nice to have		
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Nice to have		
Coastal and riverine structures	Not required	Not required		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL 2 Spring 2018	QL 2 Spring 2018		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	http://msdis.missouri.edu/ https://kansasgis.org/			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Moderate		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Minor	Major		

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Increased revenues	Minor	Minor		
Mission-driven performance improvements	Moderate	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor		
Improved response or timeliness	Minor	Moderate		
Improved customer experience	Moderate	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate		
Environmental	Minor	Moderate		
Public safety, including life and property	Minor	Major		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Minor	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide							
Increased revenues	Minor	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			I don't know								
Environmental	Minor			I don't know								
Public safety, including life and property	Moderate			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades				
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes	Yes		
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

Kentucky

Current status of elevation data for Kentucky

Kentucky has complete coverage of lidar-derived elevation data and 18 counties were reacquired in spring of 2019. Nearly two-thirds of the commonwealth has Quality Level 2 (QL2) data and the remainder is QL3. Over 20 Program Partners have contributed to the effort since its inception. The Kentucky Office of IT Architecture and Governance Commonwealth Office of Technology GIS Branch has taken on the leadership role for the planning, contractual requirements, data storage, distribution, and publication for lidar data statewide. More information regarding Collaboration Partners and Program Status Maps can be found at https://kyfromabove.ky.gov

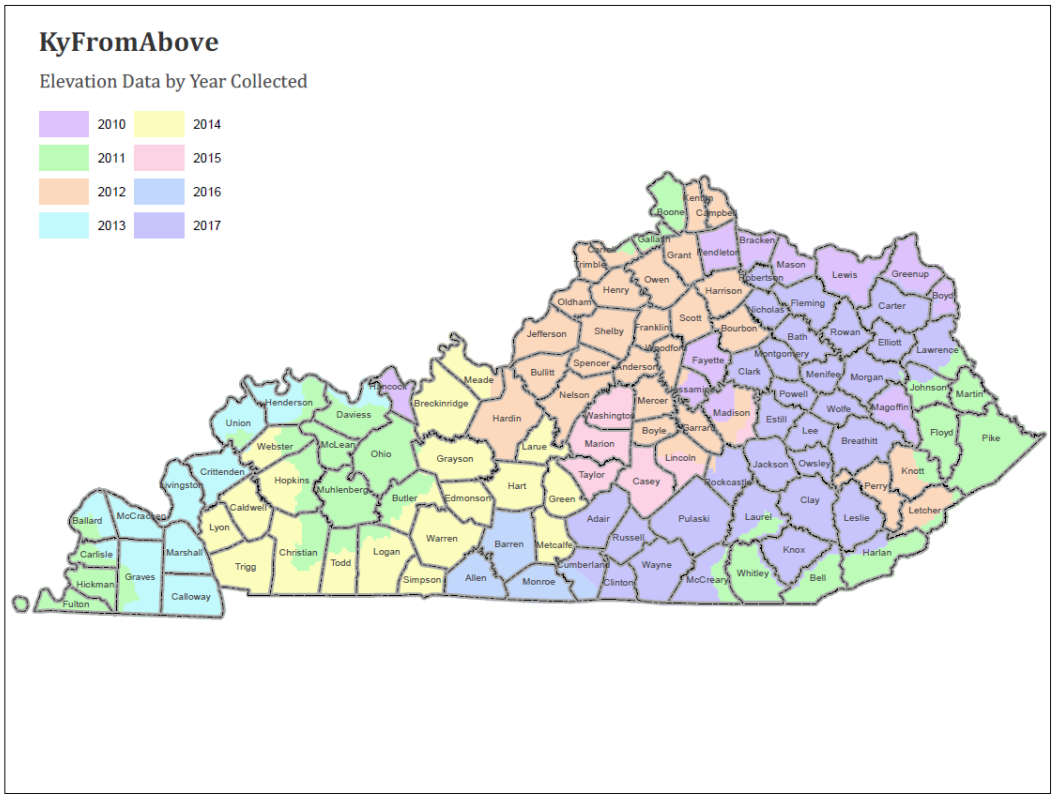


Figure 1. Kentucky From Above Lidar Program Status Map

Importance of elevation data to Kentucky

The agencies that benefit from lidar is detailed in the following document: https://kygeonet.ky.gov/kyfromabove/pdfs/AgencyUses.pdf

This document is a compilation of agency uses that was prepared early during the tenure of the KyFromAbove effort. A variety of state, local, and federal entities contributed. It has been used several times as a justification for lidar acquisition funding. As noted, dollars are saved, and efficiencies are gained through the use of lidar-derived elevation data at all levels of government.

The following paragraphs are examples taken from the Kentucky From Above benefit document:

Kentucky Height Modernization

The goal of the Kentucky Height Modernization project is to "provide a reliable and accurate infrastructure for elevation data that meets the needs of a broad spectrum of users and applications." Continuously Operating GPS Reference Stations (KY-CORS) provides the framework for lidar to accurately reference flight paths and perform data calibration. Lidar is a mature technology. With a modern geodetic control network in place Kentucky has the ability to create an accurate elevation model, meeting the needs of the commonwealth.

Kentucky Infrastructure Authority

The development of high-resolution elevation data will be of tremendous benefit to projects for which the Kentucky Infrastructure Authority provides funding resources. Current elevation data derived from lidar technology will be of the resolution and accuracy required to support all but the most demanding planning, design and construction purposes. With respect to water projects elevation data can be used to model variations in water line pressure due to topography, thus facilitating optimum locations for pressure reducing valves and pumping stations, as well as determining critical design parameters for water tanks. On the wastewater side elevation data play a critical role in determining optimum locations and alignments for gravity-based sewer lines and appurtenances.

Kentucky Parks

Obtaining new imagery and elevation data is vital to the personnel of State Parks. Many of our in-house park engineers and architects are working on numerous projects throughout our "off the beaten path" state park system. It is extremely difficult to see or even visualize existing structures as well as proposed facilities at all the 52 parks. The ability to have accurate elevations will provide the answer to many common questions and will increase workflow as projects develop. For example, accurately mapping an elevation for a new water front cabin within the confines of U.S. Army Corps of Engineers elevation regulations.

USDA – Natural Resources Conservation Service State Office

High-resolution lidar elevation data are a priority need for NRCS statewide. Lidar data provide accurate elevations to delineate slope classes for compiling and updating the digital Soil Survey Program and is used for performing flood hazard/breech analysis on approximately 100 high-hazard dams PL-566 Small Watershed Program.

Kentucky Transportation Cabinet

A lidar-based elevation model is a key pillar in the Transportation Cabinet's effort to update and streamline our project development business. With a detailed elevation model, the Transportation Cabinet can save significantly in the initial project design phase and have much more accurate cut and fill estimates. It can also be used in environmental areas for development of improved viewshed analysis of National Register properties and probability models for threatened and endangered species.

Kentucky Office Surface Mining

Division of Mine Permits - Topographic maps, elevation models and aerial photography are critical elements for the evaluation of mining and reclamation plans reviewed and regulated by Division of Mine Permits. The review process incorporates aerial digital imagery and topographic maps into a GIS and checks for applicants to meet state and federal standards as required by the federal Surface Mining Control and Reclamation Act of 1977 (SMCRA). The modernization of out-of-date elevation

data with statewide lidar is vital for developing mine plans and the continuous update of topographic maps and other elevation products.

Division of Mine Reclamation and Enforcement – using updated, highly accurate lidar-based elevation models inspectors can accurately determine if the mines are being reclaimed and mined according to their approved plans.

Kentucky Division of Forestry

Lidar data holds the most promise for the Division of Forestry to be able to measure forest canopy heights and subcanopy as aboveground biomass, as well as providing critical information about the function and productivity of the commonwealth's forest. The most immediate need for these data is revealed in the intent of nation's pursuit of biomass as a potential fuel source. The acquisition of lidar and co-registered high-resolution aerial photography (including a crucial fourth near infrared band) data for Kentucky would be essential to the Division of Forestry for providing metrics to the public, so that both sustainable forest practices and renewable energy from woody biomass could be accomplished.

Kentucky Geological Survey

Detailed topographic data such as that available through lidar technology provides a fundamental advancement in the ability to delineate landforms and identify subtle or large landforms in circumstances where access is limited. There is an increasing demand for utilizing information from lidar, especially in geologic applications, because of its exceptional accuracy over other elevation and terrain model data sets. The Kentucky Geological Survey can use lidar for highly detailed virtual inspection of slope geomorphology and landslide activity for landslides hazards mapping. Providing the public, local government, and state offices with information about slope stability, existing landslide activity, highly susceptible areas, and high-risk areas because of slope movement is vital in landslide hazard mitigation.

High-level summary of elevation data requirements

It has been determined by a wide range of users that QL3 data are acceptable for many applications but that QL2 data do provide more value in western Kentucky where the change in elevation is minimal and flooding impacts farmland. There are very few areas in the commonwealth where coniferous forest cover is dense thus acquisition during the leaf-off season yields ample ground points. The technical advisory committee members have determined that QL2 data meet most everyone's needs at this time. More information about the KyFromAbove lidar specifications can be found at https://kyfromabove.ky.gov. Higher resolution elevation data (QL1 HD) could potentially benefit users that have a need for more precise, site specific data for projects that require a Class A property survey. Inland bathymetry is required at QL1B. Topography and bathymetry data should be updated every 4-5 years to meet most user requirements.

The Commonwealth of Kentucky has a variety of requirements for high-quality elevation data. These Mission Critical activities include:

- Surface and Ground Water Quality, Water Supply and Riverine Ecosystem Management;
- Riverine Navigation and Management;
- Forest Resource Management;
- Geologic Mapping/Assessment, Mining and Extraction;
- Flood Risk Management;
- Urban and Regional Planning;

- Infrastructure Management;
- Land and Aviation Management;
- Homeland Security; and
- Military Management.

Kentucky's Public Outreach Sites

Kentucky From Above Lidar Elevation Story Map

https://kygeonet.maps.arcgis.com/home/item.html?id=57c751fc499c4adfb8598717459446ba

Kentucky Lidar Point Cloud Data Web Map

http://kygeonet.maps.arcgis.com/home/item.html?id=b5ff91df6309491090c20333c8f58f52

Kentucky DEM Web Map

https://kygeonet.maps.arcgis.com/home/item.html?id=785e6040154e4050bda80049fc12d4a6

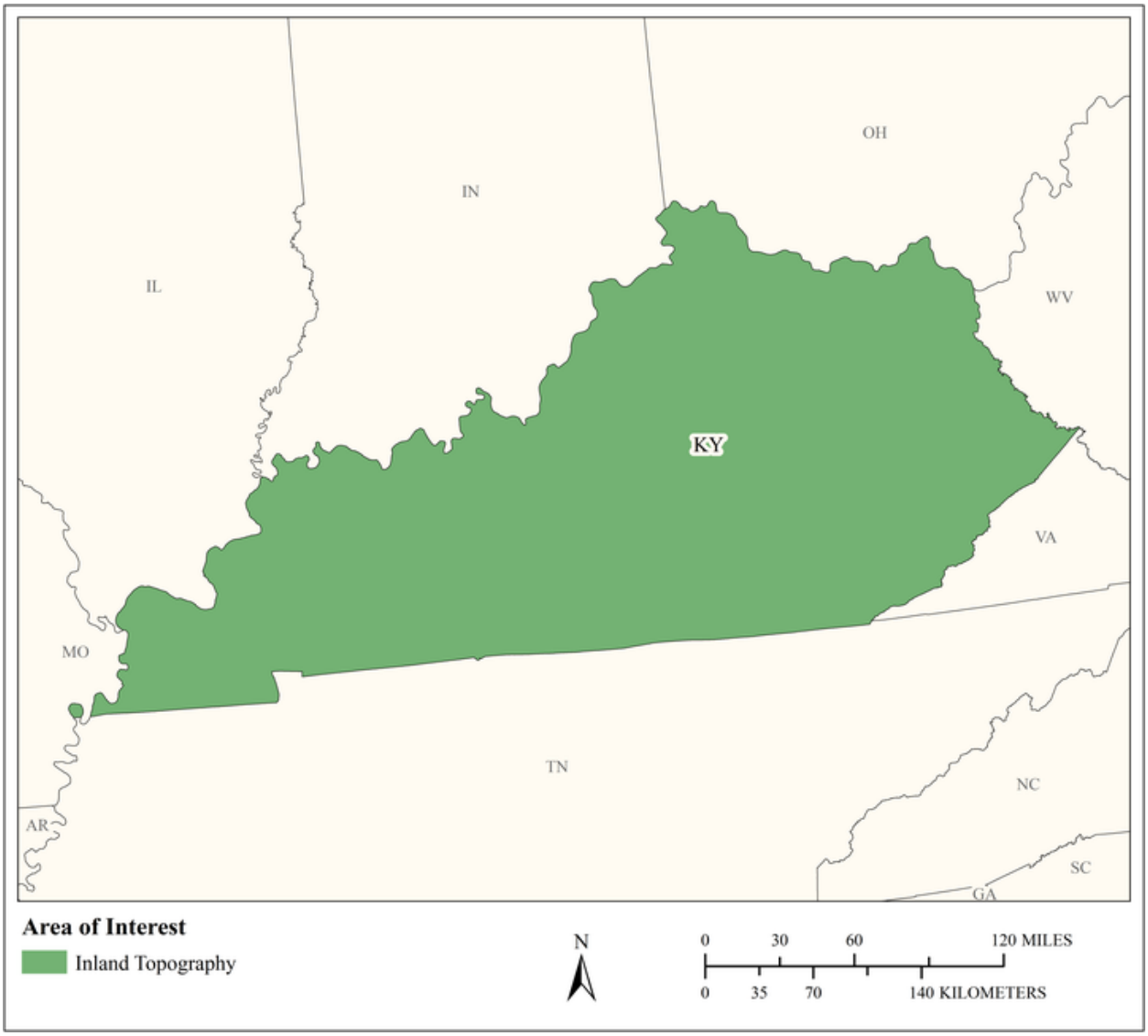
The Commonwealth of Kentucky has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	Commonwealth of Kentucky	60187	Water Supply and Quality	Inland Topo	QL2	4-5 years	$224,056	$60,014	Moderate	Major	Moderate
BU 02 – Riverine Ecosystem Management	Commonwealth of Kentucky	60188	Riverine Ecosystem Management	Inland Topo	QL1 HD	6-10 years	$61,852	$6,178	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$32,926	$2,321	Major	Major	Major
BU 04 – Forest Resource Management	Commonwealth of Kentucky	60189	Forest Resources Management	Inland Topo	QL1	2-3 years	$159,772	$231,609	Major	Major	Major
BU 10 – Geologic Assessment	Commonwealth of Kentucky	60190	Geologic Assessment and Hazard Mitigation	Inland Topo	QL1	4-5 years	$8,530,104	$149,745	Major	Major	Major
BU 11 – Geologic Resource Extraction	Commonwealth of Kentucky	60191	Geologic Resource Mining and Extraction	Inland Topo	QL1 HD	2-3 years	$9,870	$6,547	Minor	Major	Major
BU 15 – Flood Risk Management	Commonwealth of Kentucky	60192	Flood Risk Management	Inland Topo	QL2	4-5 years	$5,673,775	$992,733	Major	Moderate	Major
				Inland Bathy	QL1B	4-5 years	$394,139	$442,517	Moderate	Moderate	Major
BU 18 – Homeland Security	Commonwealth of Kentucky, Commonwealth Office of Technology, GIS Branch	1151	Statewide Geospatial Data Coordination and Support	Inland Topo	QL2	4-5 years	$6,000,000 to $9,000,000	Unable to quantify	Moderate	Moderate	Moderate
BU 19 – Land Navigation	Commonwealth of Kentucky	60193	Land Navigation and Safety	Inland Topo	QL0	2-3 years	$523,484	$42,273	Minor	Major	Major
BU 20 – Marine and Riverine Navigation	Commonwealth of Kentucky	60194	Marine and Riverine Navigation and Safety	Inland Topo	QL0 HD	2-3 years	$1,548,031	Unable to quantify	None	None	Minor
				Inland Bathy	QL0B	2-3 years	$737,108	$97,012	Moderate	Moderate	Moderate
BU 21 – Aviation Navigation	Commonwealth of Kentucky	60195	Aviation Navigation and Safety	Inland Topo	QL1 HD	Annually	$136,607	$170,139	Minor	Moderate	Moderate
BU 22 – Infrastructure Management	Commonwealth of Kentucky	60196	Infrastructure and Construction Management	Inland Topo	QL0 HD	4-5 years	$1,816,006	$5,344,141	Minor	Moderate	Major
				Inland Bathy	QL0B	4-5 years	$611,841	$63,532	Minor	Moderate	Moderate

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 23 – Urban and Regional Planning	Commonwealth of Kentucky	60197	Urban and Regional Planning	Inland Topo	QL1	4-5 years	$10,872,708	$1,255,259	Moderate	Major	Major
BU 29 – Military	Commonwealth of Kentucky	60198	Military	Inland Topo	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

MCA Title: Water Supply and Quality



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Fate and transport of contaminants. Pollution risk mitigation. Runoff and sedimentation analyses. Point- or non-point source pollution modeling. Management of contaminants and marine debris - point, non-point, vessel, and atmospheric pollution; spills; trash.
MCA Title	Water Supply and Quality
MCA ID	60187
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Kentucky
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

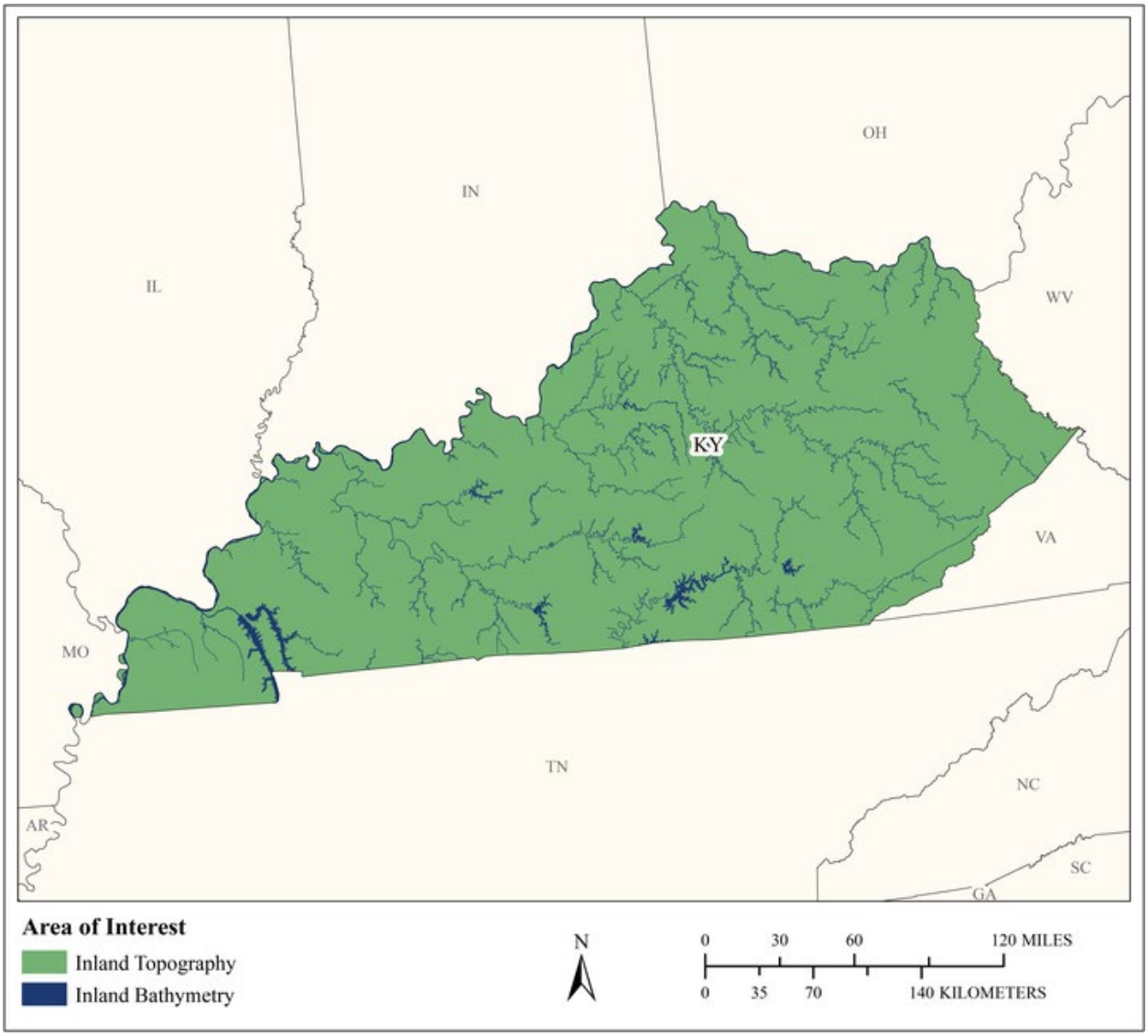
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$224,056									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$60,014									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Major											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Riverine Ecosystem Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Stream channel analysis and mapping. Stream bank erosion analysis. Aquatic and terrestrial species habitat management. Environmental management.
MCA Title	Riverine Ecosystem Management
MCA ID	60188
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Kentucky
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B		
Update Frequency	6-10 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Required			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Required	Highly desirable		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Highly desirable	Nice to have		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Moderate	Minor		
Cost avoidance	Moderate	None		
Increased revenues	None	None		
Mission-driven performance improvements	Major	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		

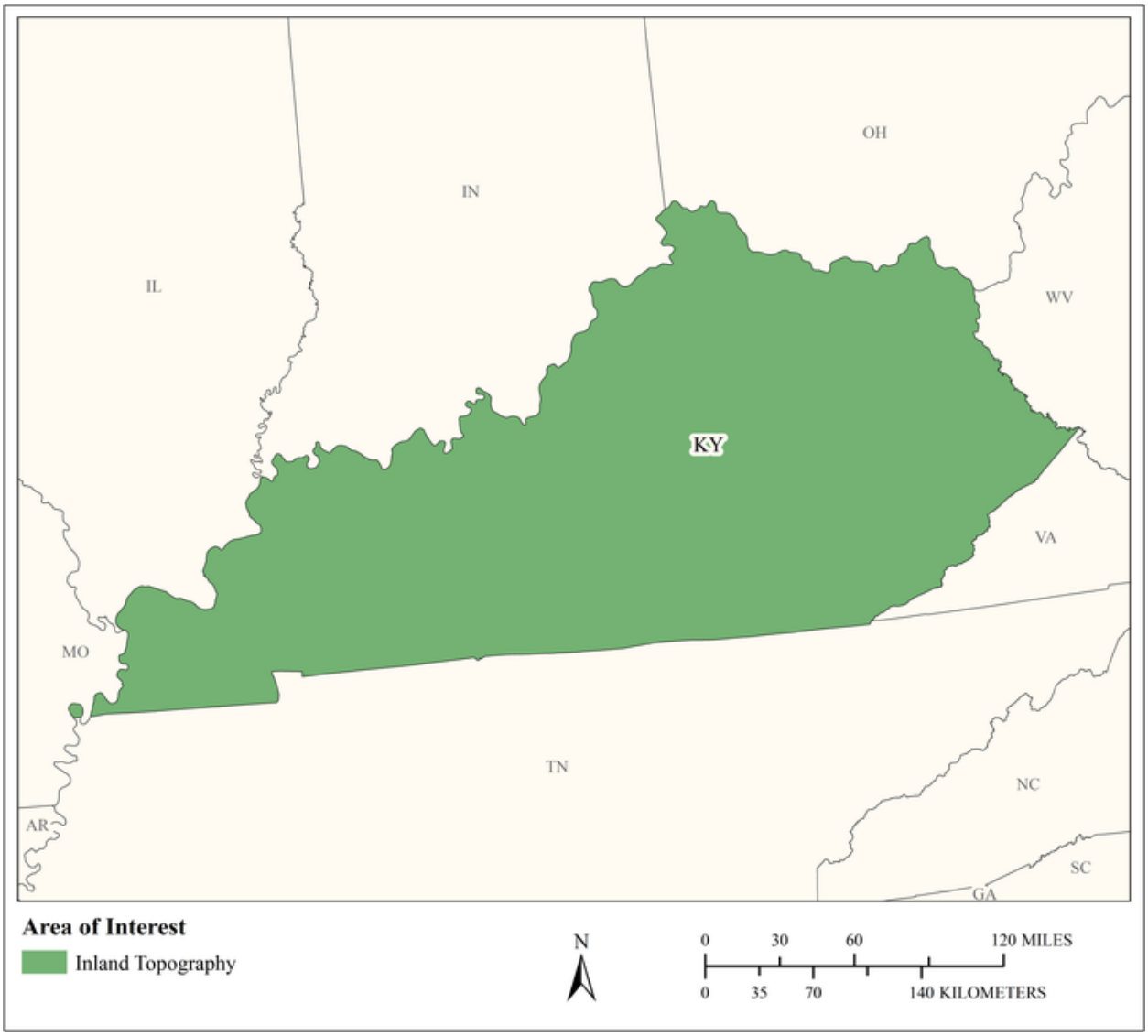
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Moderate		
Improved customer experience	Major	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate		
Environmental	Major	Major		
Public safety, including life and property	Major	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$61,852		Annual dollars saved/ realized	$32,926						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$6,178		Annual dollars saved/ realized	$2,321						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Major			Major								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Forest Resources Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Forest health assessment. Determination of standing inventory of forest resources. Prescribed burn planning. Analysis of carbon stocks for trade. Harvest systems planning.
MCA Title	Forest Resources Management
MCA ID	60189
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Kentucky
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Highly desirable			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

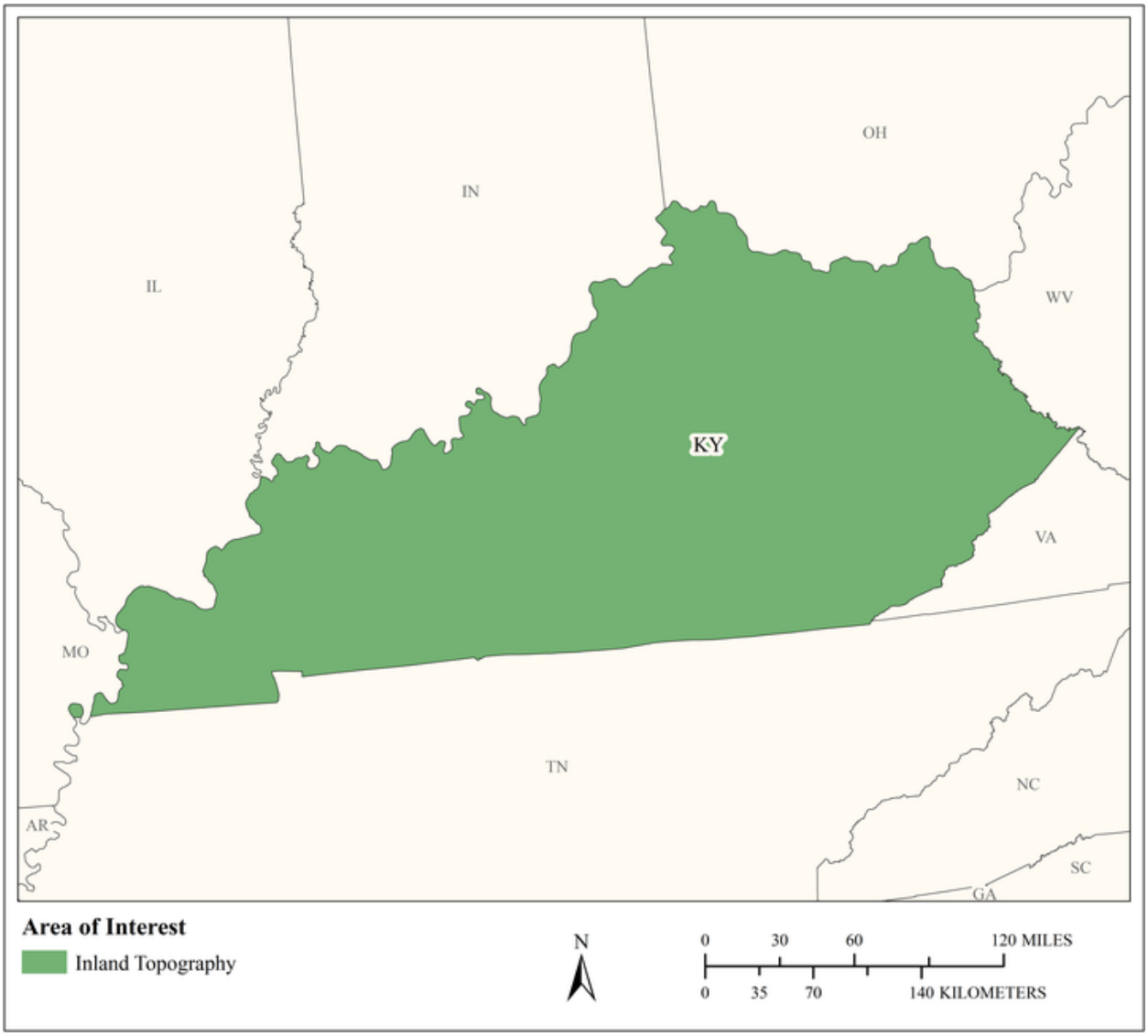
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$159,772									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$231,609									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic Assessment and Hazard Mitigation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Geologic mapping and analysis. Sinkhole and steephead mapping, monitoring, and analysis. Identification of geomorphologic units. Landslide hazard mapping and assessment. Karst mapping, including springs and caves. Aquifer recharge.
MCA Title	Geologic Assessment and Hazard Mitigation
MCA ID	60190
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Kentucky
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

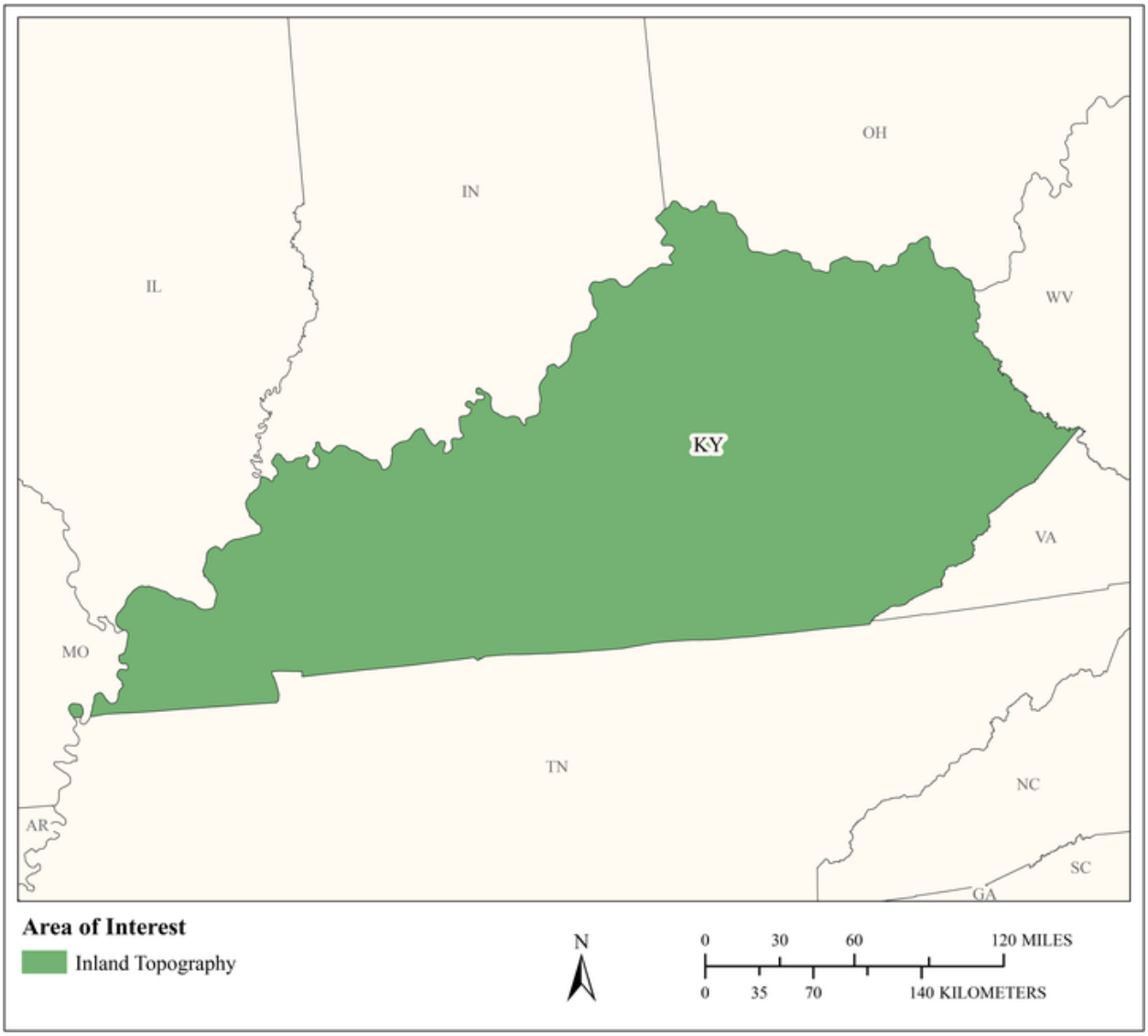
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$8,530,104									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$149,745									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic Resource Mining and Extraction



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Onshore or offshore mineral extraction. Monitoring sand as a local resource. Seabed resources. Open mine volume computations. Stockpile analysis. Environmental impact assessment and site restoration.
MCA Title	Geologic Resource Mining and Extraction
MCA ID	60191
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Kentucky
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 11 - Geologic Resource Mining and Extraction
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			

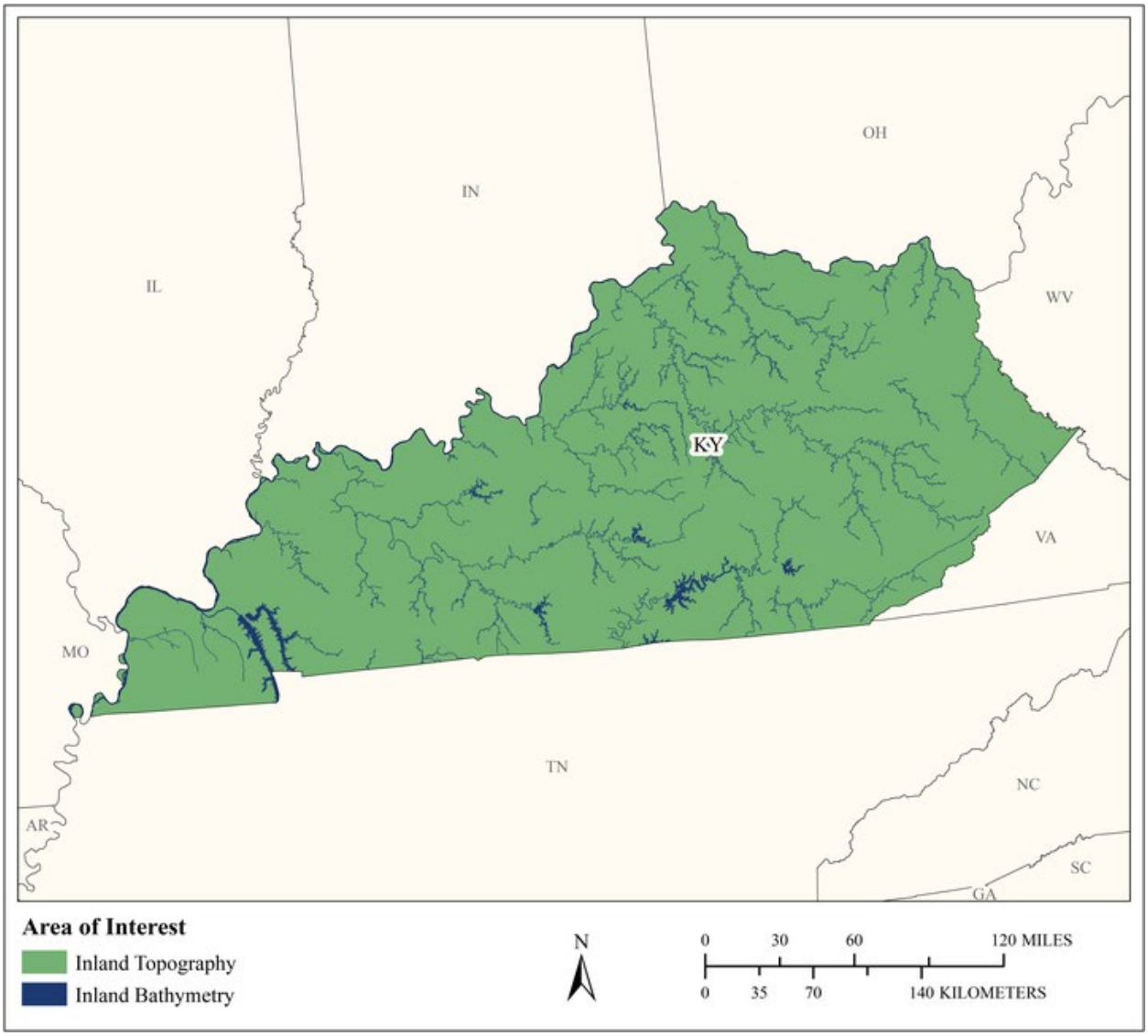
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Minor	Unable to provide										
Cost avoidance	Minor	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$9,870									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$6,547									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Flood Risk Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Flood risk modeling and mapping of riverine and coastal areas. Dam/dike/levee safety analysis. Emergency management. Flood forecasts.
MCA Title	Flood Risk Management
MCA ID	60192
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Kentucky
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Required	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Required	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	Major	Moderate		
Increased revenues	Minor	Minor		
Mission-driven performance improvements	Major	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		

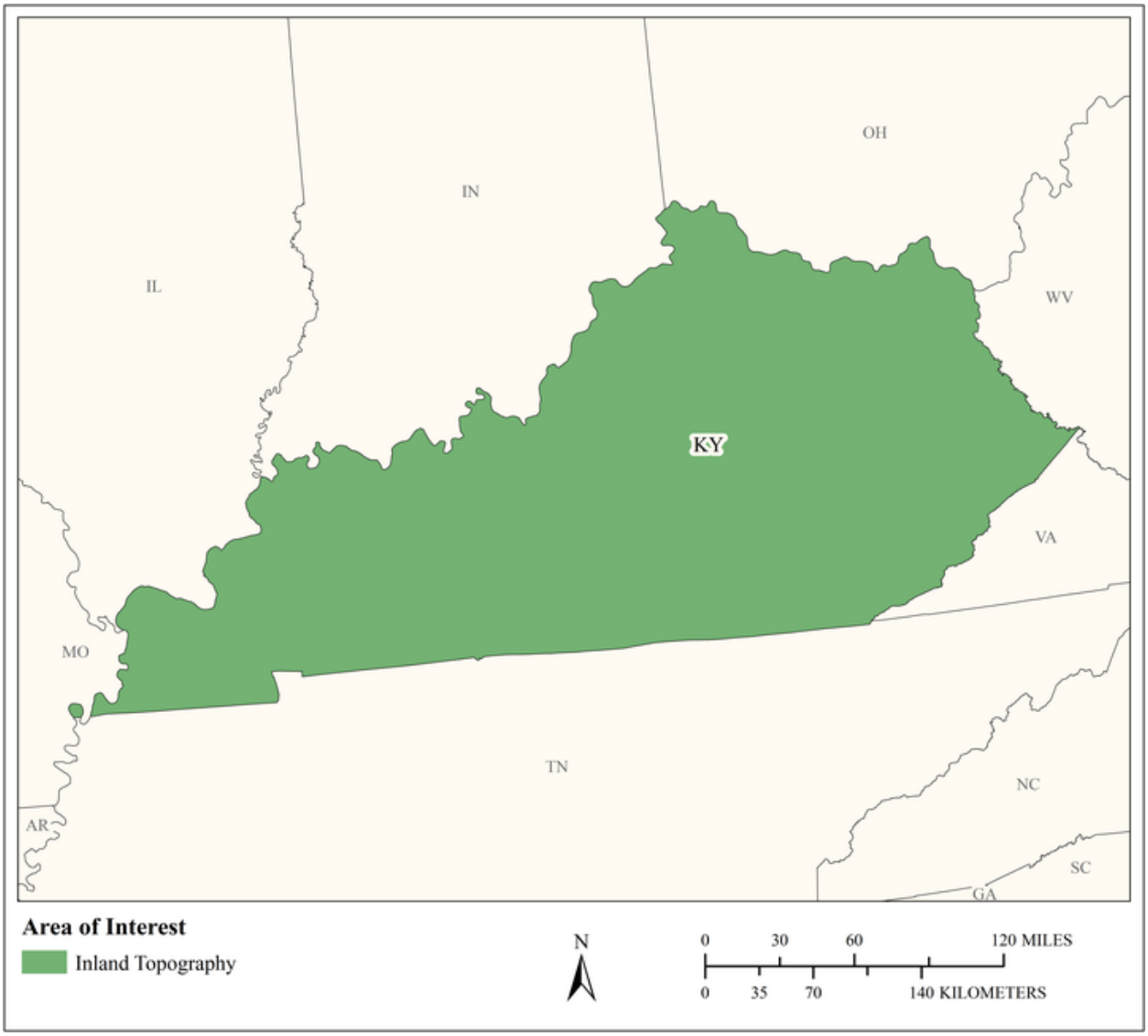
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor		
Improved customer experience	Major	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor		
Environmental	Major	Moderate		
Public safety, including life and property	Major	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		None								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$5,673,775		Annual dollars saved/ realized	$394,139						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$992,733		Annual dollars saved/ realized	$442,517						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate								
Environmental	Moderate			Moderate								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Statewide Geospatial Data Coordination and Support



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Our agency is situated within the Executive Branch as an umbrella agency that provides GIS Service to all Cabinets. Individual Cabinet uses of the data statewide vary considerably. Lidar data are currently used for inundation plans, building footprint extraction, archaeology, highway design, and many more.
MCA Title	Statewide Geospatial Data Coordination and Support
MCA ID	1151
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Kentucky, Commonwealth Office of Technology, GIS Branch
Sub-Agency or Division	
Organization Mission	Mission: Facilitate statewide electronic geographic data sharing and its application for streamlined decision-making, greater efficiency, public protection, and economic vitality. Vision: Expand the use of geographic information technology throughout state & local government agencies and the citizenry of the Commonwealth while simultaneously making selected data available to other entities that can benefit from its utility.
Program Name	See primary note above regarding MCA and BU's.
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 22 - Infrastructure and Construction Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Varies by Cabinet

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Nice to have			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Nice to have			
Wetlands	Nice to have			
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	The majority of Kentucky's data falls into the QL2 category but some of the data collected very early on is QL3.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Kentucky Geography Network - KyFromAbove Data Sources			

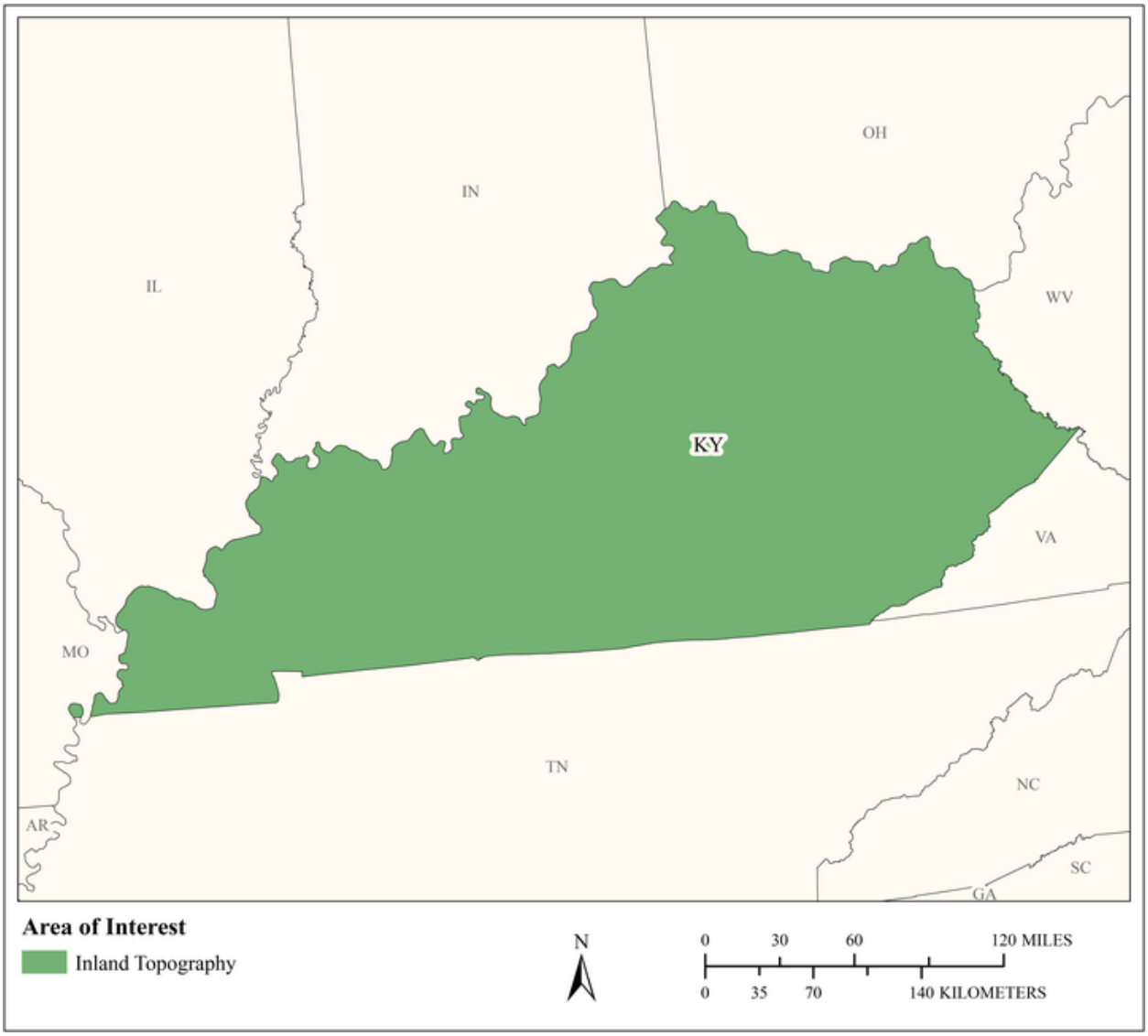
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	Moderate			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Moderate			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$6,000,000 to $9,000,000									
Time savings description	KYTC will see faster project development and improved corridor selection. Kentucky Transportation Cabinet (KYTC) will have reduced survey requirements.											
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Mission-driven performance improvements	Moderate	Unable to provide										
Mission-driven performance improvements description	KYTC will be able to generate tighter cost estimates.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Moderate											
Environmental description	KYTC will be better able to identify project impacts to the environment, and improve mitigation options. Wetland and stream restoration will be improved.											
Public safety, including life and property	Moderate											
Public safety, including life and property description	Sinkhole identification and mapping will be improved											
Other												
Other benefits	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Land Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Road and railroad route selection and maintenance. Slope analysis for autonomous cars. GPS navigation visualization.
MCA Title	Land Navigation and Safety
MCA ID	60193
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Kentucky
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 19 - Land Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

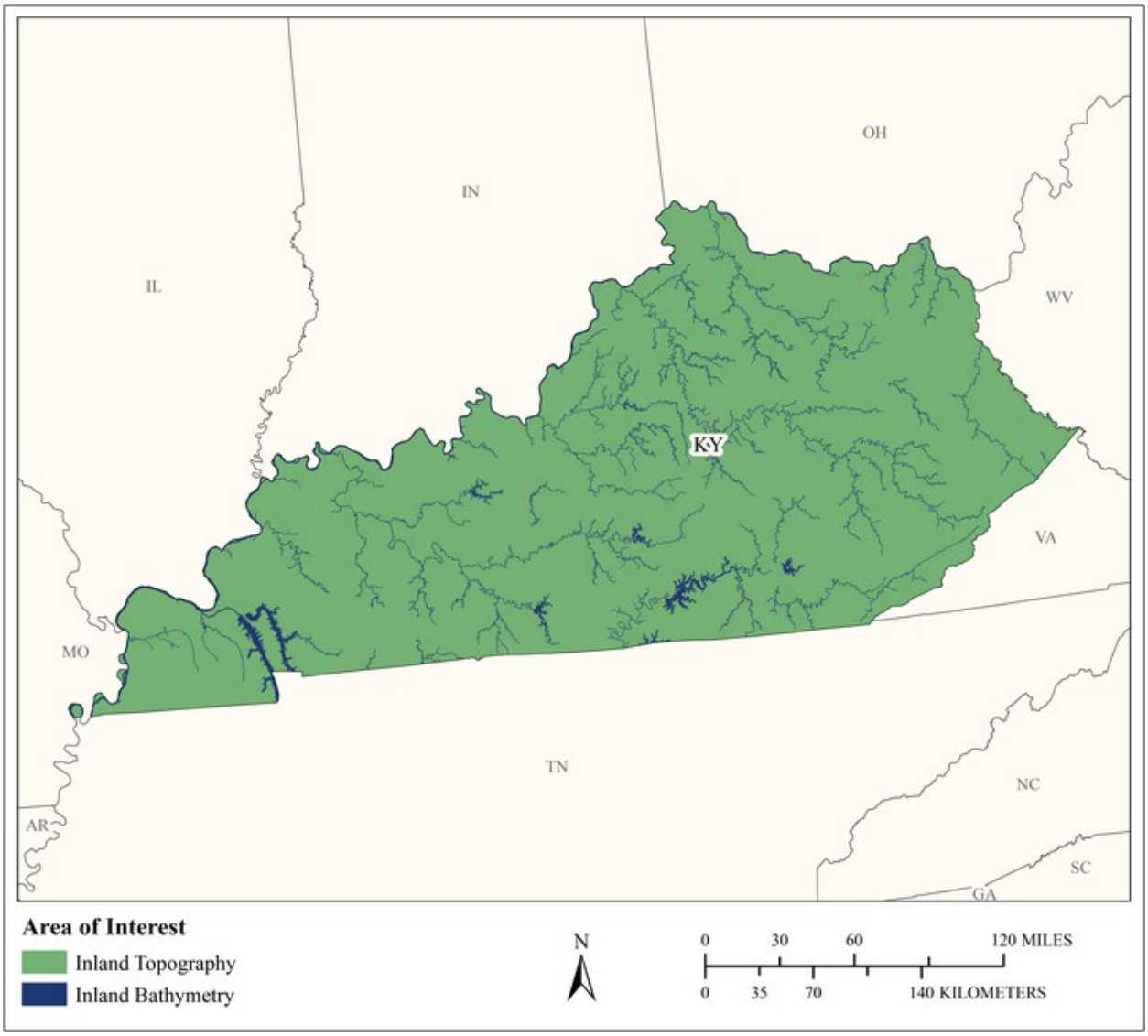
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Moderate			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Moderate	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$523,484									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$42,273									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Marine and Riverine Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Nautical charting. Bathymetric measurements of nearshore submerged coastal topography. Identification of hazards to navigation. Sediment management at coastal navigation projects. Precision marine navigation. Movement of goods and fishing vessels.
MCA Title	Marine and Riverine Navigation and Safety
MCA ID	60194
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Kentucky
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Nice to have
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B		
Update Frequency	2-3 years	2-3 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	Up to 2 meters		
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Nice to have			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level			Up to double the required TVU at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Required	Nice to have		
Classified point cloud	Required	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Required	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Required		
Land use/land cover	Nice to have	Nice to have		
Wetlands	Highly desirable	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Required		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Required	Nice to have		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Required	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts		Yes		
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	I don't know		
Cost avoidance	Moderate	Major		
Increased revenues	Moderate	None		
Mission-driven performance improvements	Moderate	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	None		

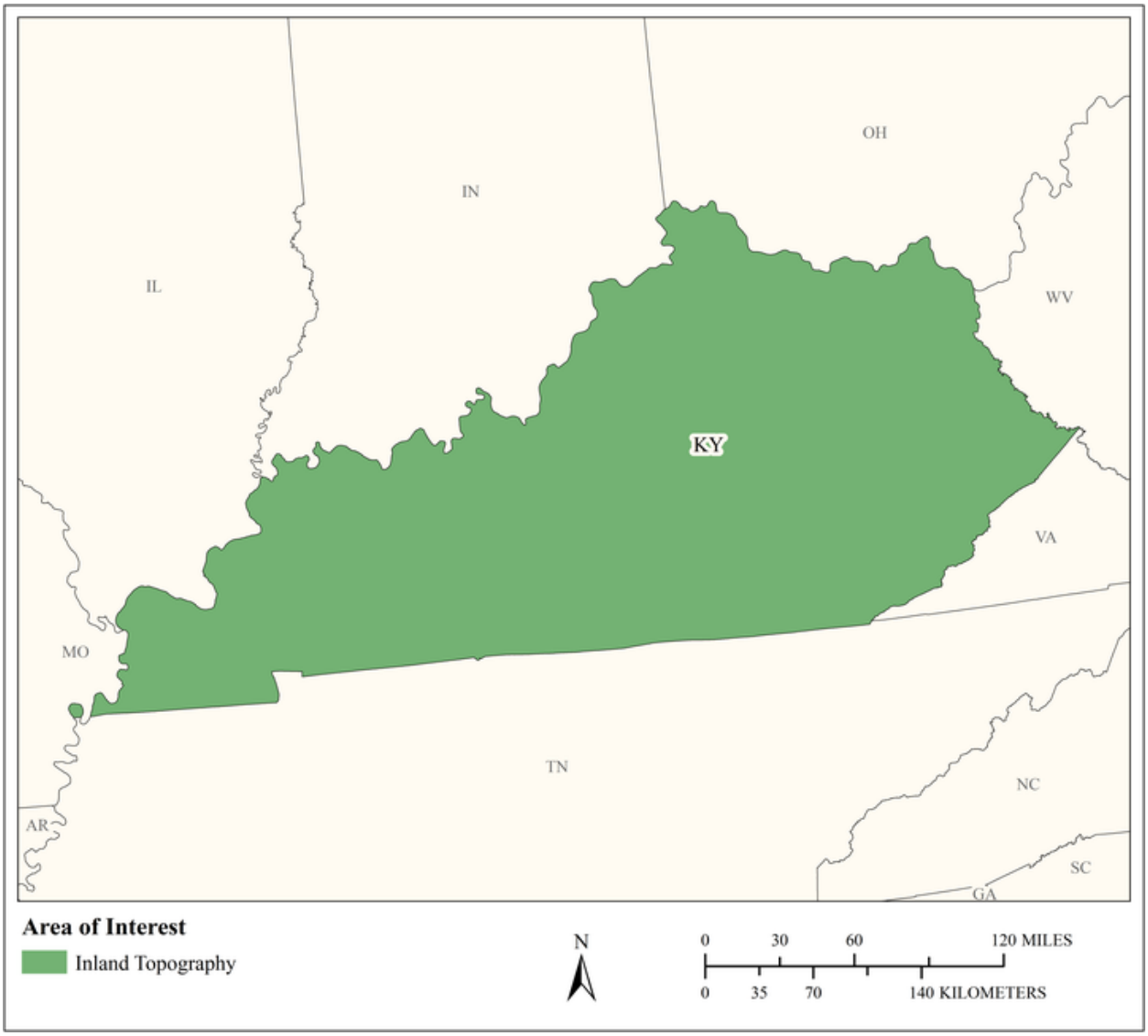
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor	None		
Improved customer experience	Moderate	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	None		
Environmental	Moderate	None		
Public safety, including life and property	Major	None		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide							
Increased revenues	None			Moderate	Unable to provide							
Mission-driven performance improvements	Moderate	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,548,031		Annual dollars saved/ realized	$737,108						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide							
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide							
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide							
Future annual customer service benefits added during validation					Annual dollars saved/ realized	$97,012						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			Moderate								
Environmental	None			Moderate								
Public safety, including life and property	Minor			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps				
Aspect maps				
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Aviation Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of in-flight hazards and path obstructions. Aeronautical charting. Runway construction and repair.
MCA Title	Aviation Navigation and Safety
MCA ID	60195
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Kentucky
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 21 - Aviation Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes			
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Major			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

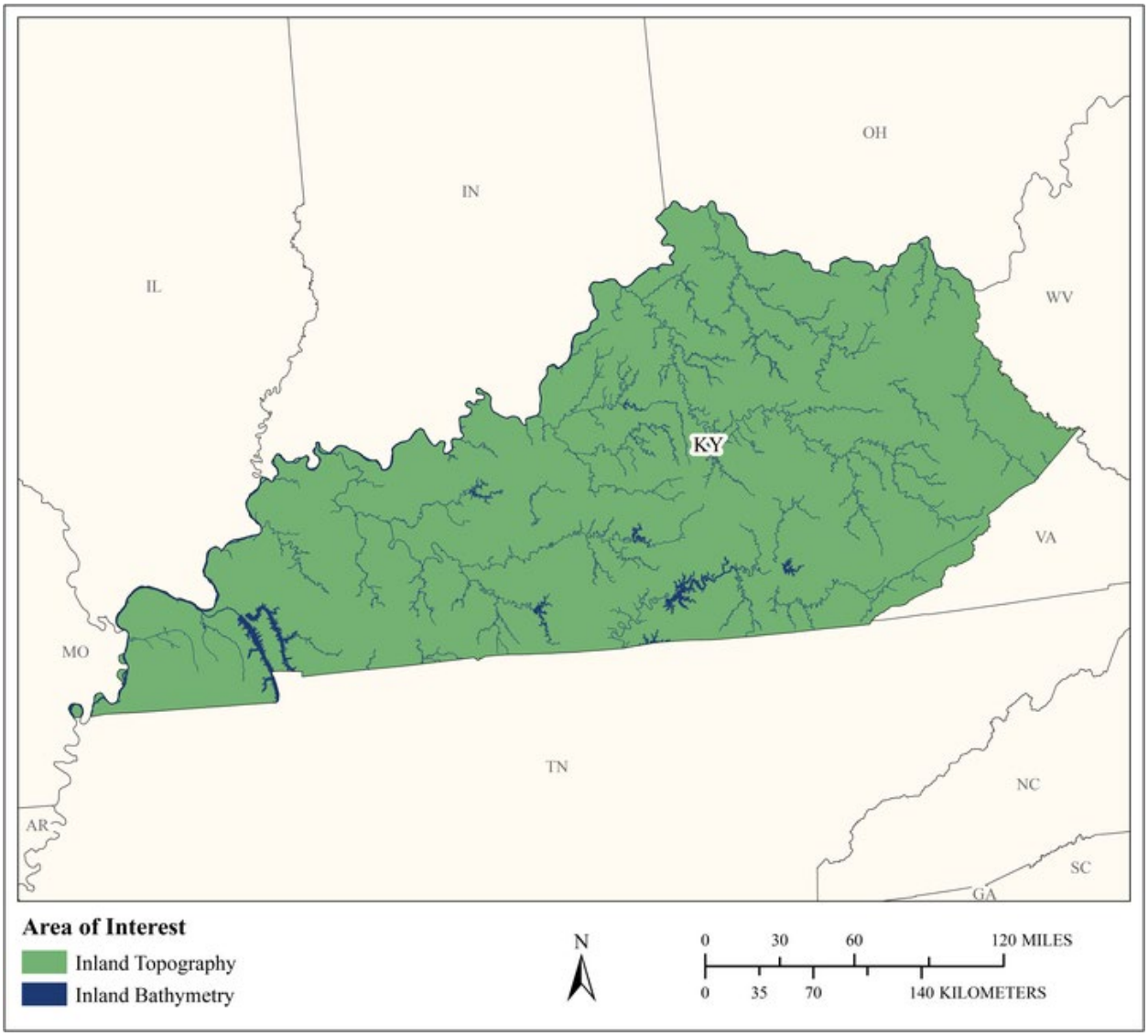
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$136,607									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$170,139									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Moderate											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Infrastructure and Construction Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Marine construction. Bridge design and construction. Engineering and construction of dams, levees, dikes, reservoirs, and coastal structures. Shipyard and port construction. Water, sewer, or power line planning and vegetation analysis. Pump, drain, and well placement. Stormwater modeling. Cut and fill analysis for earth-moving. Building site analysis. Road infrastructure. Infrastructure hardening or mitigation for climate change effects, e.g. sea level change.
MCA Title	Infrastructure and Construction Management
MCA ID	60196
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Kentucky
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	Up to 2 meters		
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Nice to have		
Classified point cloud	Required	Highly desirable		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Nice to have		
Coastal and riverine structures	Highly desirable	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Moderate		
Increased revenues	Minor	None		
Mission-driven performance improvements	Moderate	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate		

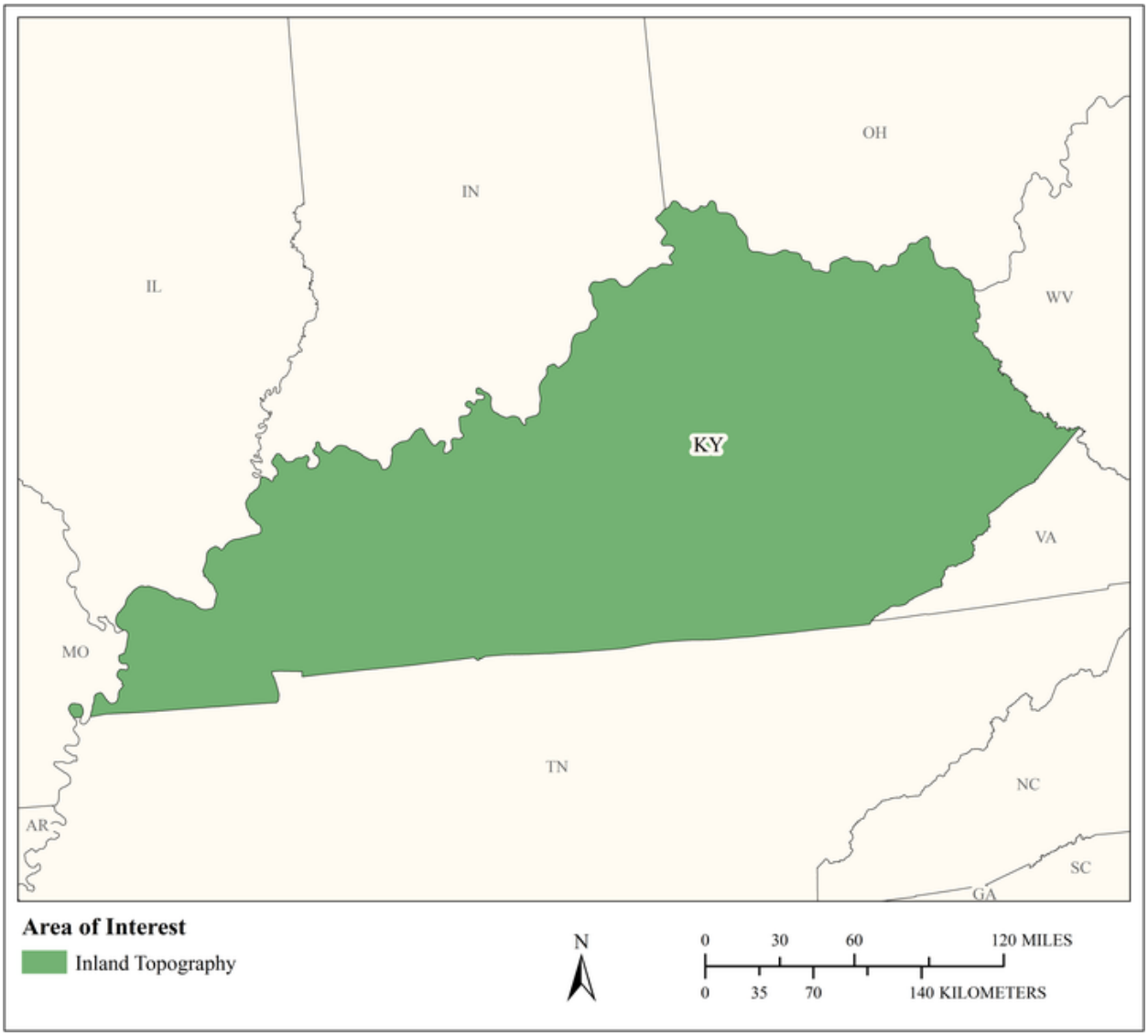
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major		
Improved customer experience	Moderate	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor		
Environmental	Moderate	Minor		
Public safety, including life and property	Moderate	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide							
Increased revenues	None			None								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,816,006		Annual dollars saved/ realized	$611,841						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Minor	Unable to provide							
Improved customer experience	Major	Unable to provide		Minor	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$5,344,141		Annual dollars saved/ realized	$63,532						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor								
Environmental	Moderate			Moderate								
Public safety, including life and property	Major			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Urban and Regional Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Land development and zoning. Municipal mapping of building footprints and elevations. Port resilience planning. Parks and transportation planning. Virtual city creation. Urban ecology planning.
MCA Title	Urban and Regional Planning
MCA ID	60197
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Kentucky
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Required			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

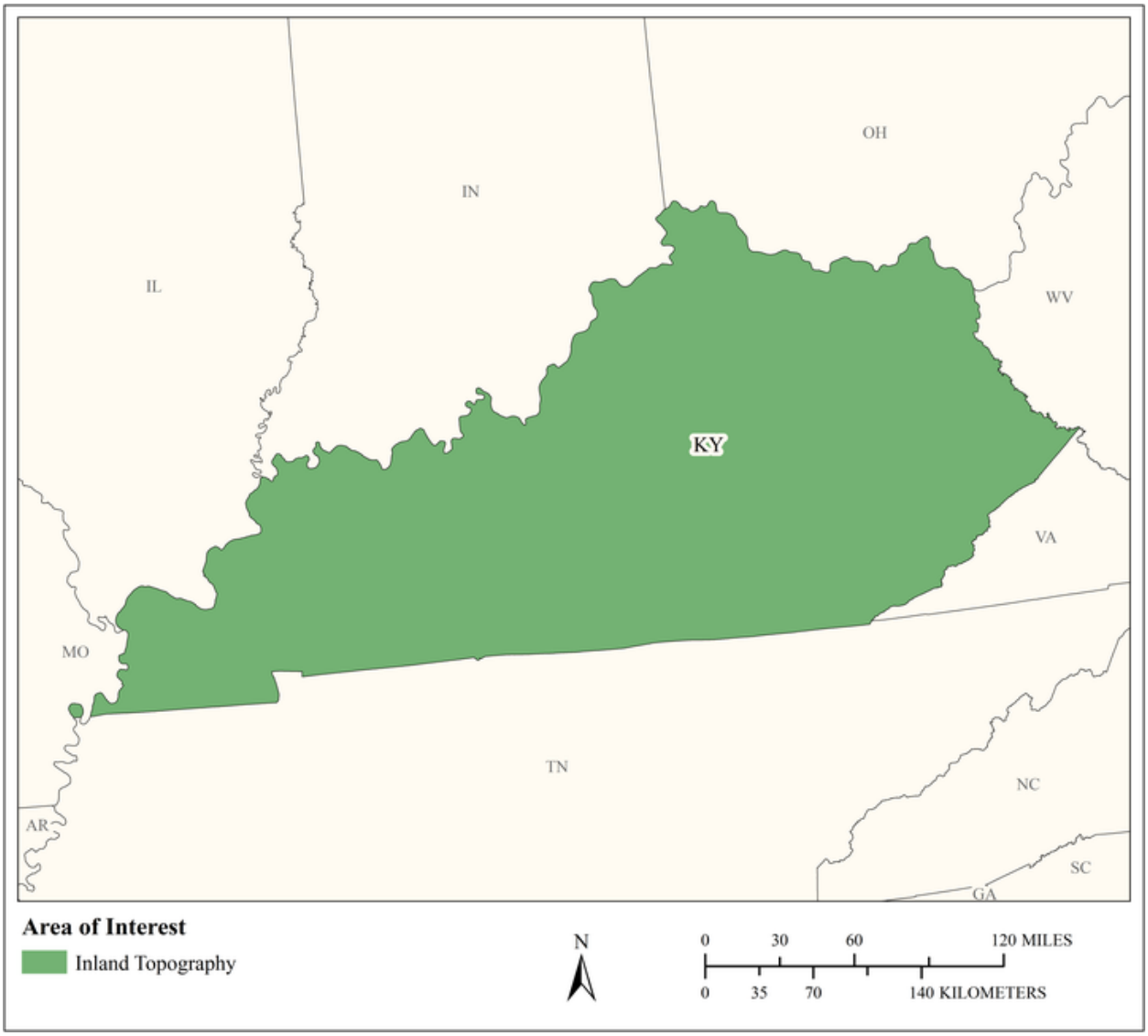
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$10,872,708									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,255,259									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Military



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Tactical military operations. Strategic defense. Amphibious landings and logistics over-the-shore. Operation of ships and submarines. Weapons system testing. Management of flight facilities and offshore launch or target areas.
MCA Title	Military
MCA ID	60198
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Kentucky
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 29 - Military
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	I don't know
Tops of vegetation	I don't know
Tops of submerged structures, objects	I don't know
Tops of submerged vegetation	I don't know
Subcanopy of vegetation/understory	I don't know
River/lake bottom	I don't know
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	
Smallest 3D features needed	
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	I don't know			
Update Frequency	I don't know			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	I don't know			
Acceptable Vertical Error	I don't know			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	I don't know
Hydro-enforcement	I don't know
Hydro-conditioning	I don't know
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	I don't know					
Entire AOI under same environmental conditions	I don't know					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	I don't know					
DEM for entire AOI needs to be seamless	I don't know					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	I don't know			
DTM	I don't know			
DEM	I don't know			
Raw point cloud data	I don't know			
Classified point cloud	I don't know			
Edited/cube XYZ				
Full waveform	I don't know			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	I don't know			
Additional breaklines for hydro-enforcement of culverts	I don't know			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	I don't know			
Ground control/ground truthing	I don't know			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	I don't know			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	I don't know			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	I don't know			
Land use/land cover	I don't know			
Wetlands	I don't know			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	I don't know			
Bridges/culverts	I don't know			
Landmark features	I don't know			
Cultural resources	I don't know			
Coastal and riverine structures	I don't know			
Overhead structures				
Lowest Floor Elevation of Buildings	I don't know			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know			
Cost savings/cost reduction	I don't know			
Cost avoidance	I don't know			
Increased revenues	I don't know			
Mission-driven performance improvements	I don't know			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	I don't know			
Improved customer experience	I don't know			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know			
Environmental	I don't know			
Public safety, including life and property	I don't know			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide										
Cost savings/cost reduction	I don't know	Unable to provide										
Cost avoidance	I don't know	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	I don't know	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide										
Improved response or timeliness	I don't know	Unable to provide										
Improved customer experience	I don't know	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

Louisiana

Current status of elevation data for Louisiana

The Louisiana Department of Transportation and Development (LADOTD), USGS, and NRCS are collaborating on planning and acquisition of several ongoing Quality Level 1 (QL1) lidar projects in the state. In total, over 37,000 square miles are currently being collected or are planned for collection throughout the state. The agencies are establishing a Memorandum of Understanding (MOU) to identify the activities that LADOTD, USGS, and NRCS will undertake to collect and maintain current, accurate, and consistent high-quality elevation data in support of the 3D Elevation Program (3DEP) and the requirement of USGS, NRCS, and the State of Louisiana. Today, high-density lidar data are the primary sources for deriving elevation models and other datasets. Historic flooding throughout Louisiana in 2016 demonstrated the need for current and accurate elevation data to support flood mapping and modeling. LADOTD is pursuing a statewide collection of QL1 lidar in partnership with state, local, and federal partners.

Importance of elevation data to Louisiana

Most of Louisiana is comprised of land created by the Mississippi River Delta. Inland topography and nearshore bathymetry are very important to Louisiana because of its role as a major transportation hub that links railroads, highways, and ports that serve the entire United States and parts of Canada. The dynamic nature of the deltaic system causes continuous change in local topography (land surface) and land-water interface. This creates challenges to maintaining infrastructure that is critical to provide public safety and support the state and national economies. In the deltas of major rivers; like the Mississippi River, the Atchafalaya River, and the Wax Lake Outlet; land is actively being created. In many coastal areas subsidence and coastal storms have converted wetlands into open water. Spoil areas created along many of the navigable channels also exhibit change in land area as dredging continues. To address coastal land loss, the state has developed a Master Plan with major coastal engineering projects that are designed to change the shoreline in local areas. In this region characterized by high rates of subsidence and land loss, low elevation, and little topographic relief, up-to-date, high-resolution elevation and water depth data are essential for: long-term flood risk reduction and restoration project monitoring; shoreline erosion analyses; ecological, hydrologic, storm-surge, and flood risk reduction modeling; and other coastal science and coastal management applications.

High-level summary of elevation data requirements

The State of Louisiana includes land use patterns that vary from remote, undeveloped forests, wetlands, and coastal areas to large urban areas. Elevation data requirements vary based on land use. For example, forestry comprises the agricultural sector in the state that will benefit from QL1 data. The state is embarking on a watershed-based management program to support modeling that will require accurate watershed delineations. Because of the relatively low relief across many areas of the state, QL1-level of elevation sampling is necessary to discriminate between adjacent basins. Louisiana has major issues with flooding that affects all types of land use from rural, to agricultural, to urban areas. To exacerbate these concerns, coastal subsidence and sea level rise are creating serious problems across most of southern Louisiana. QL1 data are essential to discriminate between small changes in elevation which can render a location safe for use or uninhabitable.

High-level summary of benefits that would come from higher resolution elevation data

Understanding the progress and changes in land surface elevations and bathymetry will provide essential data toward the state's efforts to fight the effects of subsidence, sea level rise, and climate change. Solutions for these problems will require accurate, up-to-date elevation data to develop new operational

methods, as well as to develop plans to mitigate impacts on critical infrastructure. Beginning in July 2019, the Louisiana Coastal Protection and Restoration Authority is collaborating with USGS CMHRP and NGP and a number of federal, state, and local agencies to create a seamless integrated topobathymetric digital elevation model for south Louisiana for use in coastal restoration and flood risk reduction efforts. The project will incorporate the most recent and best available multi-source topographic and bathymetric elevation data for south Louisiana. The spatial resolution of the TBDEM will be 1 meter and spatial coverage in the Louisiana coast will extend from the Texas border to the Mississippi border.

The State of Louisiana has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

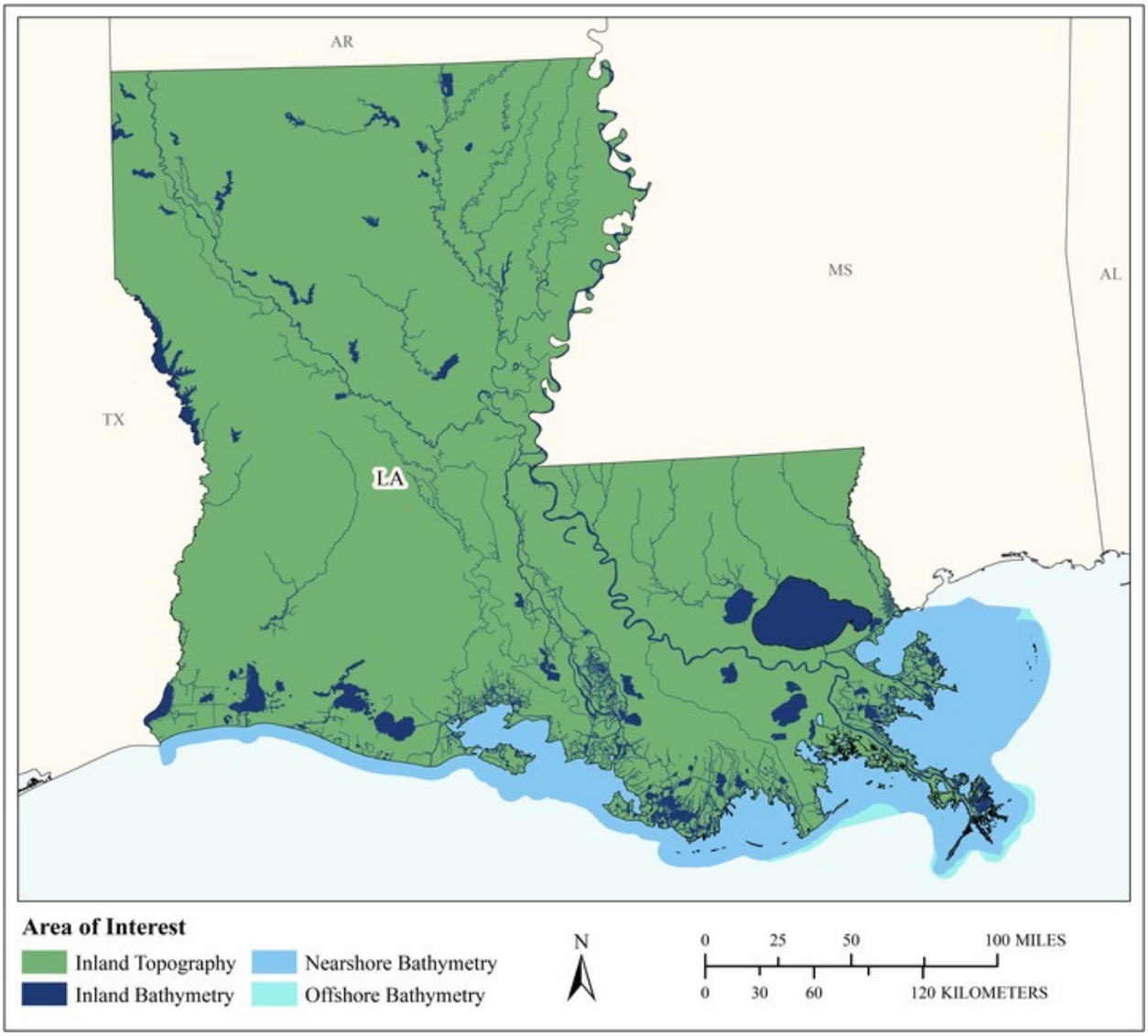
Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	Louisiana Department of Environmental Quality (LDEQ)	32959	Environmental Management	Inland Topo	QL2	6-10 years	$255,515	$68,441	None	Major	None
				Inland Bathy	QL1B	6-10 years	$1,105,383	$115,517	None	Major	Minor
				Nearshore Bathy	QL1B	4-5 years	$200,405	$330,144	Moderate	Moderate	Moderate
				Offshore Bathy	Order 1a	4-5 years	$326	$1,633	Minor	Major	Major
BU 02 – Riverine Ecosystem Management	State of Louisiana	60199	Riverine Ecosystem Management	Inland Topo	QL1 HD	6-10 years	$70,537	$7,045	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$37,549	$2,647	Major	Major	Major
				Nearshore Bathy	QL0B	2-3 years	$607,781	$464,441	Moderate	Moderate	Moderate
				Offshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 03 – Coastal Zone Management	Terrebonne Parish Consolidated Government	22067	Coastal Zone Management	Nearshore Bathy	QL1B	Annually	$1,057,232	$25,627	Major	Major	Major
BU 06 – Natural Resource Management	State of Louisiana	60200	Natural Resources Conservation	Inland Topo	QL1 HD	4-5 years	$1,807,533	$6,637,814	Major	Major	Major
				Inland Bathy	QL0B	6-10 years	$244,990	$11,028	Major	Major	Major
				Nearshore Bathy	QL1B	6-10 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate
				Offshore Bathy	Cross sections and/or transects meet needs	4-5 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
BU 07 – Wildlife and Habitat Management	Louisiana Department of Wildlife & Fisheries	22089	Habitat Modeling and Monitoring	Inland Topo	QL0	Annually	$10,977	$31,705	Moderate	Moderate	Major
				Inland Bathy	QL0B	Annually	$87,974	$53,175	Moderate	Moderate	Moderate
				Nearshore Bathy	QL0B	Annually	$6,016	$355	Moderate	Moderate	Moderate
				Offshore Bathy	Special Order	4-5 years	$257	$17	Moderate	Major	Major
BU 08 – Agriculture	State of Louisiana	60201	Agriculture and Precision Farming	Inland Topo	QL2	2-3 years	$53,354	$42,297	Major	Major	Minor
				Inland Bathy	QL4B	4-5 years	$93,478	$42,297	Moderate	Major	Major
				Nearshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Offshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 10 – Geologic Assessment	Louisiana Geological Survey, Louisiana State University	22446	Geospatial Mapping, Analysis, and Cartography	Inland Topo	QL2	4-5 years	$9,727,787	$170,771	Major	Major	Major
				Inland Bathy	QL1B	6-10 years	$27,719	$30,459	Major	Major	Major
				Nearshore Bathy	QL1B	6-10 years	$468,662	$754,060	Major	Major	Major
				Offshore Bathy	Order 3	6-10 years	Unable to quantify	Unable to quantify	Major	Major	Major

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 12 – Renewable Energy Resources	State of Louisiana	60202	Renewable Energy Resources	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	None
				Inland Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Offshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 14 – Cultural Resource Management	State of Louisiana	60203	Cultural Resources Preservation and Management	Inland Topo	QL1	4-5 years	$8,446	$7,385	Minor	Minor	Minor
				Inland Bathy	QL0B	6-10 years	$20,255	Unable to quantify	Moderate	Minor	Minor
				Nearshore Bathy	QL0B	4-5 years	$17,391	Unable to quantify	Minor	Moderate	Minor
				Offshore Bathy	Order 1a	6-10 years	$634	Unable to quantify	Minor	Moderate	Minor
BU 15 – Flood Risk Management	Louisiana DOTD	1101	Flood Risk Modeling and Management	Inland Topo	QL1	4-5 years	$15,000,000	$5,000,000	I don't know	I don't know	I don't know
				Inland Bathy	QL1B	4-5 years	$5,000,000	$2,000,000	Moderate	Moderate	Major
				Nearshore Bathy	QL2B	4-5 years	$1,150,473	$852,664	Major	Moderate	Major
				Offshore Bathy	Special Order	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 15 – Flood Risk Management	Terrebonne Parish Consolidated Government	22055	Flood Risk Management	Inland Topo	QL1 HD	2-3 years	$1,076,120	$1,105,826	Major	Major	Major
				Inland Bathy	QL1B	4-5 years	$1,079,858	$125,122	Major	Major	Major
BU 18 – Homeland Security	Terrebonne Parish Consolidated Government	1236	Disaster Response	Inland Topo	QL1 HD	4-5 years	$214,861	$61,807	Major	I don't know	Major
				Inland Bathy	QL1B	4-5 years	$1,071,090	$71,807	Major	Moderate	Major
BU 18 – Homeland Security	Louisiana Oil Spill Coordinator's Office (LOSCO) / Department of Public Safety and Corrections	21558	Oil Spill Prevention, Planning, and Response	Inland Topo	QL1	6-10 years	$1,359,474	$24,028	Major	Major	Major
				Inland Bathy	QL1B	6-10 years	$382,862	$24,427	Major	Major	Major
				Nearshore Bathy	QL1B	6-10 years	$55,977	$1,606	Major	Major	Major
				Offshore Bathy	Order 2	6-10 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 20 – Marine and Riverine Navigation	Louisiana Department of Transportation/ Office of Multimodal Commerce	32936	Port and Waterway Oversight	Inland Bathy	Cross sections and/or transects meet needs	Event driven	$1,262,627	$167,285	Major	Major	Major
				Nearshore Bathy	Cross sections and/or transects meet needs	Event driven	$1,258,105	$167,285	Major	Major	Major

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 22 – Infrastructure Management	South Lafourche Levee District	50013	Levee Analysis, Construction, and Maintenance	Inland Topo	QL0	4-5 years	$1,150,720	Unable to quantify	Minor	Moderate	Major
BU 23 – Urban and Regional Planning	Louisiana Economic Development	21536	Urban and Regional Planning for Economic Development Activities	Inland Topo	QL1	6-10 years	$12,399,307	$1,431,505	Minor	Minor	Major
				Inland Bathy	QL1B	>10 years	$505,002	$638,871	Minor	Moderate	Major
				Nearshore Bathy	QL2B	6-10 years	$1,112,130	$1,173,253	Moderate	Moderate	Major
BU 23 – Urban and Regional Planning	Regional Planning Commission, New Orleans, LA	21913	Analysis of Intermodal Transportation Systems Leading to Projects	Inland Topo	QL1	6-10 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Major
				Nearshore Bathy	QL3B	6-10 years	Unable to quantify	Unable to quantify	Moderate	Minor	Moderate
BU 30 – Maritime and Land Boundary Management	State of Louisiana	60204	Maritime and Land Boundary Management	Inland Topo	QL1	6-10 years	$51,856	$198,819	Moderate	Minor	None
				Inland Bathy	QL2B	6-10 years	$38,916	Unable to quantify	Major	Major	Moderate
				Nearshore Bathy	QL0B	2-3 years	$1,395,786	Unable to quantify	Moderate	Major	Moderate
				Offshore Bathy	I don't know	2-3 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate

MCA Title: Environmental Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Fate and transport of contaminants. Pollution risk mitigation. Runoff and sedimentation analyses. Point - or non-point source pollution modeling. Management of contaminants and marine debris - point, non-point, vessel, and atmospheric pollution; spills; trash.
MCA Title	Environmental Management
MCA ID	32959
Organization Type	State or U.S. Territorial government
Organization Name	Louisiana Department of Environmental Quality (LDEQ)
Sub-Agency or Division	
Organization Mission	The mission of the Department of Environmental Quality is to provide service to the people of Louisiana through comprehensive environmental protection in order to promote and protect health, safety and welfare while considering sound policies that are consistent with statutory mandates.
Program Name	LDEQ Water Planning and Assessment Division, LDEQ Water Planning and Assessment Division.
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Weirs and other water control structures.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have

Inland Bathy Feature Size Requirements	Response
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL1B	Order 1a
Update Frequency	6-10 years and certain events.	6-10 years and certain events.	4-5 years	4-5 years
Event type(s)	A major storm event (like a hurricane or other major flood) that could affect inland hydrology or coastal morphology.	A major storm event (like a hurricane or other major flood) that could affect inland hydrology or coastal morphology.		
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter	Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 20 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed	Below MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Nice to have	Highly desirable	Highly desirable	Nice to have	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Not required	Nice to have	Highly desirable	Not required	Nice to have
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable	Required	Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Accuracy and seamlessness are essential, two products would satisfy our needs.	Accuracy and seamlessness are both required, two products would satisfy our needs.	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Accuracy and seamlessness are both required, two products would satisfy our needs.	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Not required	Nice to have	Required
DTM	Nice to have	Nice to have	Nice to have	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Not required	Not required	Nice to have	Nice to have
Classified point cloud	Not required	Not required	Nice to have	
Edited/cube XYZ		Not required	Nice to have	Nice to have
Full waveform	Not required	Not required	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Not required	Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Not required	Not required		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Not required	Not required	Nice to have	Nice to have
Ground control/ground truthing	Not required	Not required	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Nice to have	Required
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required	Required	Highly desirable	Required
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Highly desirable
Bottom type			Nice to have	Highly desirable
Submerged features			Nice to have	Highly desirable
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Nice to have	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Not required
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Highly desirable
Floating observation/navigation systems			Nice to have	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Required	Highly desirable	
Land use/land cover	Required	Required	Highly desirable	Nice to have
Wetlands	Highly desirable	Required	Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Nice to have		
Landmark features	Not required	Nice to have	Nice to have	
Cultural resources	Not required	Not required	Nice to have	
Coastal and riverine structures	Required	Required	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	2008 state-wide seamless LiDAR, QL3/QL4	NOAA Multibeam Bathymetry Database		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Atlas.lsu.edu			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available	Moderate	Moderate
Cost savings/cost reduction	Major	Inland bathy data not available	Moderate	Moderate
Cost avoidance	Minor	Inland bathy data not available	Minor	Moderate

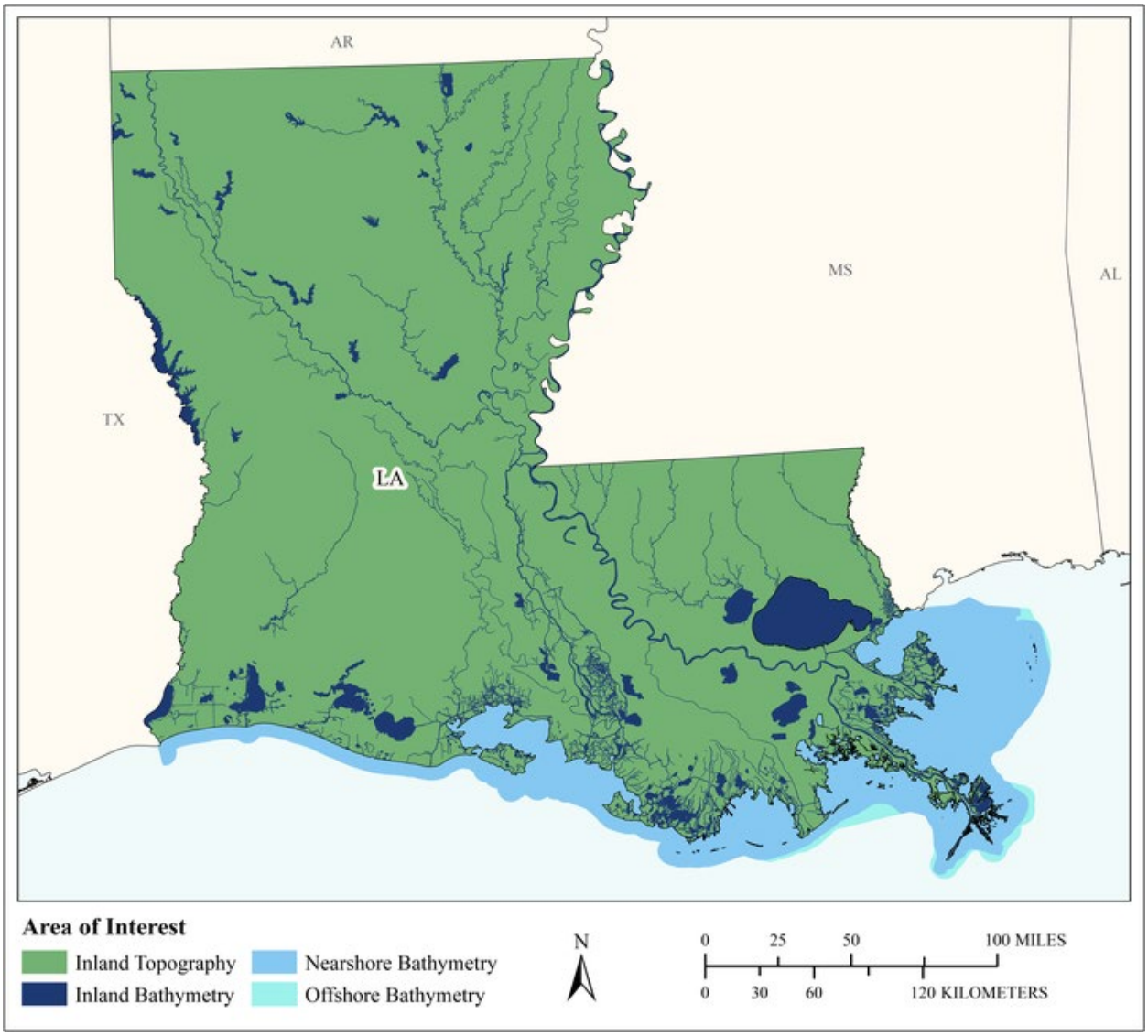
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	None	Inland bathy data not available	Minor	Minor
Mission-driven performance improvements	Major	Inland bathy data not available	Minor	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None	Inland bathy data not available	Moderate	Minor
Improved response or timeliness	None	Inland bathy data not available	Moderate	Moderate
Improved customer experience	None	Inland bathy data not available	Moderate	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Inland bathy data not available	Minor	Minor
Environmental	Major	Inland bathy data not available	Moderate	Minor
Public safety, including life and property	Moderate	Inland bathy data not available	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Minor	Unable to provide		None		
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Increased revenues	None			None			Minor	Unable to provide		None		
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$255,515		Annual dollars saved/ realized	$1,105,383		Annual dollars saved/ realized	$200,405		Annual dollars saved/ realized	$326
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		None			Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$68,441		Annual dollars saved/ realized	$115,517		Annual dollars saved/ realized	$330,144		Annual dollars saved/ realized	$1,633
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			None			Moderate			Minor		
Environmental	Major			Major			Moderate			Major		
Environmental description	Improved modelling leading to improved environmental quality											
Public safety, including life and property	None			Minor			Moderate			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours			Yes	Yes
Hillshades			Yes	Yes
Slope maps	Yes		Yes	Yes
Aspect maps				
Curvature maps				
Cross sections		Yes	Yes	Yes
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes	Yes	
Hydrologic Flow Accumulation Grids	Yes	Yes	Yes	
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Riverine Ecosystem Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Stream channel analysis and mapping. Stream bank erosion analysis. Aquatic and terrestrial species habitat management. Environmental management.
MCA Title	Riverine Ecosystem Management
MCA ID	60199
Organization Type	State or U.S. Territorial government
Organization Name	State of Louisiana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B	QL0B	I don't know
Update Frequency	6-10 years	4-5 years	2-3 years	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable	I don't know	Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Required	I don't know	Highly desirable	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	I don't know	Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Required	Required	I don't know	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	I don't know
DTM	Required	Highly desirable	Required	I don't know
DEM	Required	Required	Required	I don't know
Raw point cloud data	Nice to have	Nice to have	Nice to have	I don't know
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Not required	Nice to have	I don't know
Full waveform	Nice to have	Nice to have	Highly desirable	I don't know
Bathymetric Attributed Grid (BAG)		Not required	Nice to have	I don't know
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	I don't know
Tide Predictions			Not required	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			Not required	I don't know
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Nice to have	I don't know
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	I don't know
Nautical and/or navigation charts			Not required	I don't know
Acoustic imagery of the seafloor			Highly desirable	I don't know
Aerial and/or satellite imagery	Required	Highly desirable	Required	I don't know
Underwater videography			Not required	I don't know
Bottom texture			Highly desirable	I don't know
Bottom type			Required	I don't know
Submerged features			Highly desirable	I don't know
Subbottom characteristics			Highly desirable	I don't know
Geologic and seismic data	Nice to have	Nice to have	Not required	I don't know
Water column properties - Physical			Nice to have	I don't know
Water column properties - Chemical			Nice to have	I don't know
Water column properties - Biological			Nice to have	I don't know
Currents			Nice to have	I don't know
Tide/wave heights			Not required	I don't know
Sea ice conditions			Not required	I don't know
Habitat distribution and classification			Nice to have	I don't know
Boundaries			Not required	I don't know
Routes			Not required	I don't know
Offshore cadastral			Not required	I don't know
Lease areas			Not required	I don't know
Fixed obstructions			Not required	I don't know
Floating observation/navigation systems			Not required	I don't know
Shorelines – current, historic, change rates	Nice to have	Nice to have	Highly desirable	
Land use/land cover	Highly desirable	Nice to have	Required	I don't know
Wetlands	Highly desirable	Highly desirable	Required	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	I don't know
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have	Not required	
Cultural resources	Nice to have	Nice to have	Not required	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	I don't know
Cost savings/cost reduction	Moderate	Minor	Moderate	I don't know
Cost avoidance	Moderate	None	None	I don't know
Increased revenues	None	None	None	I don't know
Mission-driven performance improvements	Major	None	Minor	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Minor	I don't know

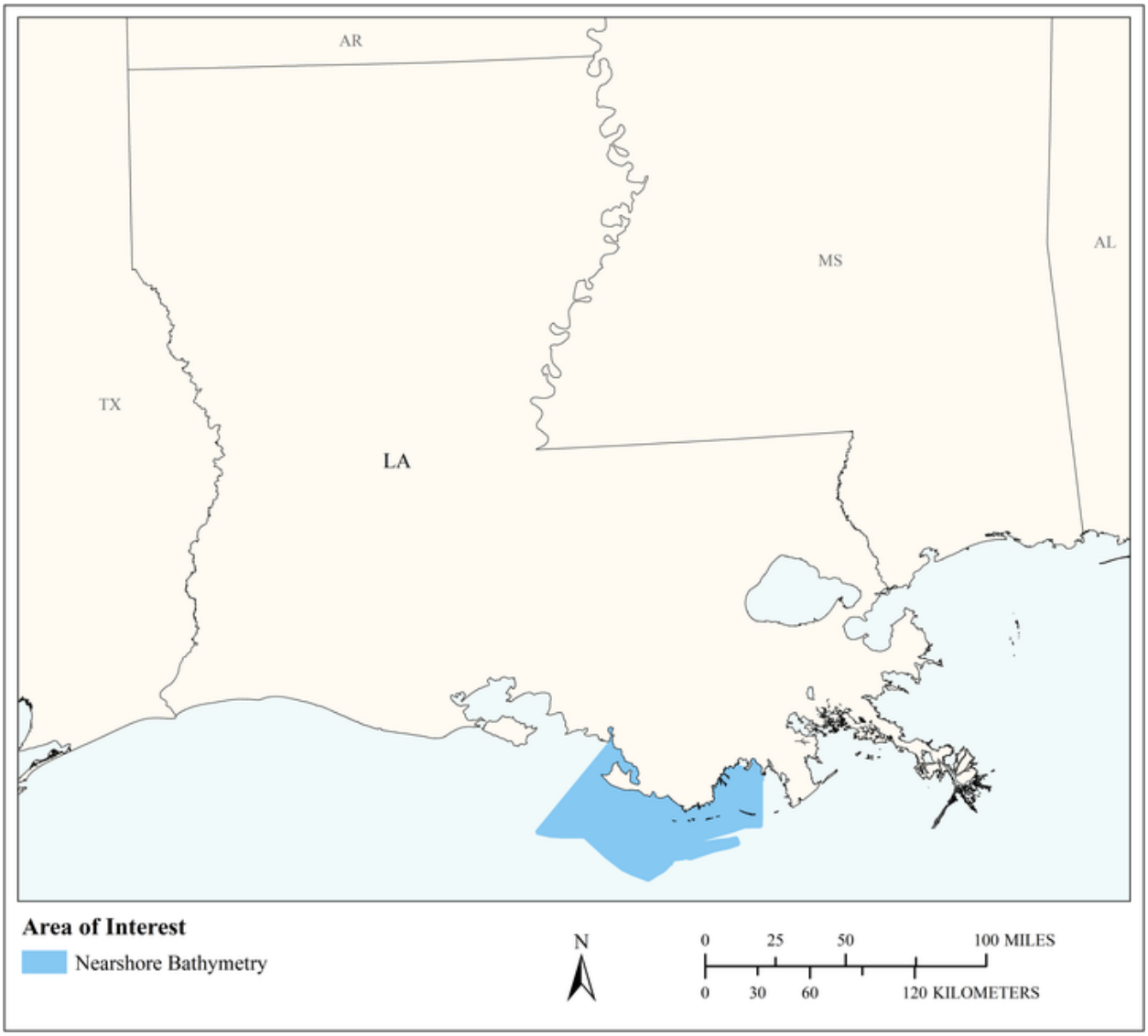
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Moderate	Minor	I don't know
Improved customer experience	Major	Minor	Minor	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Minor	I don't know
Environmental	Major	Major	Moderate	I don't know
Public safety, including life and property	Major	Moderate	Moderate	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$70,537		Annual dollars saved/ realized	$37,549		Annual dollars saved/ realized	$607,781			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$7,045		Annual dollars saved/ realized	$2,647		Annual dollars saved/ realized	$464,441			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate			I don't know		
Environmental	Major			Major			Moderate			I don't know		
Public safety, including life and property	Major			Major			Moderate			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps			Yes	
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints			Yes	
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Coastal Zone Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type			Required	
Geographic Area Requirements			Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements			Terrebonne Parish, LA	

MCA Description	Response
Mission Critical Activity	Coastal Zone Management
MCA Title	Coastal Zone Management
MCA ID	22067
Organization Type	Regional, County, City, or other local government
Organization Name	Terrebonne Parish Consolidated Government
Sub-Agency or Division	
Organization Mission	Coastal Zone Management for the citizens of Terrebonne Parish
Program Name	Terrebonne Parish Coastal Restoration & Preservation Department
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	Landscapes for erosion and subsidence measurement

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order			QL1B	
Update Frequency			Annually	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error			Less than 50 cm	
Acceptable Vertical Error			Up to 30 cm	
How far onshore needed			1 kilometer inland	
How far down the beach profile needed			To MLLW	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement			MLLW	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season			Highly desirable			
Entire AOI under same environmental conditions			Highly desirable			
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless			Highly desirable			
DEM for entire AOI needs to be seamless			Highly desirable			
Amount of acceptable vertical manipulation to achieve spatial seamlessness			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM			Highly desirable	
DTM			Highly desirable	
DEM			Required	
Raw point cloud data			Required	
Classified point cloud			Highly desirable	
Edited/cube XYZ			Highly desirable	
Full waveform			Highly desirable	
Bathymetric Attributed Grid (BAG)			Highly desirable	
Breaklines required for standard hydro-flattening				
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery			Highly desirable	
Ground control/ground truthing			Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery			Nice to have	
Underwater videography			Nice to have	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data			Nice to have	
Water column properties - Physical			Highly desirable	
Water column properties - Chemical			Highly desirable	
Water column properties - Biological			Highly desirable	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Highly desirable	
Routes			Highly desirable	
Offshore cadastral			Nice to have	
Lease areas			Highly desirable	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates			Required	
Land use/land cover			Highly desirable	
Wetlands			Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features			Highly desirable	
Bridges/culverts				
Landmark features			Highly desirable	
Cultural resources			Nice to have	
Coastal and riverine structures			Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used			Unknown	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings			Major	
Cost savings/cost reduction			Major	
Cost avoidance			Major	
Increased revenues			Major	
Mission-driven performance improvements			Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services			Major	

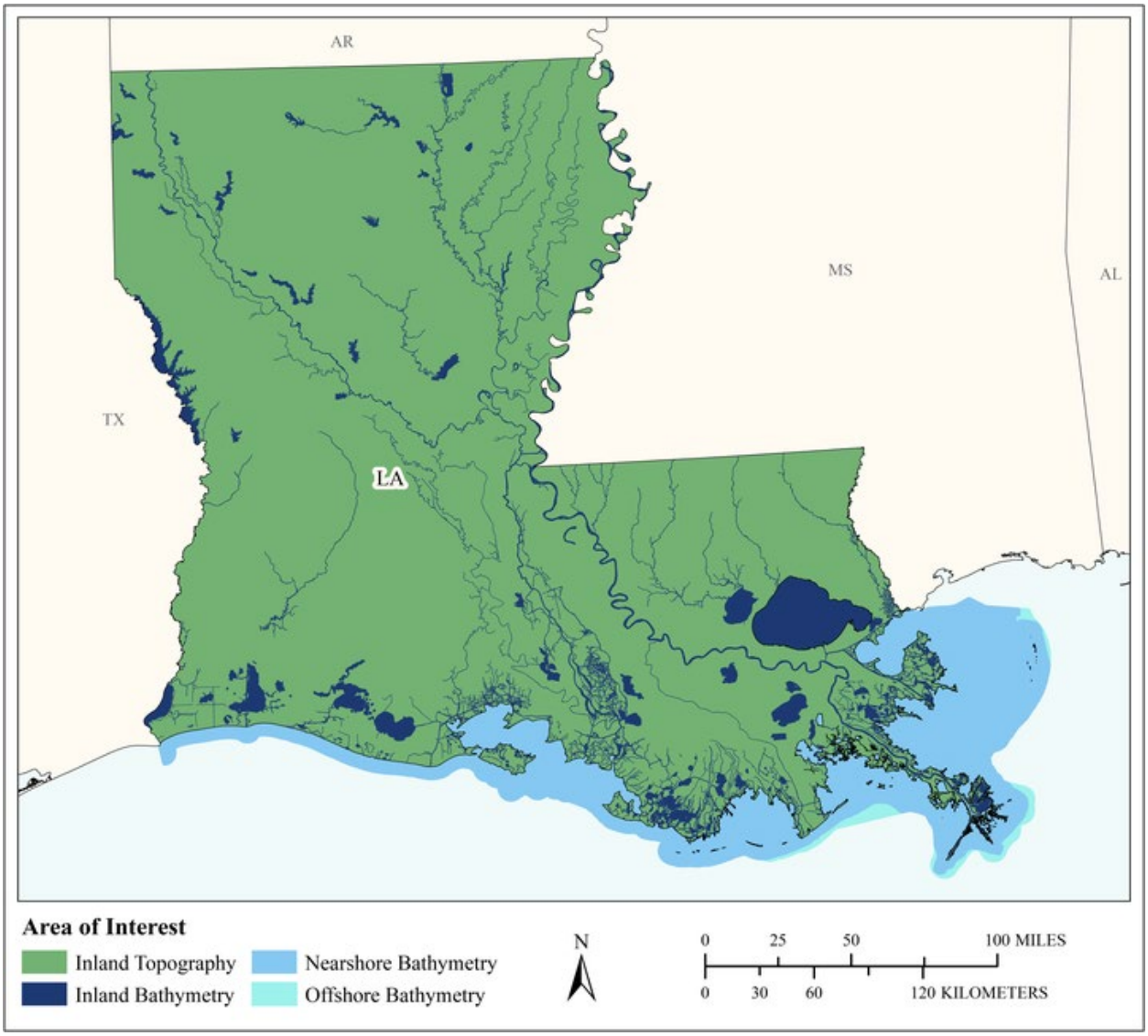
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness			Major	
Improved customer experience			Major	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach			Major	
Environmental			Major	
Public safety, including life and property			Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings							Major	Annual dollars saved/realized	$46,732			
Time savings description							Field verification of mitigation strategies. 2 hours per week * 50 weeks. 4 hours per week * 50 weeks.					
Cost savings/cost reduction							Major	Annual dollars saved/realized	$8,000			
Cost savings/cost reduction description							Minimum data collection savings.					
Cost avoidance							Major	Annual dollars saved/realized	$1,002,500			
Cost avoidance description							50 hours * $30 per hour. Potentially much greater if property loss can be avoided. 50 hours * $20 per hour.					
Increased revenues							Major	Unable to provide				
Increased revenues description							I don't know how to estimate this. Potential oyster harvest yields.					
Mission-driven performance improvements							Major	Annual percent improvement	75%			
Mission-driven performance improvements description							Major improvements to decision making. Major improvements to program effectiveness. Major improvements to mission effectiveness.					
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services							Major	Annual dollars saved/realized	$3,015			
Value added to products or services description							New mitigation strategies. I don't know how to estimate this.					
Improved response or timeliness							Moderate	Annual dollars saved/realized	$19,598			
Improved response or timeliness description							1 hours per week * 50 weeks. Potentially much greater. 2 hours per week * 50 weeks.					
Improved customer experience							Major	Annual dollars saved/realized	$3,015			
Improved customer experience description							1 hours per week * 50 weeks. Increased citizen confidence is major benefit.					
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach							Major					
Education or outreach description							Enormous benefits to public education					
Environmental							Major					
Environmental description							Enormous benefits to environmental preservation					
Public safety, including life and property							Major					
Public safety, including life and property description							Enormous benefits to public safety and property security					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours			Yes	
Hillshades			Yes	
Slope maps			Yes	
Aspect maps			Yes	
Curvature maps			Yes	
Cross sections				
Height-Above-Ground maps			Yes	
Viewshed maps				
Hydrologic Flow Direction Grids			Yes	
Hydrologic Flow Accumulation Grids			Yes	
Hydrologic networks (e.g. streams, lakes)			Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)			Yes	
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness			Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	1
Update frequency	3

MCA Title: Natural Resources Conservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation engineering. Soils and wetlands mapping and characterization. Modeling of biological and ecological systems. Erosion control. Rainfall penetration studies, impervious surfaces. Assessment of blue carbon stocks.
MCA Title	Natural Resources Conservation
MCA ID	60200
Organization Type	State or U.S. Territorial government
Organization Name	State of Louisiana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B	QL1B	Cross sections and/or transects meet needs
Update Frequency	4-5 years	6-10 years	6-10 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				Yes
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Highly desirable	Required	Required	Required	Required
Entire AOI under same environmental conditions	Required	Required	Required	Required	Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Required	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Required	Required	Required	Required
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Highly desirable	Required	Highly desirable
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Nice to have	Highly desirable
Ground control/ground truthing	Required	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Nice to have	Required
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Highly desirable
Underwater videography			Nice to have	Highly desirable
Bottom texture			Nice to have	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Highly desirable	Highly desirable
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Nice to have	Highly desirable
Habitat distribution and classification			Required	Highly desirable
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Highly desirable
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates	Highly desirable	Required	Highly desirable	
Land use/land cover	Required	Required	Highly desirable	Nice to have
Wetlands	Required	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Highly desirable
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Nice to have	Highly desirable	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	Major
Cost savings/cost reduction	Major	Major	Minor	Major
Cost avoidance	Major	Moderate	Minor	I don't know
Increased revenues	Minor	Minor	None	I don't know
Mission-driven performance improvements	Major	Major	Moderate	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Moderate	Major

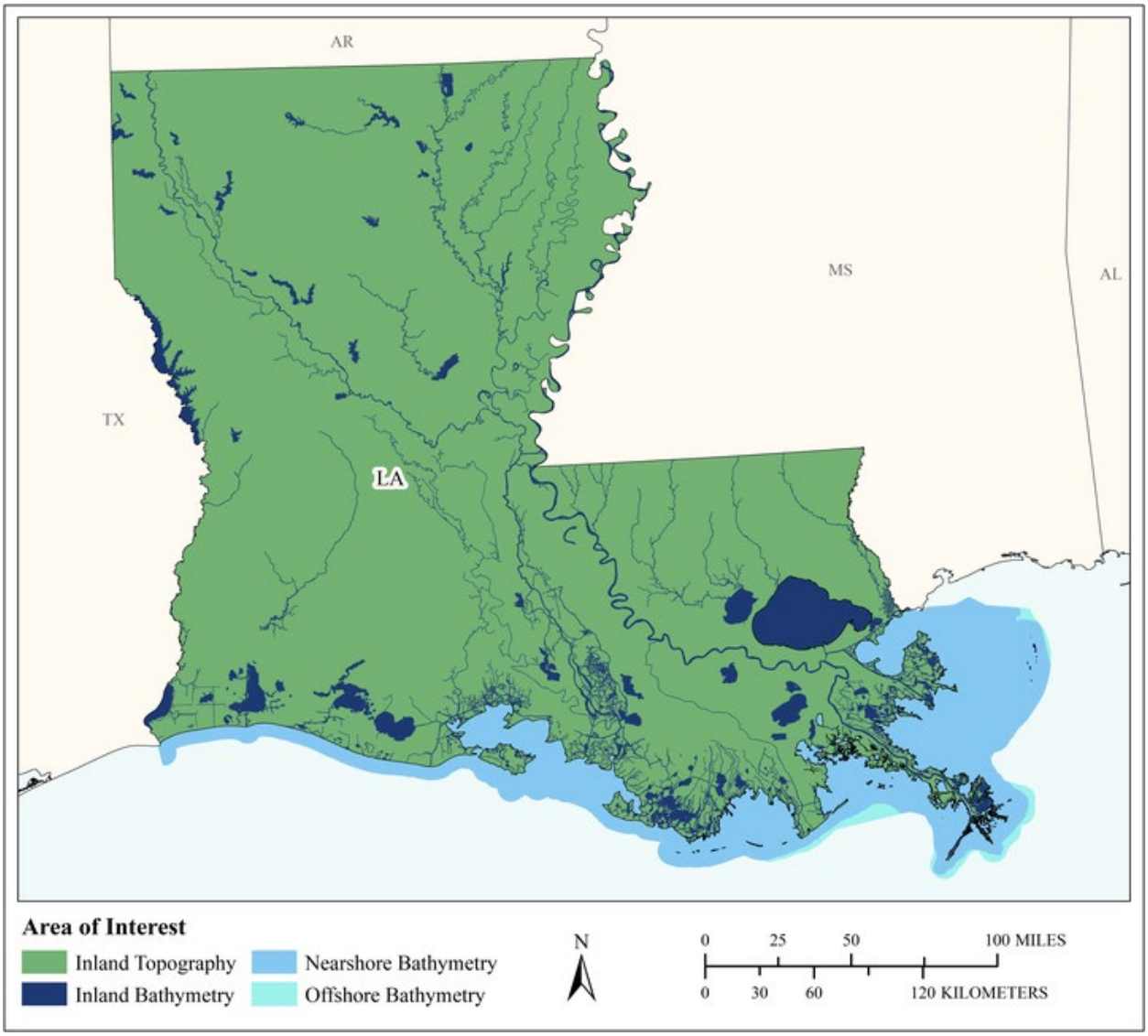
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major	Moderate	Major
Improved customer experience	Major	Moderate	Minor	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Moderate	Major
Environmental	Major	Major	Major	Major
Public safety, including life and property	Major	Moderate	Moderate	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		None			Moderate	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,807,533		Annual dollars saved/ realized	$244,990						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$6,637,814		Annual dollars saved/ realized	$11,028						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate			Moderate		
Environmental	Major			Major			Major			Major		
Public safety, including life and property	Major			Major			Moderate			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Habitat Modeling and Monitoring



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation planning for wildlife management areas, refuges and conservation areas as well as private lands. Conservation and management of fisheries. Prescribed burning on Wildlife Management Areas (WMAs) for habitat management. Elevation data are used for flood modeling of WMAs. The forestry section uses elevation data for planning for prescribed burning operations. For fisheries, lidar is used to model waterbodies when levels are lowered or drained (i.e. drawdowns).
MCA Title	Habitat Modeling and Monitoring
MCA ID	22089
Organization Type	State or U.S. Territorial government
Organization Name	Louisiana Department of Wildlife & Fisheries
Sub-Agency or Division	
Organization Mission	To manage, conserve, and promote wise utilization of Louisiana's renewable fish and wildlife resources and their supporting habitats through replenishment, protection, enhancement, research, development, and education for the social and economic benefit of current and future generations; to provide opportunities for knowledge of and use and enjoyment of these resources; and to promote a safe and healthy environment for the users of the resources.
Program Name	Management of Wildlife habitat throughout Louisiana.
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	BU 04 - Forest Resources Management
Tertiary Business Use	BU 09 - Fisheries Management and Aquaculture

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Understory vegetation. Oyster beds and artificial reefs.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL0B	QL0B	Special Order
Update Frequency	Annually	Annually	Annually	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	Less than 50 cm	Less than 50 cm	Up to 2 meters
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm	Less than 10 cm	Less than 1 meter
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed	To MLLW		To MLLW	
Tide correction requirement			MSL	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Required	Required	Highly desirable	Required	Required
Entire AOI under same environmental conditions	Required	Required	Required	Highly desirable	Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required	Highly desirable	Required	Required
DEM for entire AOI needs to be seamless	Required	Required	Required	Highly desirable	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Required	Highly desirable
DTM	Required	Required	Required	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Required	Required	Required	Highly desirable
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Required	Nice to have
Full waveform	Not required	Nice to have	Highly desirable	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Required	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Highly desirable
Nautical and/or navigation charts			Required	Highly desirable
Acoustic imagery of the seafloor			Required	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Highly desirable	Nice to have
Bottom texture			Required	Highly desirable
Bottom type			Required	Required
Submerged features			Required	Required
Subbottom characteristics			Required	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Required	Highly desirable
Water column properties - Chemical			Required	Highly desirable
Water column properties - Biological			Required	Highly desirable
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Required	Highly desirable
Boundaries			Required	Highly desirable
Routes			Highly desirable	Nice to have
Offshore cadastral			Highly desirable	Nice to have
Lease areas			Highly desirable	Nice to have
Fixed obstructions			Required	Highly desirable
Floating observation/navigation systems			Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Required	Required	Required	Highly desirable
Wetlands	Required	Required	Required	Nice to have
Estuaries			Required	Nice to have
Inland surface water features	Required	Required	Required	
Bridges/culverts	Not required	Nice to have		
Landmark features	Required	Highly desirable	Required	
Cultural resources	Not required	Not required	Nice to have	
Coastal and riverine structures	Required	Required	Highly desirable	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Louisiana / Federal Emergency Management Agency (FEMA) Statewide LiDAR processed by Watershed Concepts and Acquired by 3001. Dates - 2001-2008. Current data are less than QL3.	Field surveys using portable bathymetric sensors attached to Trimble GPS receivers/field units and university data when available and NOAA	NOAA georeferenced charts	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast			Yes	
NCEI				
Open Topography				
NOAA nautical charts		Yes		
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			

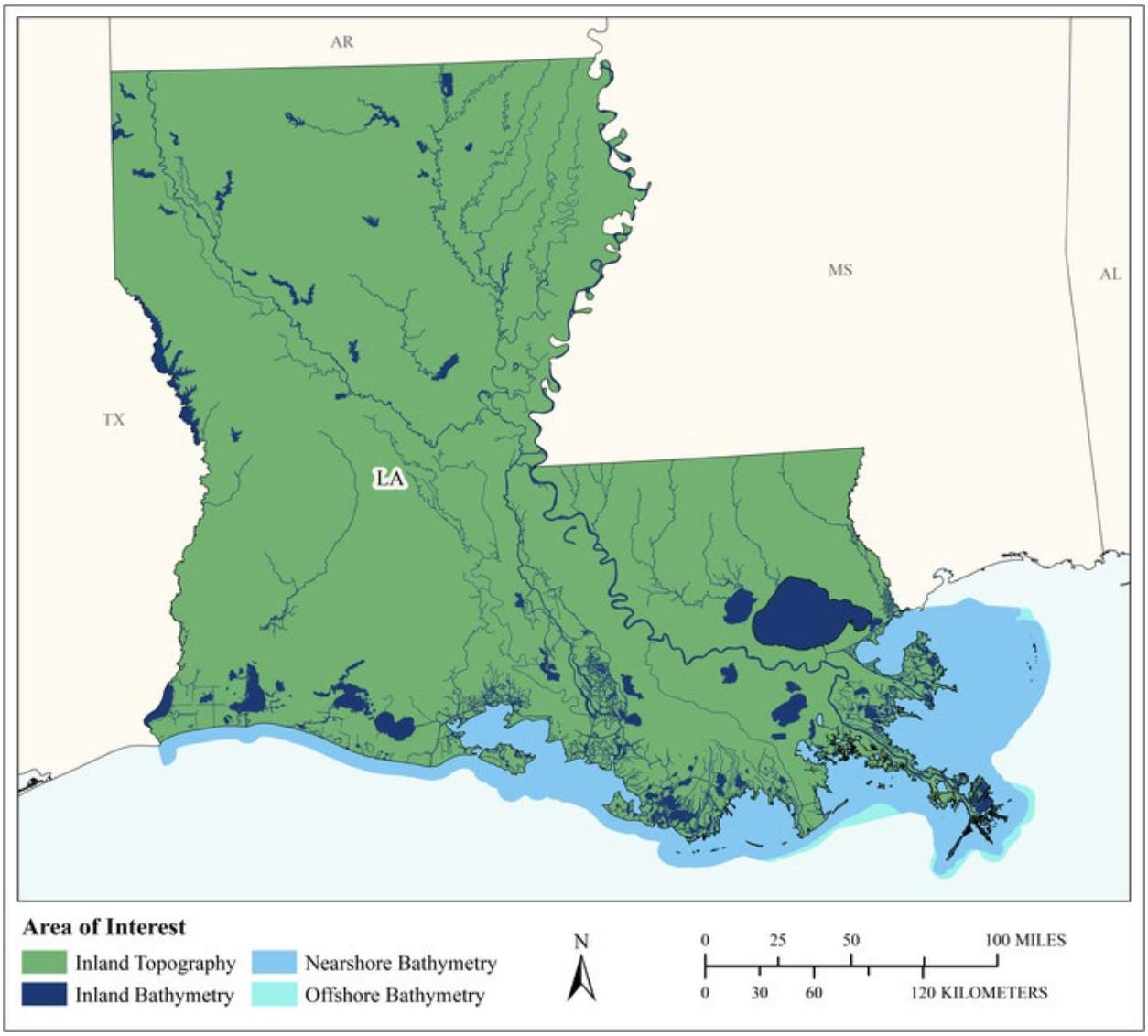
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
State repositories used	Atlas.lsu.edu			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know	I don't know	I don't know	Moderate
Cost savings/cost reduction	None	I don't know	I don't know	Minor
Cost avoidance	Major	I don't know	Moderate	Major
Increased revenues	None	I don't know	I don't know	None
Mission-driven performance improvements	Moderate	Moderate	Moderate	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Moderate	Minor
Improved response or timeliness	Moderate	I don't know	Moderate	Minor
Improved customer experience	Moderate	Moderate	Moderate	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	I don't know	Moderate	Minor
Environmental	Major	I don't know	Moderate	Major
Public safety, including life and property	Major	I don't know	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide		Major	Unable to provide	
Cost avoidance description	Staff time reduced by having processing done by outside organization.											
Increased revenues	Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide		Major	Unable to provide	
Other operational benefits				Moderate	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$10,977		Annual dollars saved/ realized	$87,974		Annual dollars saved/ realized	$6,016		Annual dollars saved/ realized	$257
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide		Major	Unable to provide	
Improved response or timeliness description	Allow for hazard avoidance by closing WMAs impacted by flooding event.											
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$31,705		Annual dollars saved/ realized	$53,175		Annual dollars saved/ realized	$355		Annual dollars saved/ realized	$17
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate			Moderate		
Environmental	Moderate			Moderate			Moderate			Major		
Public safety, including life and property	Major			Moderate			Moderate			Major		
Public safety, including life and property description	Allow for hazard avoidance by closing WMAs impacted by flooding event											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes			Yes
Curvature maps	Yes			
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Agriculture and Precision Farming



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Farm pond design. Irrigation system design. Detailed site analysis to support precision farming. Analysis of farm sedimentation and runoff. Calibration of fertilizer application, fertilizer management, and irrigation planning. Optimized terraforming.
MCA Title	Agriculture and Precision Farming
MCA ID	60201
Organization Type	State or U.S. Territorial government
Organization Name	State of Louisiana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 08 - Agriculture and Precision Farming
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Nice to have
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL4B	I don't know	I don't know
Update Frequency	2-3 years	4-5 years	I don't know	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 10 meters	I don't know	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 50 cm	I don't know	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required	I don't know	I don't know	Not required	I don't know
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	I don't know	I don't know	Nice to have	I don't know
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	I don't know	I don't know	Not required	I don't know
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	I don't know	I don't know	Not required	I don't know
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	I don't know	I don't know	Up to double the required TVU at the 95% confidence level	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	I don't know	I don't know
DTM	Required	Required	I don't know	I don't know
DEM	Required	Required	I don't know	I don't know
Raw point cloud data	Nice to have	Nice to have	I don't know	I don't know
Classified point cloud	Nice to have	Nice to have	I don't know	
Edited/cube XYZ		Highly desirable	I don't know	I don't know
Full waveform	Nice to have	Highly desirable	I don't know	I don't know
Bathymetric Attributed Grid (BAG)		Highly desirable	I don't know	I don't know
Breaklines required for standard hydro-flattening	Required	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			I don't know	I don't know
Tide Predictions			I don't know	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			I don't know	I don't know
Intensity imagery/sidescan imagery	Nice to have	Nice to have	I don't know	I don't know
Ground control/ground truthing	Highly desirable	Highly desirable	I don't know	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			I don't know	I don't know
Nautical and/or navigation charts			I don't know	I don't know
Acoustic imagery of the seafloor			I don't know	I don't know
Aerial and/or satellite imagery	Required	Required	I don't know	I don't know
Underwater videography			I don't know	I don't know
Bottom texture			I don't know	I don't know
Bottom type			I don't know	I don't know
Submerged features			I don't know	I don't know
Subbottom characteristics			I don't know	I don't know
Geologic and seismic data	Nice to have	Highly desirable	I don't know	I don't know
Water column properties - Physical			I don't know	I don't know
Water column properties - Chemical			I don't know	I don't know
Water column properties - Biological			I don't know	I don't know
Currents			I don't know	I don't know
Tide/wave heights			I don't know	I don't know
Sea ice conditions			I don't know	I don't know
Habitat distribution and classification			I don't know	I don't know
Boundaries			I don't know	I don't know
Routes			I don't know	I don't know
Offshore cadastral			I don't know	I don't know
Lease areas			I don't know	I don't know
Fixed obstructions			I don't know	I don't know
Floating observation/navigation systems			I don't know	I don't know
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	I don't know	
Land use/land cover	Highly desirable	Required	I don't know	I don't know
Wetlands	Required	Required	I don't know	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			I don't know	I don't know
Inland surface water features	Required	Required	I don't know	
Bridges/culverts	Required	Required		
Landmark features	Nice to have	Required	I don't know	
Cultural resources	Nice to have	Highly desirable	I don't know	
Coastal and riverine structures	Highly desirable	Required	I don't know	
Overhead structures			I don't know	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	None	I don't know	I don't know
Cost savings/cost reduction	Major	I don't know	I don't know	I don't know
Cost avoidance	Major	Moderate	I don't know	I don't know
Increased revenues	None	I don't know	I don't know	I don't know
Mission-driven performance improvements	Moderate	None	I don't know	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None	I don't know	I don't know

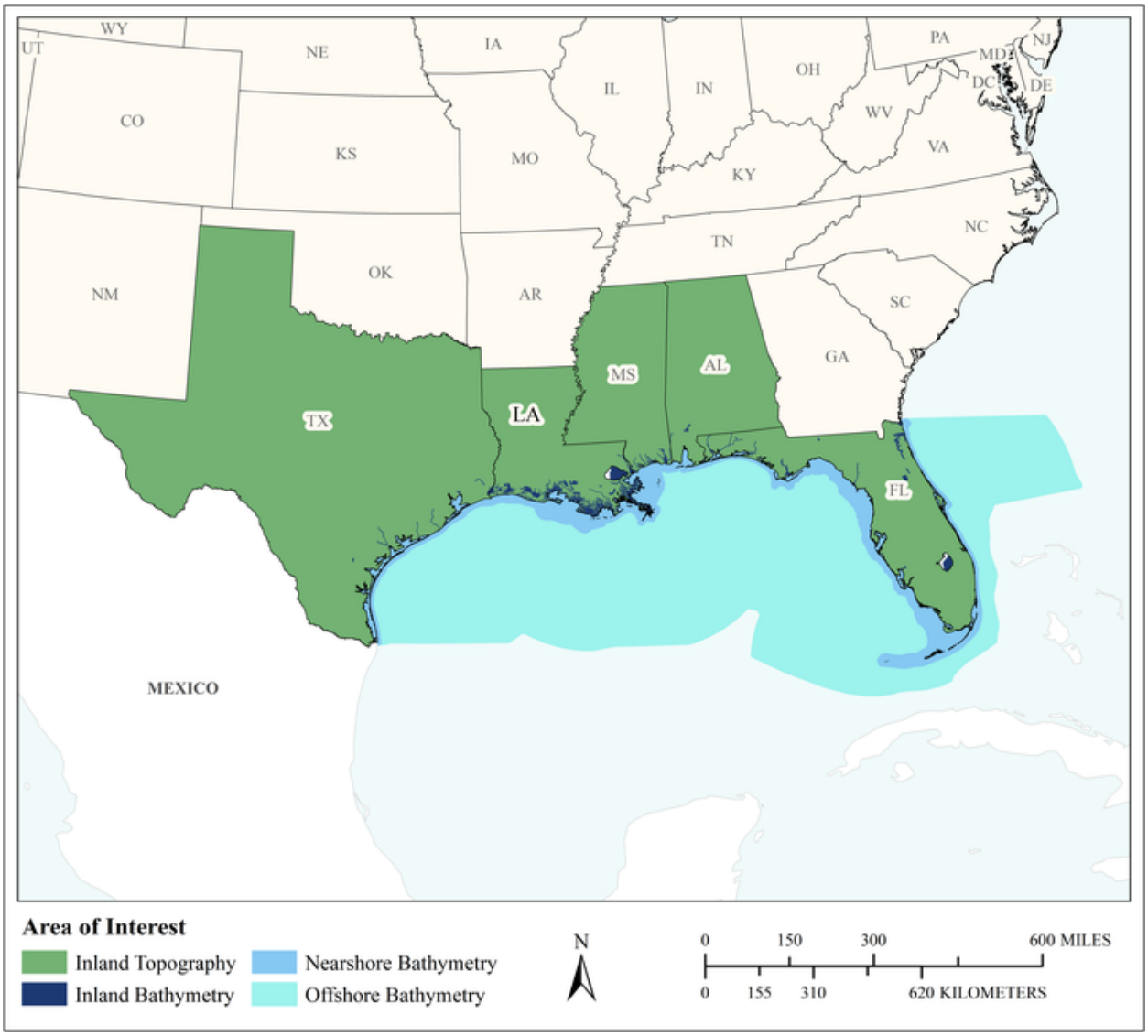
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	None	I don't know	I don't know
Improved customer experience	Moderate	None	I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	None	I don't know	I don't know
Environmental	Major	I don't know	I don't know	I don't know
Public safety, including life and property	Moderate	I don't know	I don't know	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues	Minor	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$53,354		Annual dollars saved/ realized	$93,478						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$42,297		Annual dollars saved/ realized	$42,297						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate			I don't know			I don't know		
Environmental	Major			Major			I don't know			I don't know		
Public safety, including life and property	Minor			Major			I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps				
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps		Yes		
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geospatial Mapping, Analysis, and Cartography



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Custom description	Custom description
Sub Area Requirements		Coastal Counties of Alabama, Florida, Louisiana, Mississippi, Texas	Alabama, Florida, Louisiana, Mississippi, and Texas, out to the EEZ	Alabama, Florida, Louisiana, Mississippi, and Texas, out to the EEZ

MCA Description	Response
Mission Critical Activity	As a major university department (LSU), Louisiana Geological Survey is engaged in a wide range of high level geospatial research, education, and disaster response and recovery. Our MCA is geospatial mapping, analysis, and cartography. Many BUs are included from the list in Question 5a. If I could list more than 3 Primary BUs I would. Research takes place across the U.S. and globally; various spatial resolutions are needed. The topo and bathy requirements vary by research project.
MCA Title	Geospatial Mapping, Analysis, and Cartography
MCA ID	22446
Organization Type	Academic or Not-for-Profit
Organization Name	Louisiana Geological Survey, Louisiana State University
Sub-Agency or Division	
Organization Mission	Research, Education, and Community Outreach (including disaster response and recovery).
Program Name	Sponsored geospatial research into geology, geologic hazards, flood modeling, coastal land loss, hydrography, hurricane surge modeling and hurricane disaster response.
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 16 - Sea Level Rise and Subsidence

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Sub meter
Description of smallest 3D features	Sub meter

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Not required
51 - 100 ft	Nice to have
101 - 500 ft	Highly desirable
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required

Inland Bathy Feature Size Requirements	Response
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL1B	Order 3
Update Frequency	4-5 years	6-10 years	6-10 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI	QL2 is required along all major inland rivers for my entire geographic area as well as the entire coastal plain of the Northern coast of the Gulf of Mexico. Lower resolution is allowed elsewhere.			My requirements vary with depth, slope, and bottom type. 10m spatial resolution would be desirable
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	The best horizontal accuracy achievable for the vertical accuracy I need
Acceptable Vertical Error	Up to 20 cm	Up to 20 cm	Up to 20 cm	Up to 5 meters
How far onshore needed			To the fall line	
How far down the beach profile needed	Below MLLW		To 10 meter depth	
Tide correction requirement			MSL	MSL
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Highly desirable	Highly desirable	Not required	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Required	Nice to have	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DTM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Not required	Nice to have	Nice to have	Not required
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	Required
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Required	Required
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Highly desirable	Highly desirable	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Required
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Highly desirable	Highly desirable
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Required	Required
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Required	Required	Required	Required
Water column properties - Physical			Highly desirable	Highly desirable
Water column properties - Chemical			Highly desirable	Highly desirable
Water column properties - Biological			Highly desirable	Highly desirable
Currents			Highly desirable	Highly desirable
Tide/wave heights			Required	Highly desirable
Sea ice conditions			Nice to have	Highly desirable
Habitat distribution and classification			Required	Required
Boundaries			Required	Required
Routes			Required	Required
Offshore cadastral			Required	Required
Lease areas			Required	Required
Fixed obstructions			Required	Required
Floating observation/navigation systems			Required	Required
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Required	Required	Required	Highly desirable
Wetlands	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Required	Required	Required	
Cultural resources	Required	Required	Required	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	USGS QL2 LiDAR, 6 inch true-color aerial photography, NAIP imagery, DOQQ both true-color and CIR	Current inland bathymetric DEM data is not complete for Coastal Louisiana! Nearshore bathymetric DEM data currently used for Coastal Louisiana is from NOAA.	From NOAA	From NOAA
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	Yes
NCEI				
Open Topography				
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS			Yes	Yes
State Repositories	Yes			
State repositories used	www.sonris.com also atlas.lsu.edu			
Other	Yes			
Other description	USDA Data Gateway			
Data that meet my needs are not available		Yes		

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Major	Major
Cost savings/cost reduction	Major	Major	Major	Major
Cost avoidance	Major	Major	Major	Major
Increased revenues	Major	Major	Major	Major
Mission-driven performance improvements	Major	Major	Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	Major
Improved response or timeliness	Major	Major	Major	Major
Improved customer experience	Major	Major	Major	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major	Major	Major
Environmental	Major	Major	Major	Major
Public safety, including life and property	Major	Major	Major	Major

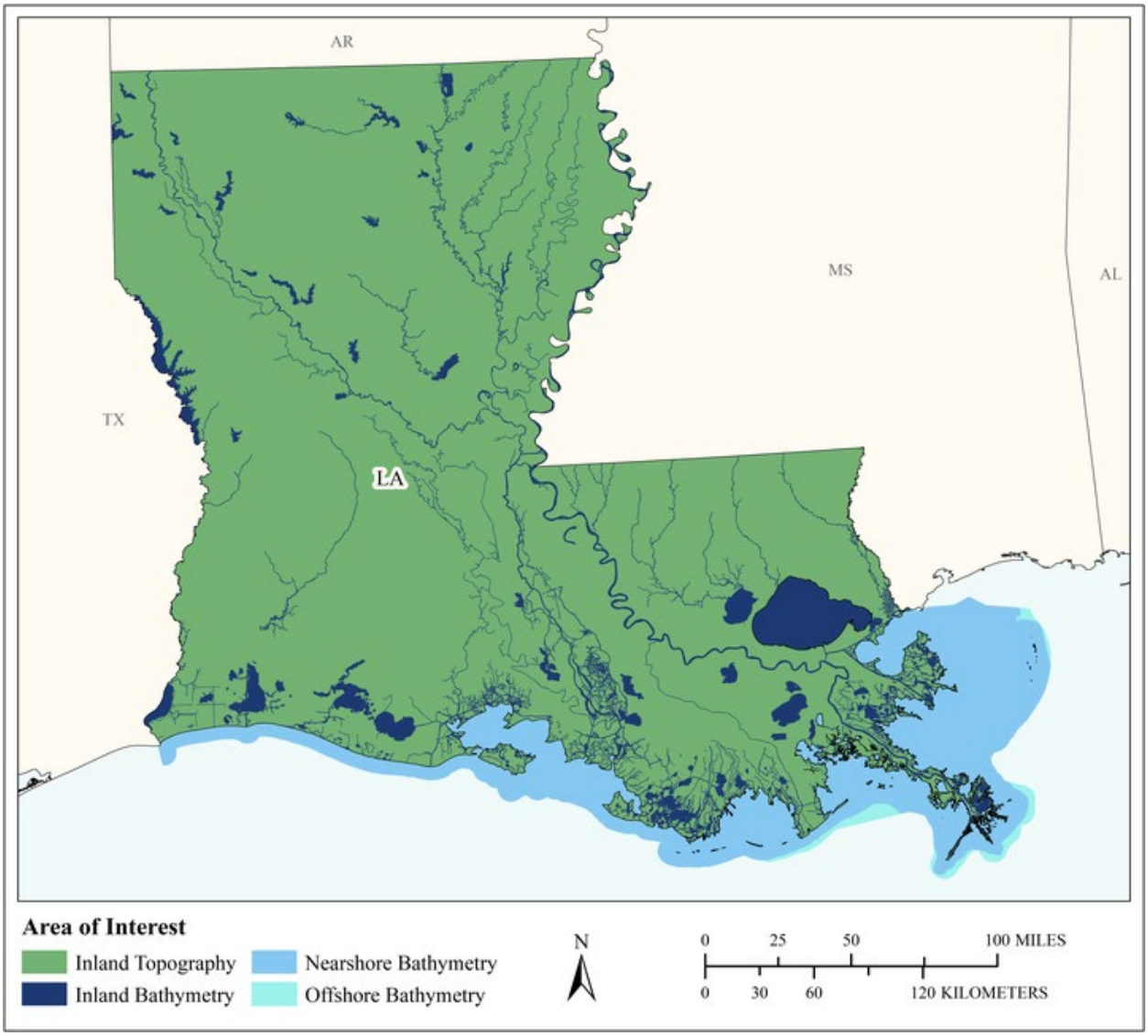
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Time savings description	Good data supports all research. Research cannot be done without good data.			Research cannot be done without good data.			Research cannot be done without good data.			Research cannot be done without good data.		
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction description	Research cannot be done without good data.			Research cannot be done without good data.			Research cannot be done without good data.			Research cannot be done without good data.		
Cost avoidance	Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost avoidance description				Research cannot be done without good data.			Research cannot be done without good data.			Research cannot be done without good data.		
Increased revenues	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues description				Research cannot be done without good data.			Research cannot be done without good data.			Research cannot be done without good data.		
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Mission-driven performance improvements description	Research cannot be done without good data.			Research cannot be done without good data.			Research cannot be done without good data.			Research cannot be done without good data.		
Other operational benefits				Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Other operational benefits description				Research cannot be done without good data.			Research cannot be done without good data.			Research cannot be done without good data.		
Future annual operational benefits added during validation		Annual dollars saved/ realized	$9,727,787		Annual dollars saved/ realized	$27,719		Annual dollars saved/ realized	$468,662			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Value added to products or services description	Research cannot be done without good data.			Research cannot be done without good data.			Research cannot be done without good data.			Research cannot be done without good data.		
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness description	Research cannot be done without good data.			Research cannot be done without good data.			Research cannot be done without good data.			Research cannot be done without good data.		
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience description	Research cannot be done without good data.			Research cannot be done without good data.			Research cannot be done without good data.			Research cannot be done without good data.		
Other customer service benefits				Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Other customer service benefits description				Research cannot be done without good data.			Research cannot be done without good data.			Research cannot be done without good data.		
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$170,771		Annual dollars saved/ realized	$30,459		Annual dollars saved/ realized	$754,060			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major			Major		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Education or outreach description	Research cannot be done without good data.	Research cannot be done without good data.	Research cannot be done without good data.	Research cannot be done without good data.
Environmental	Major	Major	Major	Major
Environmental description	Research cannot be done without good data.	Research cannot be done without good data.	Research cannot be done without good data.	Research cannot be done without good data.
Public safety, including life and property	Major	Major	Major	Major
Public safety, including life and property description	Research cannot be done without good data.	Research cannot be done without good data.	Research cannot be done without good data.	Research cannot be done without good data.
Other				
Other benefits	Major	Major	Major	
Other description		We are in tremendous need for current inland bathymetric DEM data for all of coastal Louisiana, as well as near-offshore!	We are in tremendous need for current inland bathymetric DEM data for all of coastal Louisiana, as well as nearshore!	

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes	Yes	Yes	
Curvature maps	Yes	Yes	Yes	
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps	Yes	Yes	Yes	
Viewshed maps	Yes	Yes	Yes	
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Renewable Energy Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Alternate energy development – solar, tidal, wind, wave, and ocean current. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Low head power potential for hydropower.
MCA Title	Renewable Energy Resources
MCA ID	60202
Organization Type	State or U.S. Territorial government
Organization Name	State of Louisiana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	I don't know
Rivers and Streams	
Less than 10 ft	I don't know
10 - 50 ft	I don't know
51 - 100 ft	I don't know
101 - 500 ft	I don't know
501 - 2,500 ft	I don't know
Greater than 2,500 ft	I don't know
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	I don't know
½ - 1 acre	I don't know
1.1 – 2 acres	I don't know
2.1 – 5 acres	I don't know

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	I don't know
Greater than 10 acres	I don't know

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	I don't know	I don't know	I don't know
Update Frequency	6-10 years	I don't know	I don't know	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	I don't know	I don't know	I don't know
Acceptable Vertical Error	Up to 20 cm	I don't know	I don't know	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					I don't know	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	I don't know	I don't know	I don't know	I don't know	I don't know
Entire AOI under same environmental conditions	Highly desirable	I don't know	I don't know	I don't know	I don't know	I don't know
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	I don't know	I don't know	I don't know	I don't know	I don't know
DEM for entire AOI needs to be seamless	Highly desirable	I don't know	I don't know	I don't know	I don't know	I don't know
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	I don't know	I don't know	I don't know
DTM	Required	I don't know	I don't know	I don't know
DEM	Required	I don't know	I don't know	I don't know
Raw point cloud data	Highly desirable	I don't know	I don't know	I don't know
Classified point cloud	Highly desirable	I don't know	I don't know	
Edited/cube XYZ		I don't know	I don't know	I don't know
Full waveform	Nice to have	I don't know	I don't know	I don't know
Bathymetric Attributed Grid (BAG)		I don't know	I don't know	I don't know
Breaklines required for standard hydro-flattening	Nice to have	I don't know		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			I don't know	I don't know
Tide Predictions			I don't know	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			I don't know	I don't know
Intensity imagery/sidescan imagery	Not required	I don't know	I don't know	I don't know
Ground control/ground truthing	Highly desirable	I don't know	I don't know	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			I don't know	I don't know
Nautical and/or navigation charts			I don't know	I don't know
Acoustic imagery of the seafloor			I don't know	I don't know
Aerial and/or satellite imagery	Highly desirable	I don't know	I don't know	I don't know
Underwater videography			I don't know	I don't know
Bottom texture			I don't know	I don't know
Bottom type			I don't know	I don't know
Submerged features			I don't know	I don't know
Subbottom characteristics			I don't know	I don't know
Geologic and seismic data	Not required	I don't know	I don't know	I don't know
Water column properties - Physical			I don't know	I don't know
Water column properties - Chemical			I don't know	I don't know
Water column properties - Biological			I don't know	I don't know
Currents			I don't know	I don't know
Tide/wave heights			I don't know	I don't know
Sea ice conditions			I don't know	I don't know
Habitat distribution and classification			I don't know	I don't know
Boundaries			I don't know	I don't know
Routes			I don't know	I don't know
Offshore cadastral			I don't know	I don't know
Lease areas			I don't know	I don't know
Fixed obstructions			I don't know	I don't know
Floating observation/navigation systems			I don't know	I don't know
Shorelines – current, historic, change rates	Nice to have	I don't know	I don't know	
Land use/land cover	Highly desirable	I don't know	I don't know	I don't know
Wetlands	Nice to have	I don't know	I don't know	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			I don't know	I don't know
Inland surface water features	Nice to have	I don't know	I don't know	
Bridges/culverts	Nice to have	I don't know		
Landmark features	Nice to have	I don't know	I don't know	
Cultural resources	Not required	I don't know	I don't know	
Coastal and riverine structures	Nice to have	I don't know	I don't know	
Overhead structures			I don't know	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	I don't know	I don't know	I don't know
Cost savings/cost reduction	Moderate	I don't know	I don't know	I don't know
Cost avoidance	Moderate	I don't know	I don't know	I don't know
Increased revenues	None	I don't know	I don't know	I don't know
Mission-driven performance improvements	Minor	I don't know	I don't know	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	I don't know	I don't know	I don't know

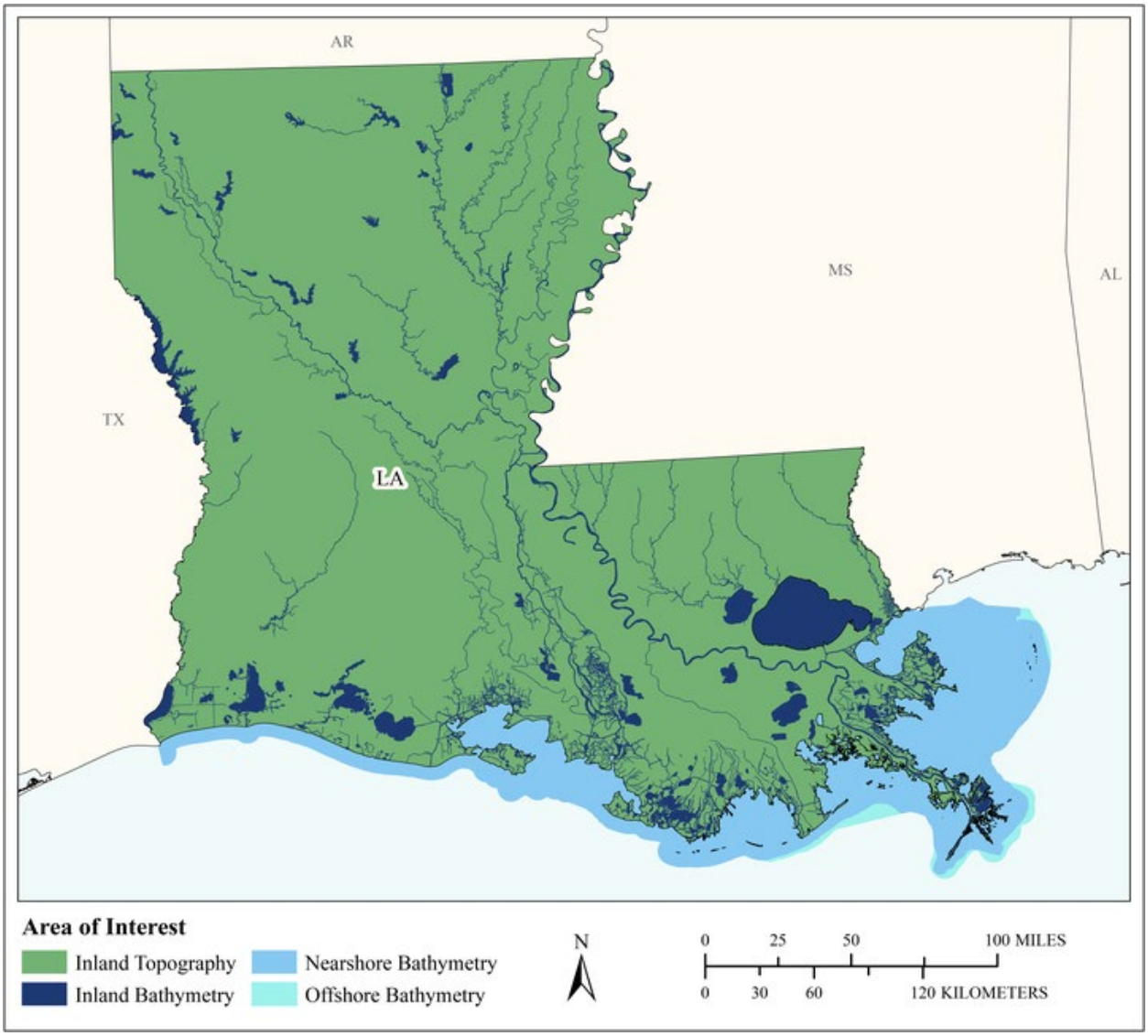
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor	I don't know	I don't know	I don't know
Improved customer experience	Minor	I don't know	I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	I don't know	I don't know	I don't know
Environmental	Minor	I don't know	I don't know	I don't know
Public safety, including life and property	Minor	I don't know	I don't know	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Minor	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			I don't know			I don't know			I don't know		
Environmental	Minor			I don't know			I don't know			I don't know		
Public safety, including life and property	None			I don't know			I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Cultural Resources Preservation and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Discovery and analysis of underwater archaeological and historical cultural sites. Site protection and preservation planning. Discovery and analysis of Native American and other historical cultural sites and subsistence activities.
MCA Title	Cultural Resources Preservation and Management
MCA ID	60203
Organization Type	State or U.S. Territorial government
Organization Name	State of Louisiana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	Order 1a
Update Frequency	4-5 years	6-10 years	4-5 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Not required	Nice to have	Nice to have	Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	Required
DTM	Required	Highly desirable	Nice to have	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Not required	Not required	Not required	Not required
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Not required	Nice to have
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Nice to have	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Highly desirable
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Nice to have	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Required
Nautical and/or navigation charts			Highly desirable	Required
Acoustic imagery of the seafloor			Highly desirable	Required
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Nice to have
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Required	Required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have	Highly desirable	Highly desirable	Highly desirable
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Highly desirable	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Highly desirable	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Required	Required
Floating observation/navigation systems			Highly desirable	Required
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Required	
Land use/land cover	Nice to have	Highly desirable	Nice to have	Highly desirable
Wetlands	Nice to have	Highly desirable	Nice to have	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Nice to have	Highly desirable	Nice to have	
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Nice to have	Highly desirable	Highly desirable	
Cultural resources	Required	Highly desirable	Required	
Coastal and riverine structures	Nice to have	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	Moderate
Cost savings/cost reduction	Moderate	Minor	Minor	Minor
Cost avoidance	Minor	Minor	Minor	Minor
Increased revenues	None	Minor	None	None
Mission-driven performance improvements	Moderate	Moderate	Minor	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor	None	Minor

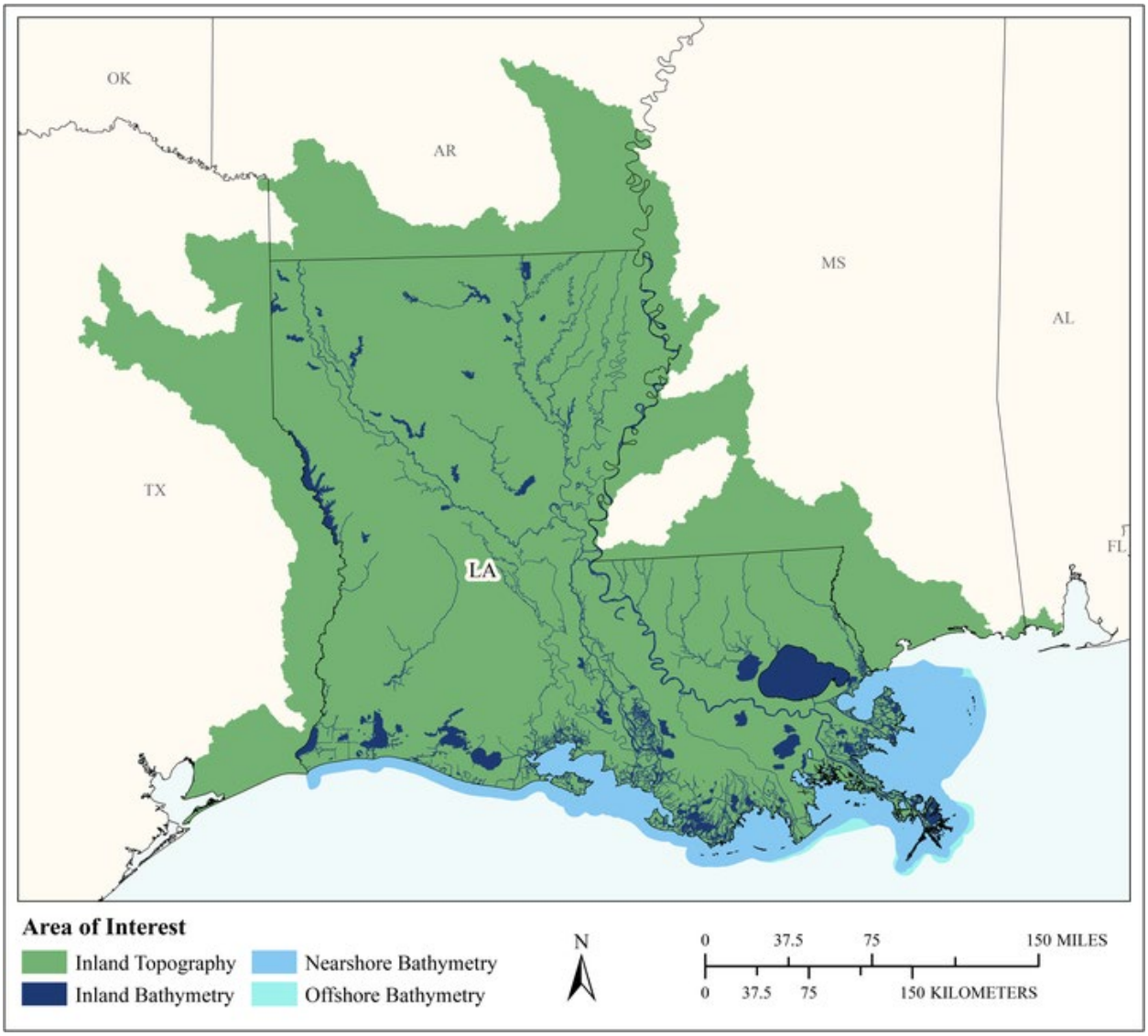
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major	Minor	Moderate
Improved customer experience	Moderate	Moderate	Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	Minor	Minor
Environmental	Minor	Moderate	Minor	Moderate
Public safety, including life and property	Minor	Moderate	None	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Increased revenues	None			None			None			None		
Mission-driven performance improvements	Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$8,446		Annual dollars saved/ realized	$20,255		Annual dollars saved/ realized	$17,391		Annual dollars saved/ realized	$634
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$7,385									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Moderate			Minor			Minor		
Environmental	Minor			Minor			Moderate			Moderate		
Public safety, including life and property	Minor			Minor			Minor			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				Yes

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Flood Risk Modeling and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more Hydrologic Units (HUC8s)	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Flood risk modeling and mapping of riverine and coastal areas. Dam/dike/levee safety analysis. Emergency management. Flood forecasts.
MCA Title	Flood Risk Modeling and Management
MCA ID	1101
Organization Type	State or U.S. Territorial government
Organization Name	Louisiana DOTD
Sub-Agency or Division	
Organization Mission	Plan, design, build and sustain a safe and reliable multimodal transportation and infrastructure system that enhances mobility and economic opportunity.
Program Name	Dam/levee safety.
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 22 - Infrastructure and Construction Management
Tertiary Business Use	BU 23 - Urban and Regional Planning

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	General topographic features to determine drainage runoff and inundation

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL2B	Special Order
Update Frequency	4-5 years	4-5 years	4-5 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Highly desirable	Highly desirable	Required	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Not required	Highly desirable	Highly desirable	Required	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Required	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Required	Highly desirable	Highly desirable
DEM	Nice to have	Required	Required	Required
Raw point cloud data	Not required	Highly desirable	Highly desirable	Nice to have
Classified point cloud	Highly desirable	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Nice to have	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Highly desirable
Ground control/ground truthing	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Highly desirable
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Nice to have	Required	Required	Required
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Nice to have	Highly desirable
Submerged features			Nice to have	Highly desirable
Subbottom characteristics			Not required	Nice to have
Geologic and seismic data	Not required	Nice to have	Not required	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Not required	Nice to have
Water column properties - Biological			Not required	Nice to have
Currents			Nice to have	Highly desirable
Tide/wave heights			Highly desirable	Required
Sea ice conditions			Not required	Nice to have
Habitat distribution and classification			Nice to have	Required
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Not required	Nice to have
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates	Not required	Highly desirable	Highly desirable	
Land use/land cover	Not required	Highly desirable	Highly desirable	Nice to have
Wetlands	Not required	Highly desirable	Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Required
Inland surface water features	Highly desirable	Required	Required	
Bridges/culverts	Highly desirable	Required		
Landmark features	Not required	Highly desirable	Nice to have	
Cultural resources	Not required	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Louisiana / Federal Emergency Management Agency (FEMA) Statewide LiDAR			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Louisiana			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know	Moderate	Minor	Minor
Cost savings/cost reduction	I don't know	Minor	Minor	Minor
Cost avoidance	I don't know	Moderate	Minor	Moderate
Increased revenues	I don't know	Minor	None	Minor

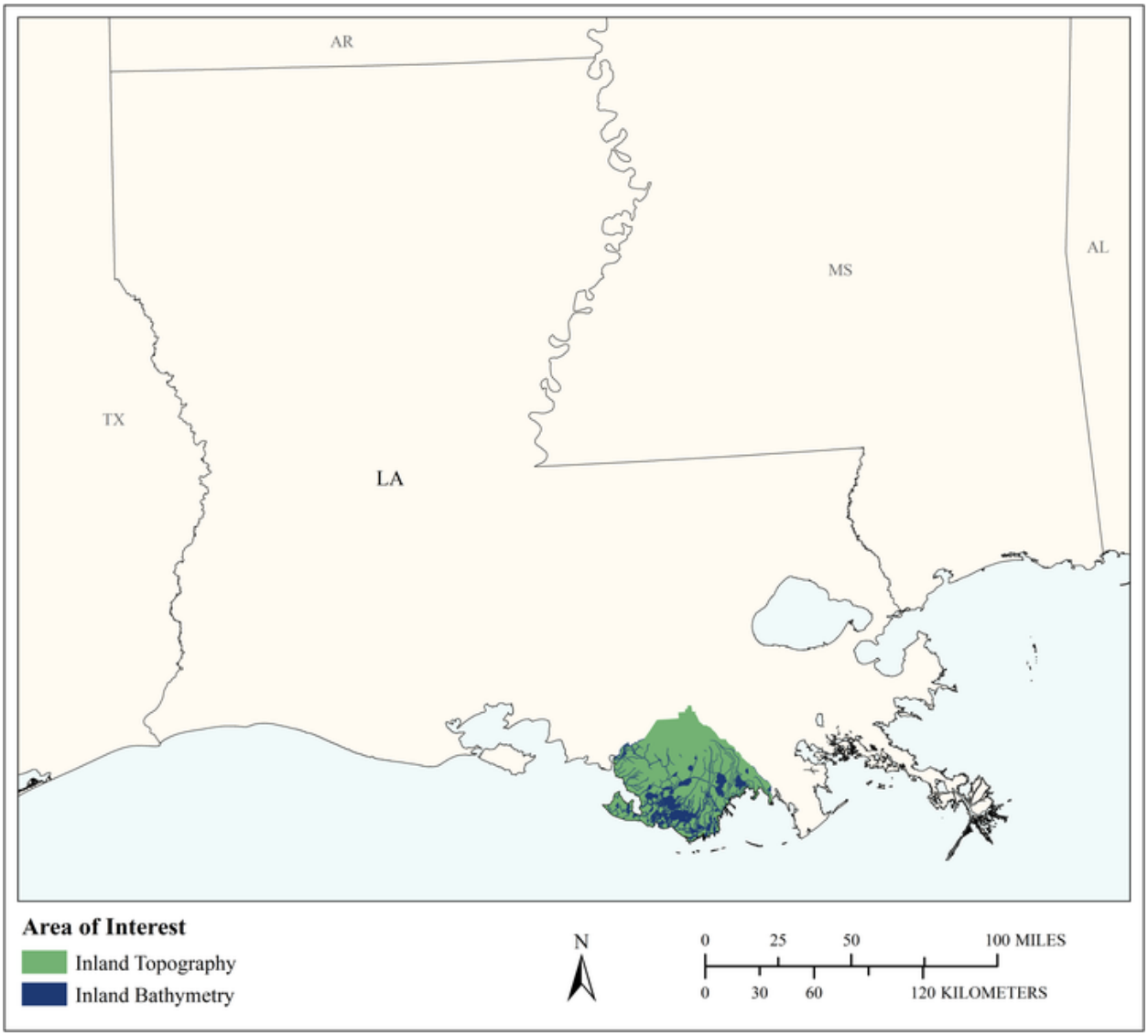
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Mission-driven performance improvements	I don't know	Minor	Minor	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know	Major	Minor	Moderate
Improved response or timeliness	I don't know	Minor	Minor	Major
Improved customer experience	I don't know	Moderate	Minor	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	Minor	Minor	Minor
Environmental	I don't know	Moderate	Moderate	Moderate
Public safety, including life and property	I don't know	Moderate	Minor	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost avoidance	I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	I don't know	Unable to provide		None			Minor	Unable to provide		Moderate	Unable to provide	
Mission-driven performance improvements	I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$15,000,000		Annual dollars saved/ realized	$5,000,000		Annual dollars saved/ realized	$1,150,473			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$5,000,000		Annual dollars saved/ realized	$2,000,000		Annual dollars saved/ realized	$852,664			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			Moderate			Major			Major		
Environmental	I don't know			Moderate			Moderate			Major		
Public safety, including life and property	I don't know			Major			Major			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours		Yes	Yes	Yes
Hillshades				Yes
Slope maps				
Aspect maps				
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes		Yes
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Flood Risk Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements	Terrebonne Parish, LA	Terrebonne Parish, LA		

MCA Description	Response
Mission Critical Activity	Flood risk management, especially levee systems and flood control structures, construction, operation, maintenance and management.
MCA Title	Flood Risk Management
MCA ID	22055
Organization Type	Regional, County, City, or other local government
Organization Name	Terrebonne Parish Consolidated Government
Sub-Agency or Division	
Organization Mission	Flood Risk Management
Program Name	Terrebonne Parish Levees
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Tertiary Business Use	BU 03 - Coastal Zone Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Levees, flood control structures, sluice gates

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL1B		
Update Frequency	2-3 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	Up to 1 meter		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed	To MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Highly desirable	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Nice to have	Highly desirable		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Required		
Bridges/culverts	Highly desirable	Required		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Required	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	2015 USGS DEM, In-house imagery	In-house dataset ~ 10 years old. In-house collected data in some areas (frequent)		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast		Yes		
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes	Yes		
Other description	In-house imagery	In-house		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Major		

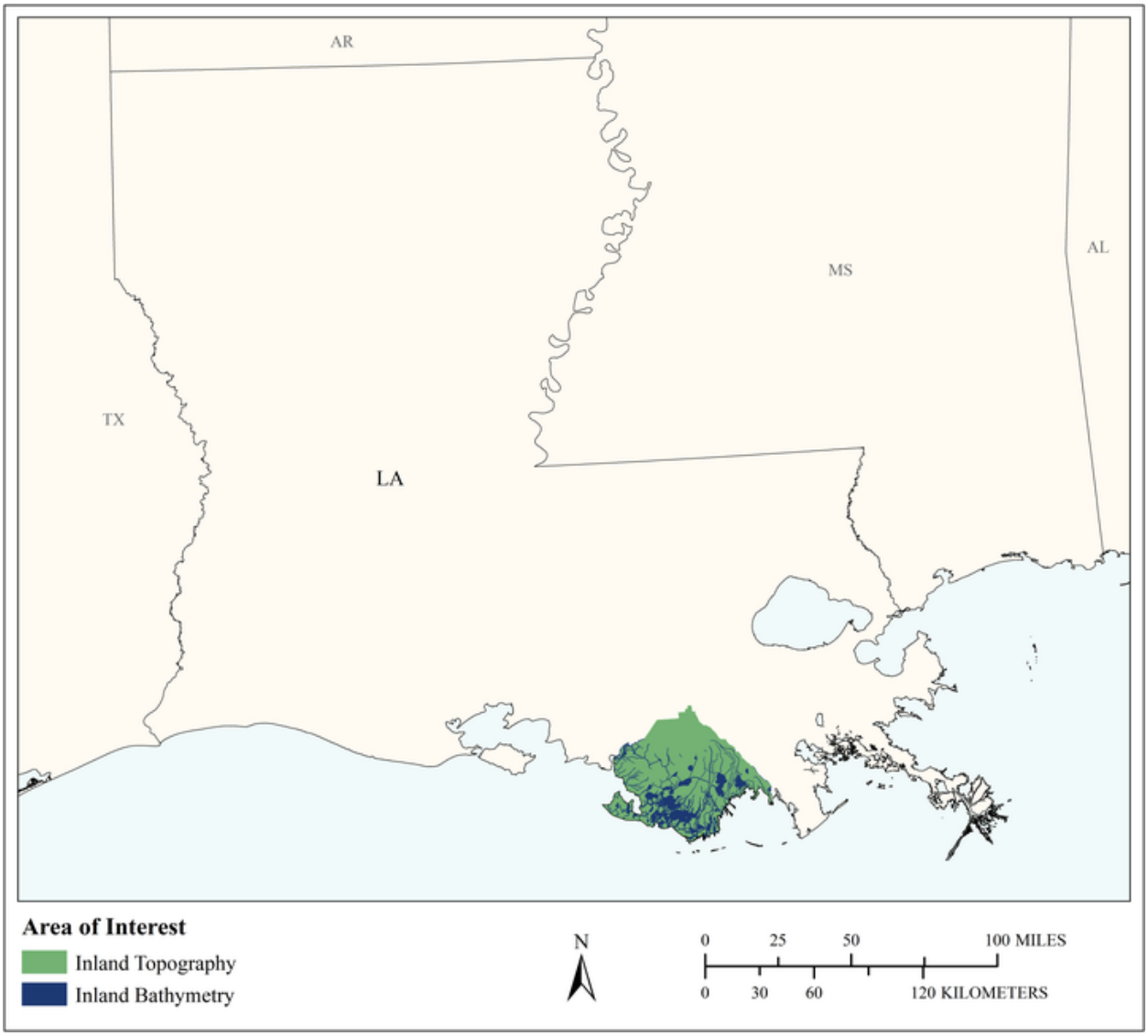
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	Moderate	Major		
Mission-driven performance improvements	Major	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate		
Improved response or timeliness	Major	Moderate		
Improved customer experience	Major	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate		
Environmental	Major	Moderate		
Public safety, including life and property	Major	Major		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$24,120	Major	Annual dollars saved/realized	$27,859						
Time savings description	1 hours per week * 50 weeks. 10 hours per week * 50 weeks. 2 hours per week * 50 weeks.			4 hours per week * 52 weeks. 2 hours per week * 50 weeks. 1 hour per week * 50 weeks. 8 hours per week * 52 weeks.								
Cost savings/cost reduction	Major	Annual dollars saved/realized	$30,000	Major	Annual dollars saved/realized	$50,000						
Cost savings/cost reduction description	Data acquisition costs. Could be significant restoration and construction savings.			Probable savings from construction and maintenance materials. Data costs.								
Cost avoidance	Major	Annual dollars saved/realized	$1,022,000	Major	Annual dollars saved/realized	$1,002,000						
Cost avoidance description	Potentially much more. Potentially millions. 50 hours * $20 per hour.			Not sure how to estimate but likely significant cost avoidance. Potentially millions or tens of millions. 50 hours * $20 per hour.								
Increased revenues	None			Major	Unable to provide							
Increased revenues description				Potentially significant capacity impacts due to control structure placement / sizing analysis.								
Mission-driven performance improvements	Major	Annual percent improvement	87%	Major	Annual percent improvement	100%						
Mission-driven performance improvements description	Data provides many opportunities for automated improvements. At least doubled improvement in mission ability.			Mission capability doubled. Program effectiveness doubled. Decision making capability at least doubled, likely much higher.								
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$1,000,000	I don't know	Unable to provide							
Value added to products or services description	Potentially much more realized cost avoidance due to not flooding.											
Improved response or timeliness	Major	Annual dollars saved/realized	$102,812	Major	Annual dollars saved/realized	$120,600						
Improved response or timeliness description	Flood mapping / projection. Software apps programming. Very impactful - many personnel hours saved. Flood hazard mapping.			Likely much higher in the event of a hazard. Potentially much greater. Flood mapping benefits.								
Improved customer experience	Major	Annual dollars saved/realized	$3,015	Major	Annual dollars saved/realized	$4,522						
Improved customer experience description	Increased citizen confidence is major. New app development.			1 hour per week * 50 weeks. 2 hours per week * 50 weeks. Increased citizen confidence is a major benefit.								
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Education or outreach description	Major benefits in public response			Education benefits are major								
Environmental	Major			Major								
Environmental description	Environmental benefits in wetland management			Environmental benefits are potentially major								
Public safety, including life and property	Major			Major								
Public safety, including life and property description	Public safety and property security extremely beneficial			Impacts to public safety and property security are significant								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections				
Height-Above-Ground maps	Yes	Yes		
Viewshed maps		Yes		
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Disaster Response



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements	Terrebonne Parish, LA	Terrebonne Parish, LA		

MCA Description	Response
Mission Critical Activity	Disaster Response, especially due to hurricane and flood events
MCA Title	Disaster Response
MCA ID	1236
Organization Type	Regional, County, City, or other local government
Organization Name	Terrebonne Parish Consolidated Government
Sub-Agency or Division	
Organization Mission	To provide essential services in an effective manner to the citizens of Terrebonne Parish, Louisiana
Program Name	Terrebonne Parish Office of Emergency Preparedness - Disaster Response Terrebonne Parish Levee District - Flood Risk Management Terrebonne Parish Department of Coastal Restoration and Preservation - Coastal Zone Management
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	BU 03 - Coastal Zone Management
Tertiary Business Use	BU 15 - Flood Risk Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Sign, curb, road line, car, small dock, etc.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL1B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI	Populated areas needed more than marshland			
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need		
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed	To MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Highly desirable	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Highly desirable	Highly desirable		
Edited/cube XYZ		Highly desirable		
Full waveform	Highly desirable	Highly desirable		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Highly desirable	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Required	Required		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Required	Required		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Required	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	USGS 2015 DEM from LiDAR for Terrebonne Parish	In-house, hydro-flattened water body feature class created in ~2005 - 2008		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast		Yes		
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Major		
Increased revenues	I don't know	I don't know		
Mission-driven performance improvements	Major	Major		

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		
Improved response or timeliness	Major	Major		
Improved customer experience	Major	Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major		
Environmental	Major	Major		
Public safety, including life and property	Major	Major		

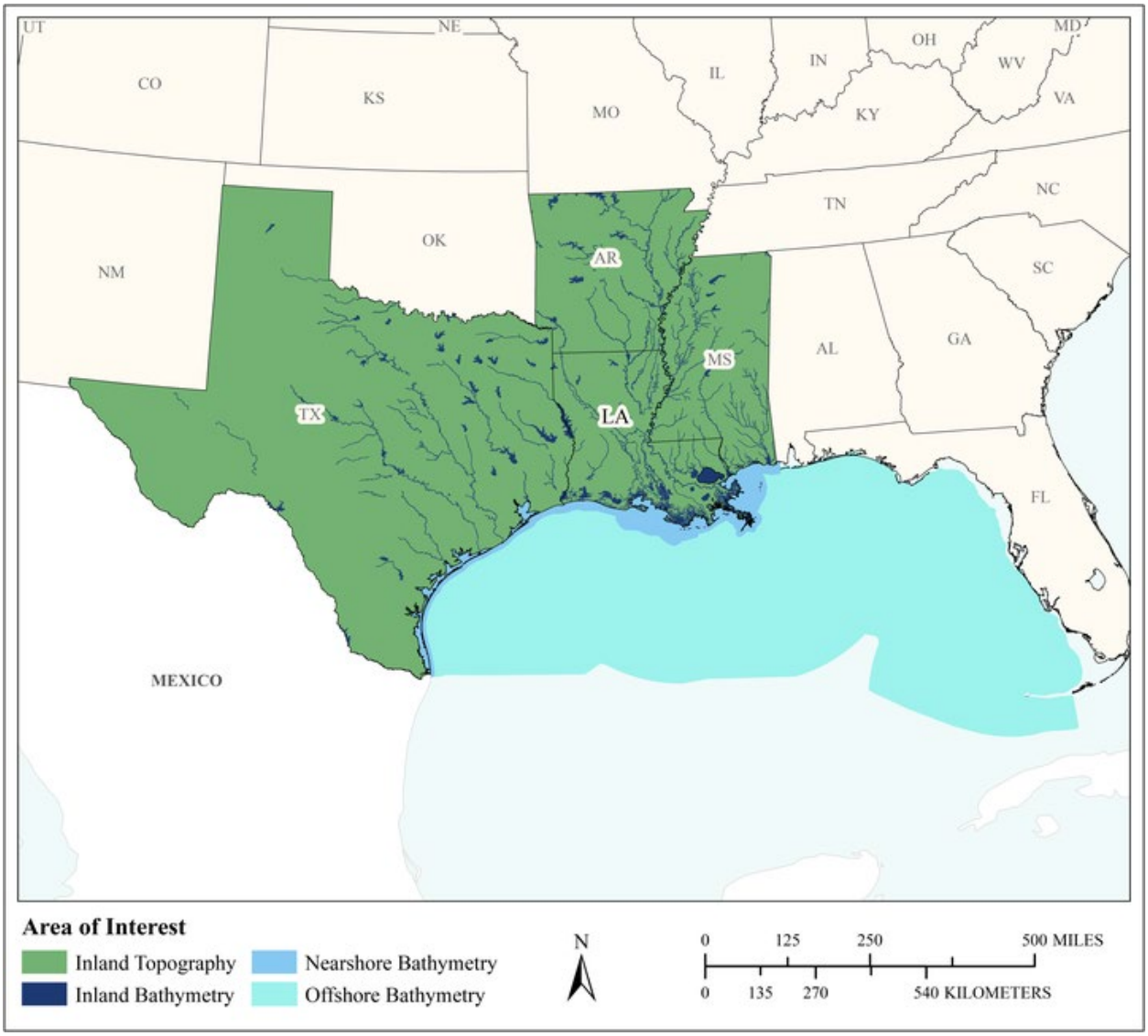
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$72,662	Major	Annual dollars saved/realized	$18,090						
Time savings description	3 hours per visit * 120 visits. 1 hours per week * 50 weeks. 5 hours per week * 50 weeks. 2 hours per week * 50 weeks. 3 hours per visit * 500 visits.			2 hours per week * 50 weeks.								
Cost savings/cost reduction	Major	Annual dollars saved/realized	$30,000	Major	Annual dollars saved/realized	$30,000						
Cost savings/cost reduction description	Available to spend on other projects.			Data acquisition costs saved.								
Cost avoidance	Major	Annual dollars saved/realized	$102,200	Major	Annual dollars saved/realized	$23,000						
Cost avoidance description	Potentially much greater if the data helps to avoid flood damage due to better sand bag distribution or other targeted mitigation efforts before an event. 60 hours * $20 per hour. 50 hours * $20 per hour.			50 hours * $20 per hour. Possibly much higher given the high use of our inland waterbodies. Possibly much higher. 100 hours * $20 per hour.								
Increased revenues	Major	Annual dollars saved/realized	$10,000	Major	Annual dollars saved/realized	$1,000,000						
Increased revenues description	Potentially much savings due to better logistics planning for ICP staging. Not necessarily income from products sold but savings due to providing end user products in house.			Potentially in increased revenues generated via maintenance of the Intracoastal canal and Houma Navigational Waterway.								
Mission-driven performance improvements	Major	Annual percent improvement	100%	Major	Annual percent improvement	75%						
Mission-driven performance improvements description	Having the data effectively doubles our program effectiveness by allowing 100% of the resources that would be spent on gathering the data to be utilized elsewhere. Having the data effectively doubles our ability to carry out our mission by allowing 100% of the resources that would be spent on gathering the data to be utilized elsewhere. Possibly much higher. Data of this quality has an enormous impact on our decision making abilities.			Huge impact to our mission abilities. Major impact to our effectiveness but not as much as to other program areas. Having this data available makes our decision making 100% better at least.								
Other operational benefits				Major	Unable to provide							
Other operational benefits description				Especially with regards to public safety during an event.								
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Annual dollars saved/realized	$13,015						
Value added to products or services description	Definitely impacts our ability to provide recreation improvements to citizens and tourists. Potentially huge impact with regards to flood warnings and mapping.			Flood mapping is very impactful.								
Improved response or timeliness	Major	Annual dollars saved/realized	$57,285	Major	Annual dollars saved/realized	$54,270						

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Improved response or timeliness description	Flood mapping benefits are major. 4 hours per week planning. Could be much higher if there is an incident. Not sure how to estimate this but potential savings to life and property are very high. Potential recovery impact is huge. 2 hours per week * 50 weeks.			2 hours per week * 50 weeks. Potentially much higher.								
Improved customer experience	Major	Annual dollars saved/realized	$4,522	Major	Annual dollars saved/realized	$4,522						
Improved customer experience description	2 hours per week for 50 weeks building new products. 1 hour per week for 50 weeks. Citizen confidence is a major benefit.			Increased citizen confidence is major. 2 hours per week * 50 weeks. 1 hour per week * 50 weeks.								
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Education or outreach description	Better informing public of safety response has huge implications and major benefits			Especially in regards to event preparation								
Environmental	I don't know			Moderate								
Public safety, including life and property	Major			Major								
Public safety, including life and property description	Potential impact is major.			Potentially very impactful								
Other												
Other benefits				Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes	Yes		
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Oil Spill Prevention, Planning, and Response



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Custom description	Custom description
Sub Area Requirements			Louisiana, Texas, & Alabama out to the EEZ	Gulf of Mexico out to the EEZ

MCA Description	Response
Mission Critical Activity	Oil spill 1) prevention, 2) contingency planning, 3) emergency response, and 4) natural resources damage assessment.
MCA Title	Oil Spill Prevention, Planning, and Response
MCA ID	21558
Organization Type	State or U.S. Territorial government
Organization Name	Louisiana Oil Spill Coordinator's Office (LOSCO) / Department of Public Safety and Corrections
Sub-Agency or Division	
Organization Mission	The Louisiana Oil Spill Coordinator's Office (LOSCO) is the lead environmental trustee for any unauthorized discharge of crude oil into the environment. Please see Louisiana Revised Statutes Title 30 Section 2454 called the "Oil Spill Prevention and Response Act" (OSPRA).
Program Name	Technical Assistance Program (see Louisiana Revised Statutes Title 30 Section 2480). The TAP is required to conduct and maintain an Environmental Baseline Inventory (EBI). The environmental baseline inventory shall be developed and maintained in such a manner that it will provide the coordinator with the technical data regarding the coastal waters before, during and after an unauthorized discharge of oil. The coordinator, in consultation with the state trustees, shall develop an inventory that identifies and catalogs the physical locations, the seasonal variations in location, and the current condition of natural resources; provides for data collection related to coastal processes, abandoned pits, facilities, sumps, reservoirs and oil spills; and identifies the recreational and commercial use areas that are most likely to suffer injury from an unauthorized discharge of oil.
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	BU 13 - Oil and Gas Resources
Tertiary Business Use	BU 03 - Coastal Zone Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	1) Oil Well Christmas Tree (Wellhead Valve Stack) 2) Pipeline Manifold Header

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL1B	Order 2
Update Frequency	6-10 years	6-10 years	6-10 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	Up to 1 meter	Up to 1 meter	Up to 20 meters
Acceptable Vertical Error	Up to 20 cm	Up to 20 cm	Up to 20 cm	Up to 20 meters
How far onshore needed			To cover the beach slope	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			No requirement for tide correction	I don't know
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required	Not required	Not required	Not required	Not required
Entire AOI under same environmental conditions	Required	Required	Required	Required	Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Required	Required
DTM	Required	Required	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Required	Required	Required	Required
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Required	Required	Required
Full waveform	Required	Required	Required	Required
Bathymetric Attributed Grid (BAG)		Required	Required	Required
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	Required
Tide Predictions			Required	Required
Tidal Constituent And Residual Interpolation (TCARI)			Required	Required
Intensity imagery/sidescan imagery	Required	Required	Required	Required
Ground control/ground truthing	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Required	Highly desirable	Highly desirable
Underwater videography			Highly desirable	Highly desirable
Bottom texture			Required	Required
Bottom type			Required	Required
Submerged features			Required	Required
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Water column properties - Physical			Required	Required
Water column properties - Chemical			Required	Required
Water column properties - Biological			Required	Required
Currents			Required	Required
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Required	Required
Boundaries			Highly desirable	Highly desirable
Routes			Highly desirable	Highly desirable
Offshore cadastral			Highly desirable	Highly desirable
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Highly desirable	Highly desirable	Required	Required
Wetlands	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Required	Required	Required	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	FEMA/LOSCO 2000-2008 Statewide LIDAR Data. This data is a QL2 type dataset with a QL 1.5 type point spacing (4 points / square meter).	Bathymetry_NOAA_1994.shp (see http://atlas.lsu.edu)	Bathymetry_NOAA_1994.shp (see http://atlas.lsu.edu)	Bathymetry_NOAA_1994.shp (see http://atlas.lsu.edu)
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI	Yes			
Open Topography				
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts		Yes	Yes	
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes		Yes	
State repositories used	http://atlas.lsu.edu/		http://atlas.lsu.edu	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available	I don't know	I don't know

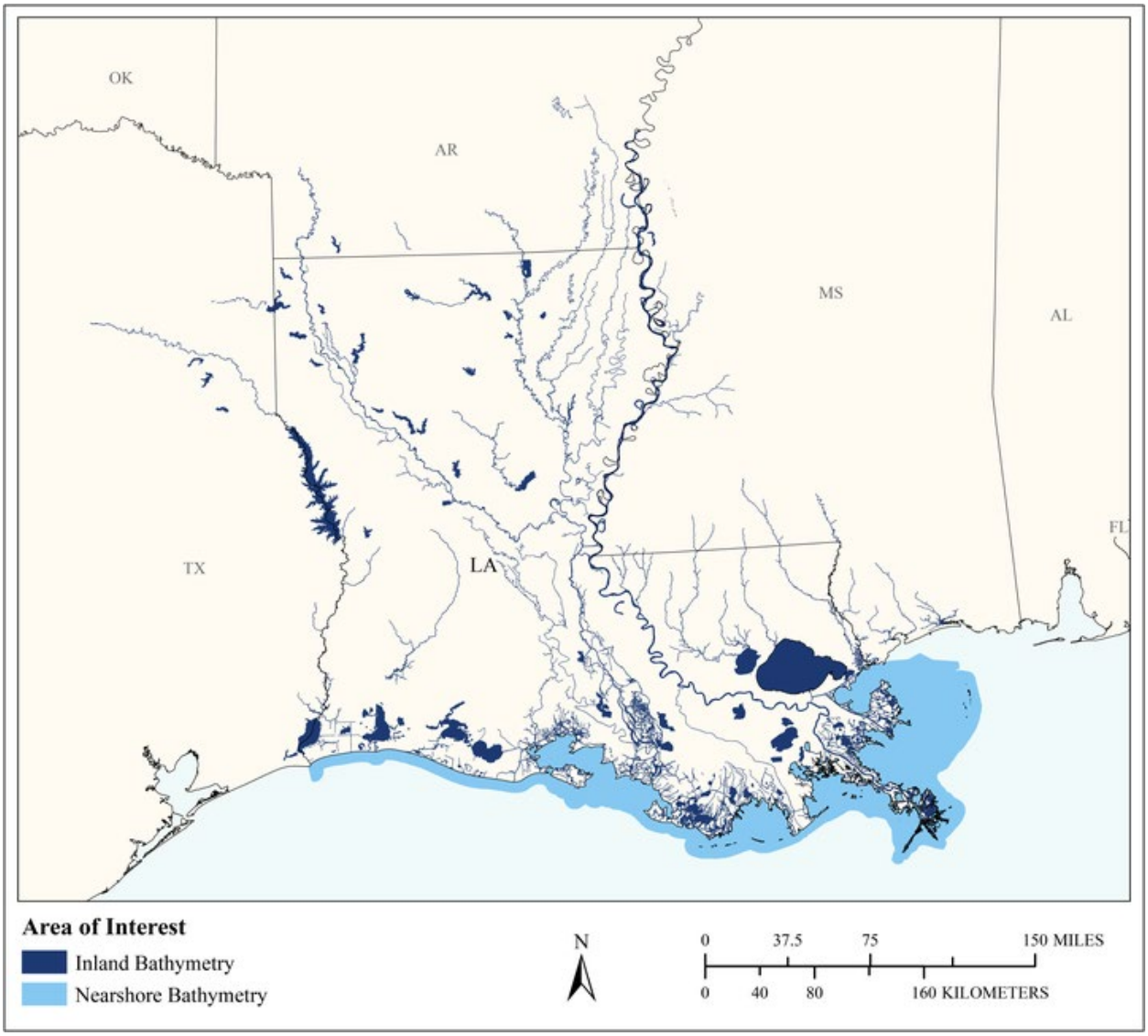
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost savings/cost reduction	Major	Inland bathy data not available	I don't know	I don't know
Cost avoidance	Major	Inland bathy data not available	I don't know	I don't know
Increased revenues	None	Inland bathy data not available	I don't know	I don't know
Mission-driven performance improvements	Moderate	Inland bathy data not available	I don't know	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Inland bathy data not available	I don't know	I don't know
Improved response or timeliness	Major	Inland bathy data not available	I don't know	I don't know
Improved customer experience	Major	Inland bathy data not available	I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Inland bathy data not available	I don't know	I don't know
Environmental	Major	Inland bathy data not available	I don't know	I don't know
Public safety, including life and property	Major	Inland bathy data not available	I don't know	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,359,474		Annual dollars saved/ realized	$382,862		Annual dollars saved/ realized	$55,977			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$24,028		Annual dollars saved/ realized	$24,427		Annual dollars saved/ realized	$1,606			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major			Major		
Environmental	Major			Major			Major			Major		
Public safety, including life and property	Major			Major			Major			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps	Yes	Yes		
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes	Yes	Yes	
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Port and Waterway Oversight



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type		Required	Required	
Geographic Area Requirements		One or more Hydrologic Units (HUC8s)	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	We are the State sponsor/overseer of Port and Waterway projects.
MCA Title	Port and Waterway Oversight
MCA ID	32936
Organization Type	State or U.S. Territorial government
Organization Name	Louisiana Department of Transportation/ Office of Multimodal Commerce
Sub-Agency or Division	
Organization Mission	The mission of the Ports & Waterways Division is to continuously improve the maritime transportation infrastructure for freight movement and river cruise industry, by nurturing economic development and enhancing quality of life through the implementation of efficient, safe, and seamless multimodal transportation systems in accordance with the Louisiana Statewide Transportation Plan.
Program Name	We provide State funding for infrastructure projects at our Ports and for the non-federal State funding for dredging and deepening projects of the State's waterways.
Total Annual Program Budget	
Primary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Secondary Business Use	BU 22 - Infrastructure and Construction Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Nice to have
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	Catch basins, fire hydrants, utilities mooring systems and parking bollards

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Required

Inland Bathy Feature Size Requirements	Response
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Not required
5.1 – 10 acres	Not required
Greater than 10 acres	Not required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order		Cross sections and/or transects meet needs	Cross sections and/or transects meet needs	
Update Frequency		Event driven only – Data need to coincide with a specific event.	Event driven only – Data need to coincide with a specific event.	
Event type(s)		Weather: hurricanes, high water/flood events, drought, high winds. Human: collisions and allusions.	Weather: hurricanes, high water/flood events, drought, high winds. Human: collisions and allusions.	
Quality Level and/or update frequency variability across AOI			Areas near USACE navigable waterways	
Acceptable Horizontal Error		I don't know	I don't know	
Acceptable Vertical Error		Up to 30 cm	Up to 30 cm	
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed			Below MLLW	
Tide correction requirement			MHW	
Cross sections and/or transects meet needs		Yes	Yes	
Cross section/transect requirement		Vertical - within a 1 foot, spacing - every 3 feet	Vertical - within a 1 foot, spacing - every 3 feet	

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season		Nice to have	Nice to have			Nice to have
Entire AOI under same environmental conditions		Nice to have	Nice to have			Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless		Nice to have	Nice to have			Nice to have
DEM for entire AOI needs to be seamless		Nice to have	Nice to have			Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM		Nice to have	Nice to have	
DTM		Nice to have	Nice to have	
DEM		Required	Required	
Raw point cloud data		Not required	Not required	
Classified point cloud		Not required	Not required	
Edited/cube XYZ		Not required	Not required	
Full waveform		Not required	Not required	
Bathymetric Attributed Grid (BAG)		Not required	Not required	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening		Not required		
Additional breaklines for hydro-enforcement of culverts				
National Vertical Datum Transformation Tool (V-Datum)			Not required	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery		Not required	Not required	
Ground control/ground truthing		Not required	Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery		Nice to have	Nice to have	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Not required	
Submerged features			Nice to have	
Subbottom characteristics			Not required	
Geologic and seismic data		Not required	Not required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Not required	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates		Nice to have	Nice to have	
Land use/land cover		Nice to have	Nice to have	
Wetlands		Nice to have	Nice to have	
Estuaries			Nice to have	
Inland surface water features		Highly desirable	Nice to have	
Bridges/culverts		Nice to have		
Landmark features		Nice to have	Nice to have	
Cultural resources		Nice to have	Nice to have	
Coastal and riverine structures		Highly desirable	Nice to have	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used		Current surveys from the US Army Corps of Engineers	Current data is from NOAA, US Corps of Engineers, US Coast Guard, and other Louisiana State Agencies	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts		Yes	Yes	
USACE navigation charts		Yes	Yes	
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories			Yes	
State repositories used			CPRA and DNR	
Data that meet my needs are not available				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings		Major	None	
Cost savings/cost reduction		I don't know	None	
Cost avoidance		Major	None	
Increased revenues		None	None	
Mission-driven performance improvements		Minor	None	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services		None	None	
Improved response or timeliness		None	None	
Improved customer experience		None	None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach		None	None	
Environmental		None	None	
Public safety, including life and property		None	None	

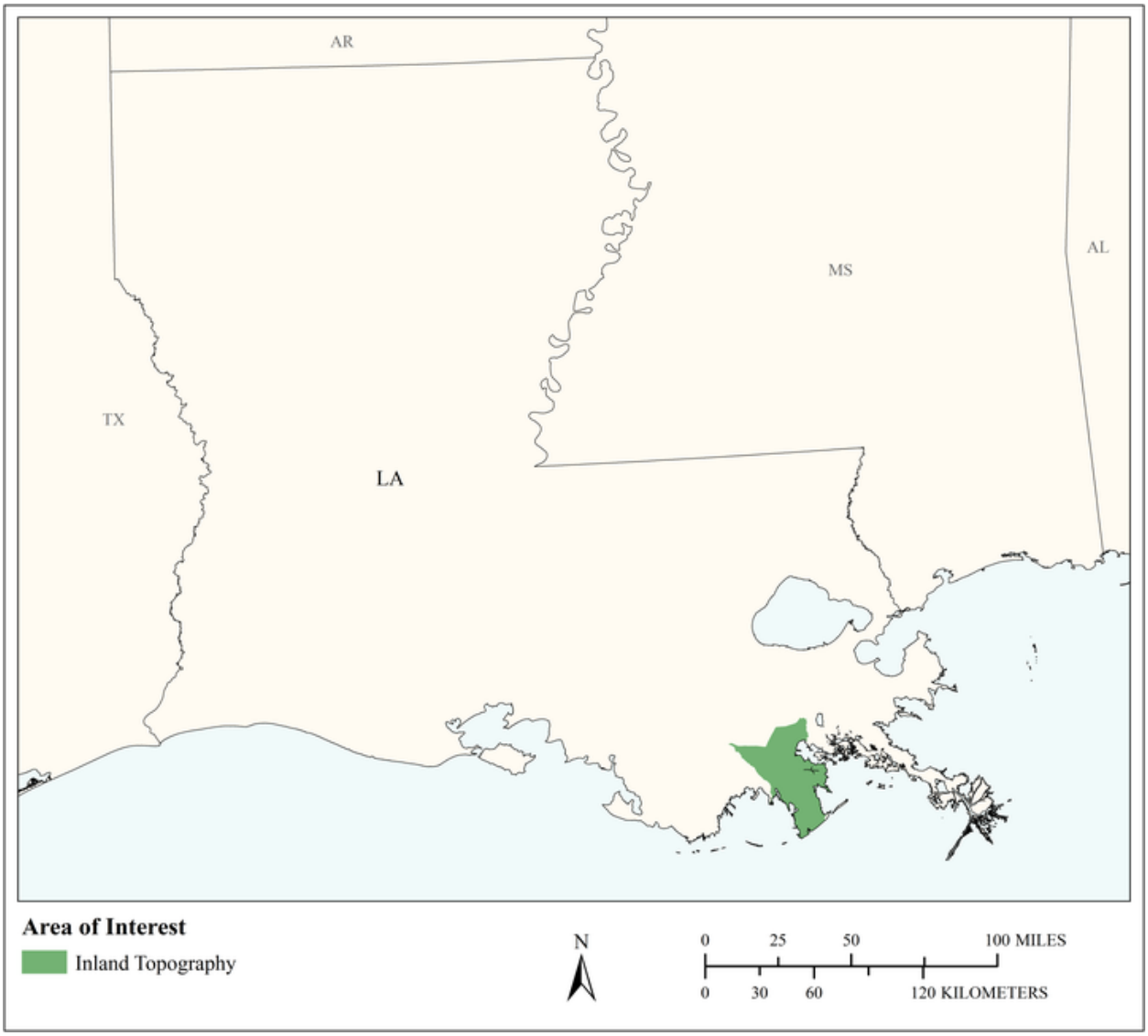
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings				Major	Annual dollars saved/realized	$25,628	Major	Annual dollars saved/realized	$21,105			
Time savings description				2 hours per week * 50 weeks. 1 hour per week * 50 weeks. 5 hours per week * 50 weeks.			5 hours per week * 50 weeks. 2 hours per week * 50 weeks. 1 hour per week * 50 weeks.					
Cost savings/cost reduction				Major	Annual dollars saved/realized	$25,000	Major	Annual dollars saved/realized	$25,000			
Cost savings/cost reduction description				Could be a significant saving depending on hurricane or other storm. Data costs.			Could be a significant saving depending on hurricane or other storm. Data costs.					
Cost avoidance				Major	Annual dollars saved/realized	$202,000	Major	Annual dollars saved/realized	$202,000			
Cost avoidance description				Potentially could be in the millions with the right data. Could be larger with the use of waterways. 50 hours * $20 per hour.			Potentially could be in the millions with the right data. Could be larger with the use of waterways. 50 hours * $20 per hour.					
Increased revenues				Major	Annual dollars saved/realized	$1,010,000	Major	Annual dollars saved/realized	$1,010,000			
Increased revenues description				It may be more of an in-house saving from using the products. Potentially could be in the tens of millions if the waterways are maintained.			It may be more of an in-house saving from using the products. Potentially could be in the tens of millions if the waterways are maintained.					
Mission-driven performance improvements				Major	Annual percent improvement	50%	Major	Annual percent improvement	50%			
Mission-driven performance improvements description				Would greatly increase our ability. Better data could greatly improve the decision in the future which in-turn could be a cost savings. Better data would increase opportunities for more efficiency.			Would greatly increase our ability. Better data could greatly improve the decision in the future which in-turn could be a cost savings. Better data would increase opportunities for more efficiency.					
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services				Moderate	Annual dollars saved/realized	$110,000	Moderate	Annual dollars saved/realized	$110,000			
Value added to products or services description				Avoidance of rebuilding cost. Potentially much more saving from avoidance of rebuilding cost.			Potentially much more saving from avoidance of rebuilding cost. Potentially could be much greater with the avoidance of rebuilding cost.					
Improved response or timeliness				Major	Annual dollars saved/realized	$51,255	Major	Annual dollars saved/realized	$51,255			
Improved response or timeliness description				2 hours per week * 50 weeks. 5 hours per week * 50 weeks. Could be higher due to a major event (hurricane). The recovery impact could be high. 5 hours per week * 50 weeks.			2 hours per week * 50 weeks. 5 hours per week * 50 weeks. Could be higher due to a major event (hurricane). The recovery impact could be high. 5 hours per week * 50 weeks.					
Improved customer experience				Major	Annual dollars saved/realized	$6,030	Major	Annual dollars saved/realized	$6,030			
Improved customer experience description				2 hours per week * 50 weeks. 2 hours per week * 50 weeks. Better data can greatly improve the decisions of our customers. Increasing Citizen confidence is a major benefit.			2 hours per week * 50 weeks. 2 hours per week * 50 weeks. Better data can greatly improve the decisions of our customers. Increasing Citizen confidence is a major benefit.					
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach				Major			Major					
Education or outreach description				Educating the public can have a huge benefit in the event of a major issue			Educating the public can have a huge benefit in the event of a major issue					
Environmental				Major			Major					
Environmental description				Protecting the environment is huge benefit			Protecting the environment is huge benefit					

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Public safety, including life and property		Major	Major	
Public safety, including life and property description		Impact is major	Impact is major	

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours		Yes	Yes	
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)		Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints		Yes		
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Levee Analysis, Construction, and Maintenance



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Custom description			
Sub Area Requirements	Lafourche Parish, LA south of the Intracoastal Waterway			

MCA Description	Response
Mission Critical Activity	Levee Analysis, Construction, and Maintenance
MCA Title	Levee Analysis, Construction, and Maintenance
MCA ID	50013
Organization Type	State or U.S. Territorial government
Organization Name	South Lafourche Levee District
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	
Smallest 3D features needed	
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

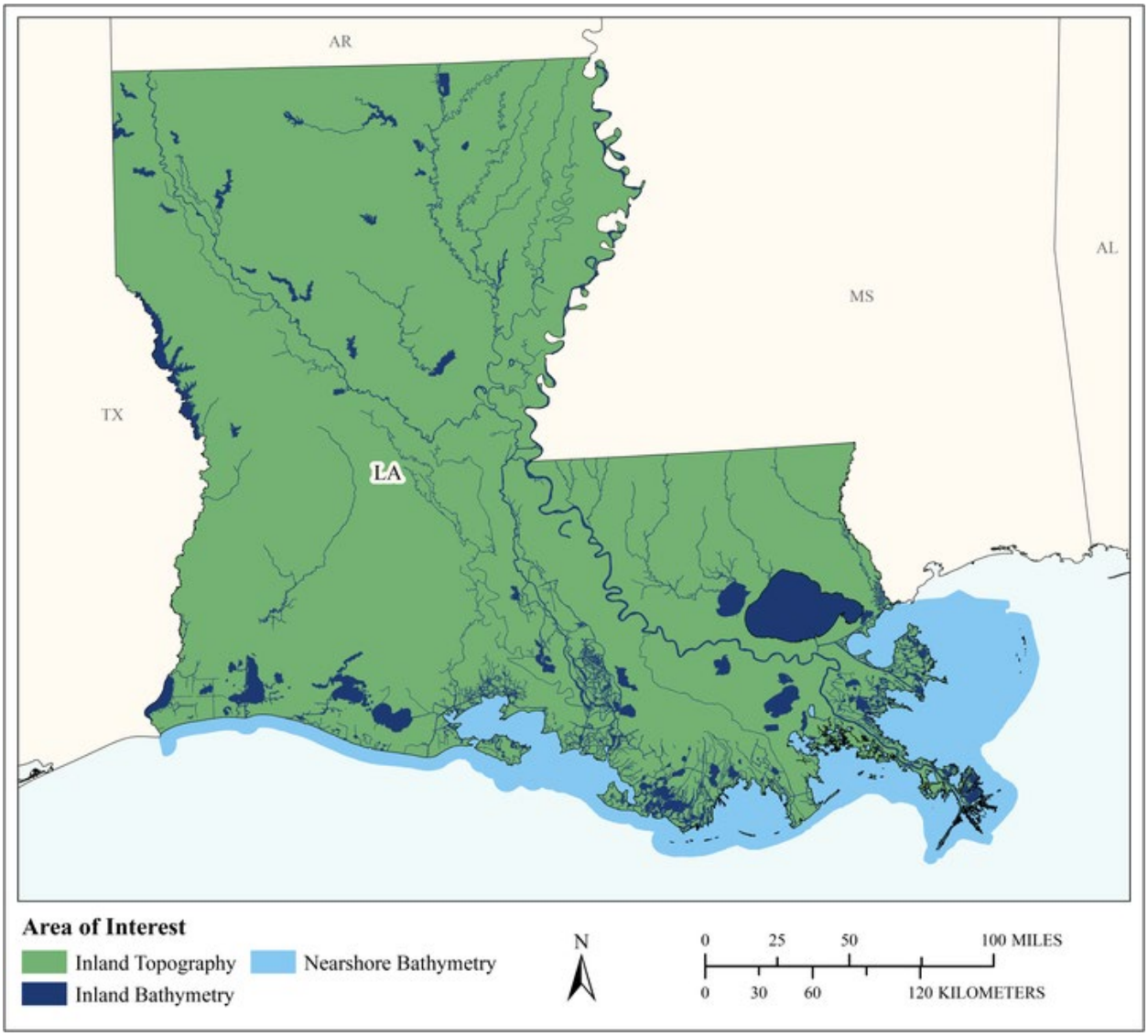
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Moderate			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$720									
Time savings description	Time saved on centerline survey.											
Cost savings/cost reduction	Major	Annual dollars saved/realized	$100,000									
Cost savings/cost reduction description	Use of GPS compared to land survey.											
Cost avoidance	Major	Annual dollars saved/realized	$50,000									
Cost avoidance description	Greatly reduces chance of flooding.											
Increased revenues	Major	Annual dollars saved/realized	$1,000,000									
Increased revenues description	Security from flooding.											
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Moderate											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Urban and Regional Planning for Economic Development Activities



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Urban and regional planning for economic development activities. Site selection for economic development projects.
MCA Title	Urban and Regional Planning for Economic Development Activities
MCA ID	21536
Organization Type	State or U.S. Territorial government
Organization Name	Louisiana Economic Development
Sub-Agency or Division	
Organization Mission	Cultivate jobs and economic opportunity for the people of Louisiana through nine integrated economic development strategies: 1. Strategically improve state economic competitiveness 2. Engage with local partners to enhance community competitiveness 3. Forge partnerships to enhance regional economic development assets 4. Expand and retain in-state businesses 5. Execute a strong business recruitment program 6. Cultivate small business, innovation and entrepreneurship 7. Enhance workforce development solutions 8. Promote Louisiana's robust business advantages 9. Attract foreign direct investments and grow international trade
Program Name	Louisiana Certified Sites Program
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Building and industrial facilities

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL2B	
Update Frequency	6-10 years	>10 years	6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	Up to 1 meter	Up to 1 meter	
Acceptable Vertical Error	Up to 30 cm	Up to 30 cm	Up to 40 cm	
How far onshore needed			To the fall line	
How far down the beach profile needed	To MHW		To MLLW	
Tide correction requirement			No requirement for tide correction	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Required	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Up to double the required TVU at the 95% confidence level	I don't know		Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	
DTM	Required	Highly desirable	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Nice to have	Highly desirable	
Classified point cloud	Highly desirable	Nice to have	Highly desirable	
Edited/cube XYZ		Nice to have	Highly desirable	
Full waveform	Nice to have	Nice to have	Highly desirable	
Bathymetric Attributed Grid (BAG)		Nice to have	Not required	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)			Not required	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Not required	
Submerged features			Highly desirable	
Subbottom characteristics			Not required	
Geologic and seismic data	Nice to have	Nice to have	Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Not required	
Boundaries			Required	
Routes			Required	
Offshore cadastral			Nice to have	
Lease areas			Required	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Required	Highly desirable	
Land use/land cover	Required	Required	Required	
Wetlands	Required	Required	Required	
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Required	Required	
Cultural resources	Required	Required	Required	
Coastal and riverine structures	Nice to have	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	National Map - QL2 1999 Louisiana LiDAR - QL4	NOAA Hydrographic Surveys - QL unknown	NOAA	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI			Yes	
Open Topography	Yes			
NOAA nautical charts		Yes		
USACE navigation charts				
USGS Inland Waters server		Yes		
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available	Major	

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Cost savings/cost reduction	I don't know	Inland bathy data not available	None	
Cost avoidance	I don't know	None	Minor	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	Minor	Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	I don't know	Major	
Improved response or timeliness	Major	Minor	Major	
Improved customer experience	Major	I don't know	Major	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	None	Minor	
Environmental	Moderate	Moderate	Minor	
Public safety, including life and property	Moderate	Major	Major	

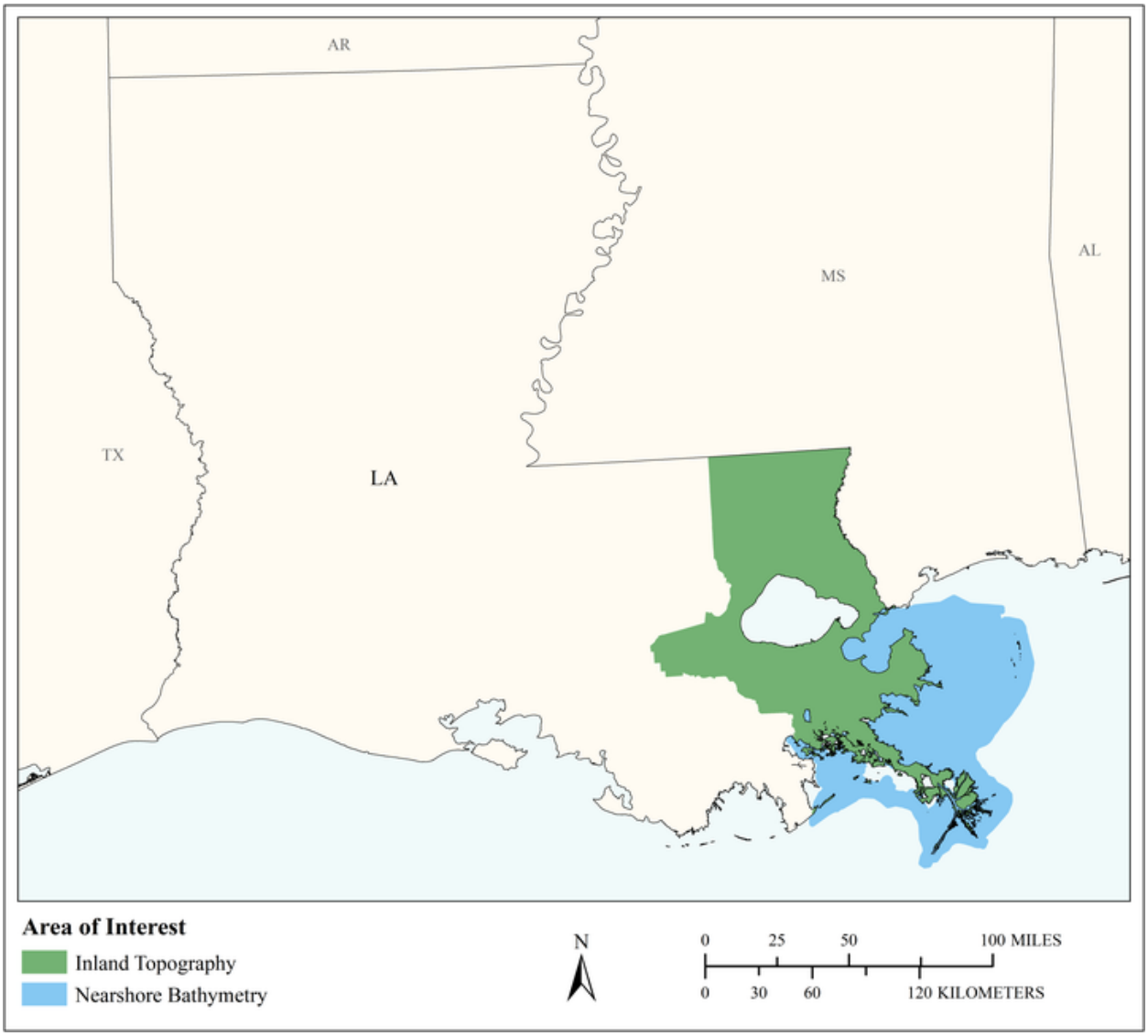
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Time savings description	To have a single source of data would make it easier than combining from multiple sources. While there are multiple data sets, they are all of good quality. Multiple times a month we are asked to provide maps and/or raw data; this would create a single location to aggregate DEMs and other critical information for businesses evaluating new investment.											
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide		None					
Cost savings/cost reduction description	There was a cost incurred in 1999 from the state's LiDAR program so in order to update it, the state would have to re-fly it themselves and our division would have a cost assigned; it is not clear what that would be.											
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost avoidance description	Division is responsible to the business community to provide guidance for planning capital investments and recognizing / avoiding risk to commercial ventures. While there are multiple data sets, they are all of good quality.											
Increased revenues	None			Minor	Unable to provide		None					
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Mission-driven performance improvements description	Higher resolution data with more current information will allow division to present information to the business community in a more timely and informed fashion.											
Future annual operational benefits added during validation		Annual dollars saved/ realized	$12,399,307		Annual dollars saved/ realized	$505,002		Annual dollars saved/ realized	$1,112,130			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Value added to products or services description	The business community relies on Division to inform them of potential risks to capital so the higher level of clarity will provide a clearer picture of risk; Will also allow Division to model natural disaster impacts (flooding, hurricanes) that would affect driver companies and will allow them to plan for resiliency.											
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness description	The business community relies on Division to inform them of potential risks to capital so the higher level of clarity will provide a clearer picture of risk; Will also allow Division to model natural disaster impacts (flooding, hurricanes) that would affect driver companies and will allow them to plan for resiliency.											

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,431,505		Annual dollars saved/ realized	$638,871		Annual dollars saved/ realized	$1,173,253			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			Moderate					
Environmental	Minor			Moderate			Moderate					
Public safety, including life and property	Major			Major			Major					
Public safety, including life and property description	The business community relies on Division to inform them of potential risks to capital so the higher level of clarity will provide a clearer picture of risk; Will also allow Division to model natural disaster impacts (flooding, hurricanes) that would affect driver companies and will allow them to plan for resiliency						Improve site certification efficiency and accuracy of hazard areas					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes	Yes	
Aspect maps				
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Analysis of Intermodal Transportation Systems Leading to Projects



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	Respondent provided own shapefile, KML, or geodatabase		Respondent provided own shapefile, KML, or geodatabase	
Sub Area Requirements	Regional Planning Commission, New Orleans, LA		Regional Planning Commission, New Orleans, LA	

MCA Description	Response
Mission Critical Activity	Analysis of intermodal transportation systems in the region and their relationships with land use, coastal programs, environmental programs, and other infrastructure projects. Prioritization of fiscally constrained transportation infrastructure projects on the federal aid system and travel demand modeling for the region - transportation, economic, and land use planning. RPC has no zoning or land use regulatory authority. Elevation data are given to consultants for preliminary design and pre-planning for jobs to be built. LA NORPC works with the USACE New Orleans District. Also lets imagery contracts and needs lidar for orthorectification. Urban land and roads are the areas of greatest need, also need nearshore data for causeways and bridges. Ports come to LA NORPC for data such as imagery, parcels, leasing sites, some lidar, but mainly the ports do their own thing. LA NORPC distributes data to anyone that needs it. There are similar metro planning organizations in Baton Rouge, Lafayette, Lake Charles, Alexandria, and other metropolitan areas. Their requirements and benefits would be similar, but only the state planning council could say for sure that NORPC's requirements and benefits would apply elsewhere.
MCA Title	Analysis of Intermodal Transportation Systems Leading to Projects
MCA ID	21913
Organization Type	Regional, County, City, or other local government
Organization Name	Regional Planning Commission, New Orleans, LA
Sub-Agency or Division	
Organization Mission	The Regional Planning Commission (RPC) is the designated Metropolitan Planning Organization (MPO) for the Greater New Orleans area, which comprises Jefferson, Orleans, Plaquemines, St. Bernard, St. Charles, St. John the Baptist, St. Tammany and Tangipahoa Parishes. The federal government requires urban areas with populations of 50,000 or more to form an MPO. The MPO is made up of elected officials, transportation authorities and members of the general public who assist in creating transportation policy. The RPC is governed by a board of local elected officials and citizen members, appointed to develop a regional vision for the future. The RPC board directs the planning and funding of regional transportation programs. The 52-member board directs the planning, allocations of funding and public involvement for regional transportation needs. The board is supported by a staff of 20 professionals with broad experience and doctorates or masters degrees in a variety of areas, including urban and regional planning, community development, economics, engineering, government, history, law, landscape architecture, political science, sustainable development, transportation, geography, and other disciplines.
Program Name	Intermodal Transportation Planning
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 22 - Infrastructure and Construction Management
Tertiary Business Use	BU 03 - Coastal Zone Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have

What Needs to be Measured in 3D	Response
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Road lane striping, turning lane or control box. Underwater soil types for bridge footings, underwater obstructions, and change over time.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1		QL3B	
Update Frequency	6-10 years		6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI			Coastal LA is more important than inland waters	
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need		Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm		Up to 40 cm	
How far onshore needed			To Mean Lower Low Water (MLLW)	
How far down the beach profile needed	To MLLW		To MLLW	
Tide correction requirement			MLLW	
Cross sections and/or transects meet needs			Partial	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross section/transect requirement			For bridges and roads adjacent to coastal areas we appreciate best available vertical accuracy we can find for pre-planning - plus or minus 16 cm is what we have been using from state sources with a 5 m grid.	

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable		Nice to have			Nice to have
Entire AOI under same environmental conditions	Highly desirable		Highly desirable			Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable		Highly desirable			Nice to have
DEM for entire AOI needs to be seamless	Highly desirable		Highly desirable			Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level		Up to double the required TVU at the 95% confidence level			Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable		Highly desirable	
DTM	Required		Highly desirable	
DEM	Required		Required	
Raw point cloud data	Required		Required	
Classified point cloud	Highly desirable		Highly desirable	
Edited/cube XYZ			Highly desirable	
Full waveform	Not required		Not required	
Bathymetric Attributed Grid (BAG)			Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable		Nice to have	
Ground control/ground truthing	Required		Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required		Highly desirable	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Not required	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Highly desirable		Highly desirable	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Not required	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Highly desirable	
Boundaries			Highly desirable	
Routes			Highly desirable	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Highly desirable		Required	
Land use/land cover	Required		Required	
Wetlands	Highly desirable		Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required		Required	
Bridges/culverts	Required			
Landmark features	Highly desirable		Highly desirable	
Cultural resources	Highly desirable		Highly desirable	
Coastal and riverine structures	Required		Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	State of LA https://maps.ga.lsu.edu/lidar2000/ 1999-2009 5 meter grid with bare earth, DEM, breaklines, point clouds and contours. USGS QL1 from various years for different areas of the region. USACE QL2 (approx.) for inside the Greater New Orleans levee system with bare earth DEM and raw points		NOAA, USGS, USACE data.	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts			Yes	
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State repositories used	LSU Atlas online https://maps.ga.lsu.edu/lidar2000/ -becoming very dated, but still useful for some areas and historic data.			
Other	Yes			
Other description	Hard drive transfer from USGS or USACE			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Moderate	
Cost savings/cost reduction	Moderate		Moderate	
Cost avoidance	Major		Moderate	
Increased revenues	None		None	
Mission-driven performance improvements	Major		Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		Minor	
Improved response or timeliness	Major		Minor	
Improved customer experience	Major		Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major		Moderate	
Environmental	Minor		Moderate	
Public safety, including life and property	Moderate		Minor	
Other Current Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other	Moderate			
Other description	Providing lidar data to consultants aids in product quality control - consultants normally would not use such data in pre-planning if they had to pay for it,			

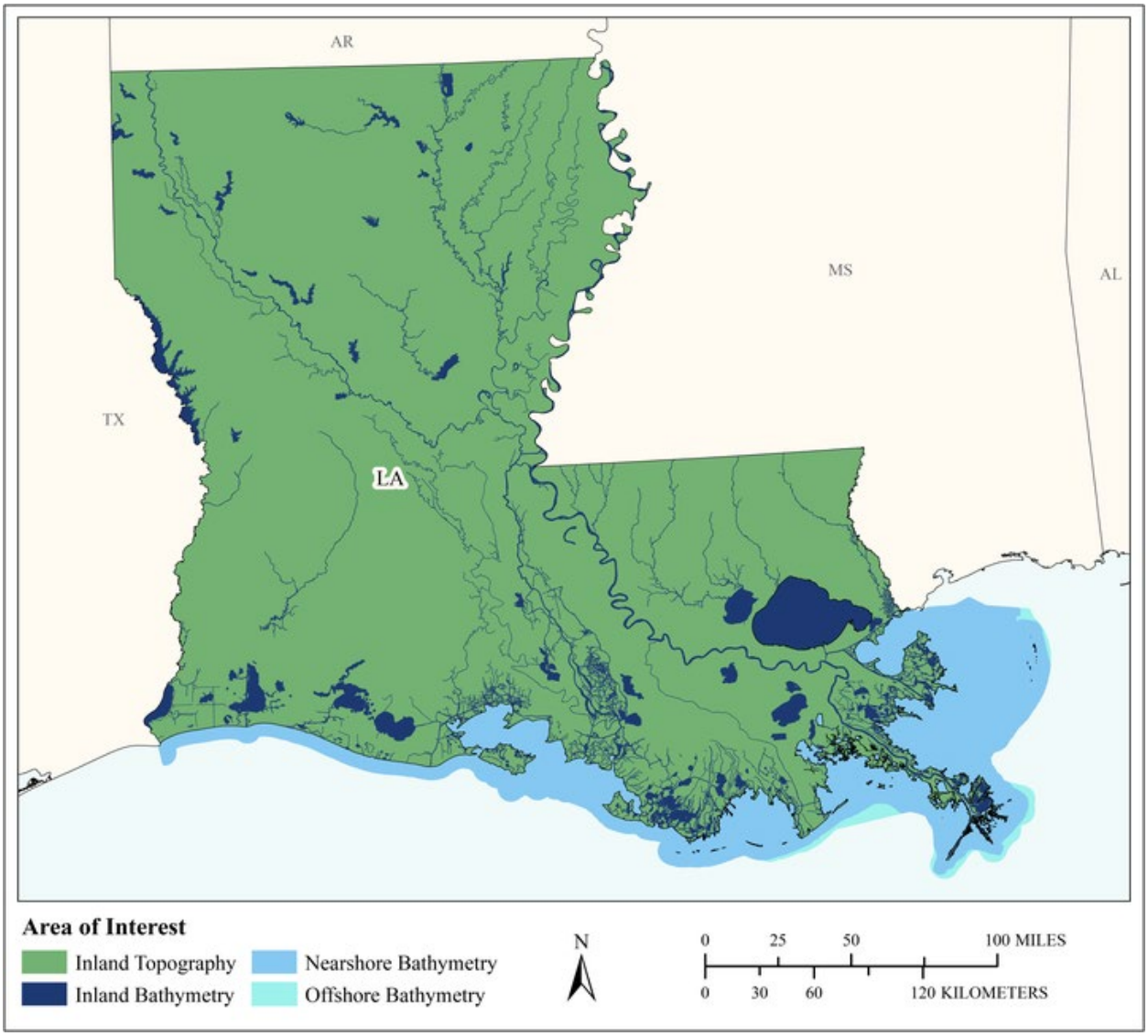
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					Major	Unable to provide				
Time savings description	Preliminary planning for projects moves faster and is more accurate requiring less major revisions as projects move toward construction documents. See answer to number 2. Probably old survey data and know GCP's would be used without it. This is true of some project areas, but not others where we use best available and combine data.						If we know this data will be provided on some regular basis we can adapt project planning and data updates accordingly. We would not purchase this data for pre-planning, we would use what we could find for free.					
Cost savings/cost reduction	Minor	Unable to provide					None					
Cost savings/cost reduction description	We wouldn't purchase the data but would have consultants use best available.						We would not purchase these data - not in the planning budget. No infrastructure materials in planning.					
Cost avoidance	Major	Unable to provide					Major	Unable to provide				
Cost avoidance description	Better planning for road elevation and major land use changes with.						Could be a major factor if the data aids us in providing more current information prior to final engineering. Currently there is a gap which generally is found during construction if there has been a major elevation change from project conception until final deliverables.					
Increased revenues	None						None					
Mission-driven performance improvements	Major	Unable to provide					Major	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Moderate	Unable to provide				
Value added to products or services description							Considering that our consultants working on public projects for us are our users.					
Improved response or timeliness	Major	Unable to provide					Major	Unable to provide				
Improved response or timeliness description	I would consider the data to have been relevant in the building of the levee system, levee lifts, diversions and pumps. Brings feasibility projects and studies to construction documents faster with better accuracy. Allows our agency to assist smaller local governments when they need data for response. We are not responders. Same as above. No event has experienced a fast recovery, but the data has aided in fast funds to victims. All of those products are made available for planning studies as needed.						I don't think better data improves EIS processes. I doubt that we would provide this service but others would for our citizens. ABFE process has had current data and it still took the political process years. Modelers would ingest the data and be able to use it for our citizens. During or after an event providing data to recovery and response would aid in speed of response. State agencies include the updated information almost immediately, but FEMA still has a long process.					
Improved customer experience	Major	Unable to provide					Moderate	Unable to provide				
Improved customer experience description	Better integration of data sets and cross checking of data.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate						Moderate					
Education or outreach description	Education of university students and local agency users is part of our mission						Used in our maps and analysis at public meetings					
Environmental	Moderate						Minor					

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Environmental description	CPRA and LSU elevation and flood modeling aids in planning process and emphases the protection of critically sensitive environments		Useful in explaining to elected officials the impacts of shoreline changes at the project level	
Public safety, including life and property	Major		Moderate	
Public safety, including life and property description	CERA project LSU aided during floods of 2016 using all available data with an interface for local government to receive information in a timely manner		Projects are often re-designed due to needed adaptations due to coastal elevation changes	
Other	Integration of lidar and local seismic fault data should aid in project prioritization on transportation networks		Integration of readily availably data	
Other benefits	Major		Moderate	
Other description			Knowledge and customary use of these data would greatly improve the feasibility and environmental clearance stages of project design	

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes		Yes	
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections	Yes		Yes	
Height-Above-Ground maps	Yes		Yes	
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes		Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes		Yes	
Breaklines for road edge-of-pavement	Yes		Yes	
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Maritime and Land Boundary Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Delimitation of legal and other coastal boundaries, inland boundaries, and ordinary high water lines (OHWL).
MCA Title	Maritime and Land Boundary Management
MCA ID	60204
Organization Type	State or U.S. Territorial government
Organization Name	State of Louisiana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 30 - Maritime and Land Boundary Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B	QL0B	I don't know
Update Frequency	6-10 years	6-10 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Highly desirable	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Nice to have	Nice to have	Highly desirable	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable	Highly desirable	Required	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable	Highly desirable	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	Required
DTM	Required	Required	Required	Required
DEM	Highly desirable	Required	Required	Required
Raw point cloud data	Nice to have	Highly desirable	Required	Required
Classified point cloud	Highly desirable	Highly desirable	Required	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Not required	Nice to have
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Not required
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Nice to have	Required	Not required	Not required
Ground control/ground truthing	Highly desirable	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Required	Highly desirable	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Nice to have
Water column properties - Biological			Not required	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Highly desirable	Nice to have
Routes			Nice to have	Highly desirable
Offshore cadastral			Highly desirable	Nice to have
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Required	Required
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Nice to have
Wetlands	Required	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Highly desirable	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Minor	None	I don't know
Cost savings/cost reduction	Moderate	None	Minor	Moderate
Cost avoidance	Moderate	None	Minor	Moderate
Increased revenues	Minor	None	None	I don't know
Mission-driven performance improvements	Major	None	Moderate	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None	None	I don't know

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	None	Minor	Moderate
Improved customer experience	Major	None	Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	Moderate
Environmental	Major	Minor	Minor	Moderate
Public safety, including life and property	Moderate	None	Minor	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	Minor	Unable to provide		None			None			I don't know	Unable to provide	
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$51,856		Annual dollars saved/ realized	$38,916		Annual dollars saved/ realized	$1,395,786			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$198,819									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Moderate			Moderate		
Environmental	Minor			Major			Major			Major		
Public safety, including life and property	None			Moderate			Moderate			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps		Yes		
Cross sections		Yes		
Height-Above-Ground maps		Yes		
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

Maine

Maine is 33,215 square miles in size with topography ranging from the western mountains to the sandy southern coastal plain to the rocky shoreline "down east." The highest elevation is Mount Katahdin at 5,268 feet and the lowest points are sea level where Maine meets the Atlantic Ocean. With almost 3,500 miles of coastline, the ocean greatly influences shore and near-shore communities and habitats. It is a rural state with approximately 1.3 million residents. Fifty percent of the state consists of unorganized territories having a total year-round population just over 20,000. This area includes the western mountains and much of the ownership is in the form of very large tracts of land mainly for forestry related operations. Accurate elevation data is important to many programs but based on the current priorities the following activities are the most important: flood risk mapping, watershed delineation and hydrography mapping (for water depth and physical features of the water body), mapping landslide hazards away from the coast, mapping infrastructure, and managing wildlife.

Lidar and lidar derived products will be available for all of Maine, once the current 2018-2019 USGS project is completed (anticipated availability 2020). The state is covered by a hodge podge mosaic of various lidar datasets ranging from Quality Level 4 (QL4) (2006, 2007), QL3 (2006, 2009, 2010, 2012), to QL2 (2007, 2013, 2015, 2016, 2017, 2018, 2019). Digital Elevation Models (DEMs) are available at various post spacings (1, 2, and larger) for all areas of Maine, as are intensity images and breaklines to support hydrographic flattening of the Digital Elevation Models (DEMs). All of the topographic data are relatively easy to access and download through state and federal warehouse services. The Maine Library of Geographic Information (GeoLib) is the clearinghouse for Maine geospatial data.

In addition to terrestrial topography, the state needs updated bathymetric data. Bathymetry data for nearshore areas are fragmented, acquired for specific projects and not in a coordinated regional manner. Large sections of the coast lack current nearshore bathymetry and the rest of the Gulf of Maine needs to be updated taking advantage of modern technology for increasing the accuracy. Maine's coast ranges from rocky shoreline, sand beaches, dunes, bluffs and other environments. It has a rich maritime history along with many rivers and streams, which drain into the Gulf of Maine. Better bathymetry would contribute greatly to improved navigation, understanding of fisheries habitat, aquaculture support, and flood modeling. Bathymetric lidar, coupled with tidally coordinated lidar, would provide a full view of these shoreline interfaces.

The Board of the Maine Library of Geographic Information (Geolibrary Board) monitors state geospatial needs and recommends appropriate data acquisition including topographic and bathymetric data, specifically bathymetric and lidar data meeting Quality Levels 1 and 2. The work of this Board is guided by the state's GIS strategic plan which was developed in 2002 and updated in 2009. According to survey results, data users indicate a need for QL1 inland topography updated every 4-5 years, QL1B inland bathymetry updated every 6-10 years, QL1B nearshore bathymetry updated every 4-5 years, and Order 1b offshore bathymetry updated every 4-5 years.

The GeoLibrary has pursued high-resolution base elevation or topographic data since 2009. In FY19 the GeoLibrary initiated another acquisition totaling approximately twenty-seven hundred square miles. The GeoLibrary expended just over $750,000 for lidar acquisition in 2020 with federal grants totaling over $400,000, and $300,000 of GeoLibrary matching funds - the GeoLibrary requires matching funds for all GeoLibrary-sponsored projects. Most of the funding comes from state, county, federal, non-profit, and private funding sources. Partners for acquiring elevation and bathymetry data include the USGS, NOAA, USDA, state agencies, the University of Maine, non-profit organizations, the Bureau of Ocean Energy Management, counties, communities, and private enterprise.

Current, accurate mapping reduces the state's labor costs and facilitates economic development in the private sector. With current reliable informative mapping, public and private employees can do more work without leaving the office saving thousands of hours of unnecessary travel time and expenses. It speeds up the permitting processes by allowing verification of information in applications submitted, thus saving economic development projects time and money.

GIS and Computer Aided Design (CAD) systems utilized by the state, private, and nonprofit sectors all rely on topographic and bathymetric mapping layers. Maintaining and improving these mapping layers is an important service benefiting from the GeoLibrary's systematic and coordinated approach to improving the state's authoritative mapping data. The GeoLibrary has acknowledged that the acquisition of accurate elevation data is a priority to the state.

The State of Maine has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

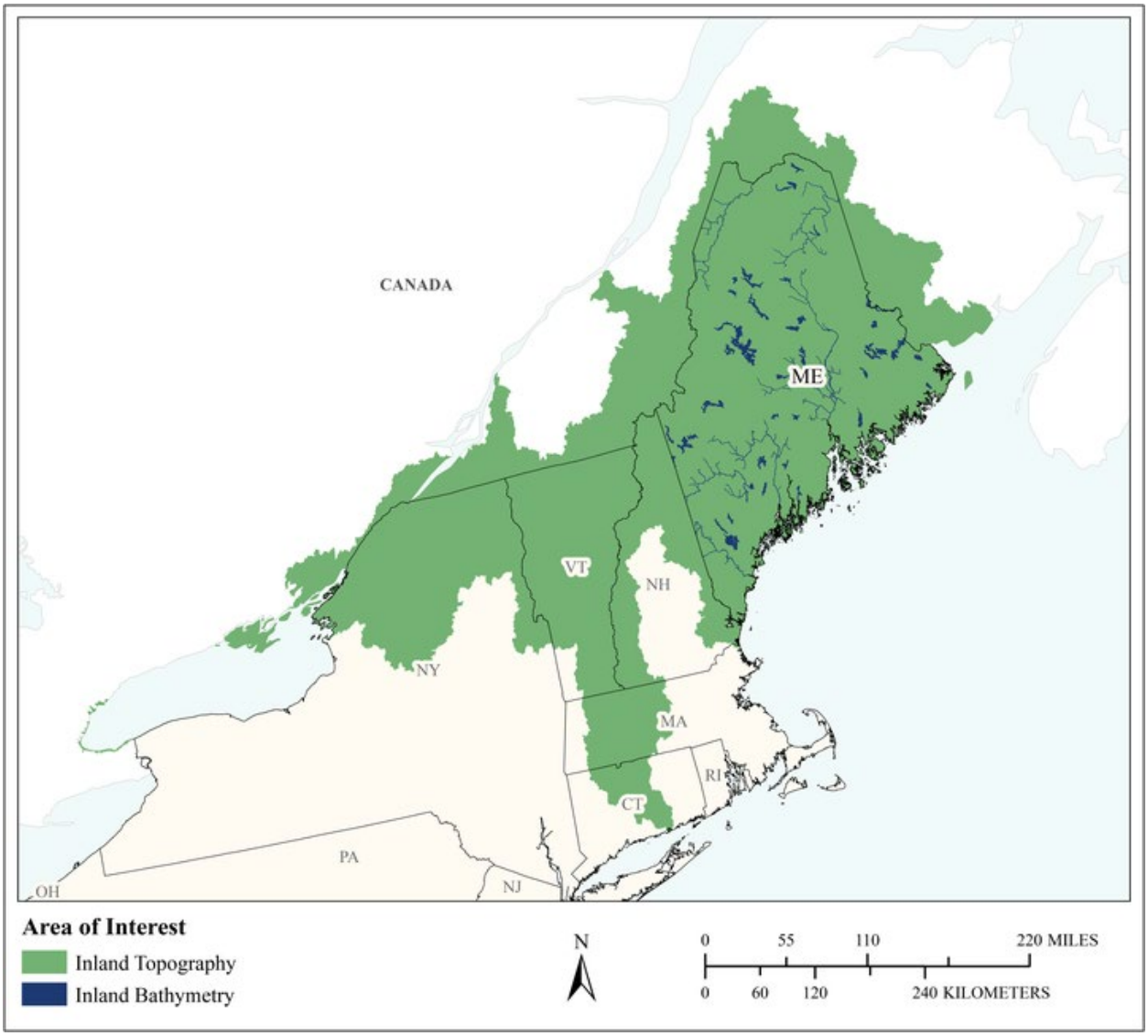
Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	Maine Department of Environmental Protection	1452	Watershed Assessments and Management	Inland Topo	QL2	4-5 years	$603	Unable to quantify	Minor	Moderate	None
				Inland Bathy	Cross sections and/or transects meet needs	6-10 years	$6,221	$1,206	Moderate	Moderate	None
BU 02 – Riverine Ecosystem Management	State of Maine	60205	Riverine Ecosystem Management	Inland Topo	QL1 HD	6-10 years	$49,605	$4,954	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$26,406	$1,862	Major	Major	Major
				Nearshore Bathy	QL0B	2-3 years	$88,345	$67,510	Moderate	Moderate	Moderate
BU 03 – Coastal Zone Management	State of Maine Department of Environmental Protection	21531	Shoreland Zone Delineation	Inland Topo	QL2	6-10 years	$301	$904	Moderate	Moderate	Minor
				Nearshore Bathy	QL3B	6-10 years	$603	$603	Minor	Minor	None
BU 03 – Coastal Zone Management	Maine Coastal Zone Management Program	22092	Seafloor Mapping and Habitat Classification	Nearshore Bathy	QL2B	6-10 years	$785,627	Unable to quantify	Major	Major	Major
				Offshore Bathy	Order 1a	6-10 years	$240,000	Unable to quantify	I don't know	I don't know	I don't know
BU 04 – Forest Resource Management	Cooperative Forestry Research Unit	22115	Characterization of the Forest and Water Resource	Inland Topo	QL1	4-5 years	$1,318,090	$1,714,951	Major	Major	Minor
BU 06 – Natural Resource Management	State of Maine	60206	Natural Resources Conservation	Inland Topo	QL1 HD	4-5 years	$1,271,164	$4,668,105	Major	Major	Major
				Inland Bathy	QL0B	6-10 years	$172,292	$7,756	Major	Major	Major
				Nearshore Bathy	QL1B	6-10 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate
				Offshore Bathy	Cross sections and/or transects meet needs	4-5 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
BU 07 – Wildlife and Habitat Management	Maine Department of Inland Fisheries and Wildlife	21980	Fisheries and Wildlife Management	Inland Topo	QL2	6-10 years	$7,720	$22,297	I don't know	Major	I don't know
				Inland Bathy	QL2B	6-10 years	$61,869	$37,396	I don't know	Major	I don't know
				Nearshore Bathy	QL0B	>10 years	$874	$51	I don't know	I don't know	I don't know
				Offshore Bathy	Special Order	4-5 years	$2,037	$141	Moderate	Major	Major
BU 08 – Agriculture	University of Maine Presque Isle	50003	Agriculture and Precision Farming	Inland Topo	QL1	4-5 years	Unable to quantify	Unable to quantify	Major	Major	I don't know

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 09 – Fisheries Management and Aquaculture	State of Maine	60207	Fisheries Management and Aquaculture	Inland Topo	QL2	2-3 years	$33,128	$71,957	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	6-10 years	$64,846	$29,514	Major	Major	Moderate
				Nearshore Bathy	QL0B	6-10 years	$138,756	$10,190	Moderate	Major	Minor
				Offshore Bathy	Special Order	6-10 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Minor
BU 10 – Geologic Assessment	Maine Geological Survey	1205	Geologic Mapping, Resource Assessment, and Hazard Mitigation	Inland Topo	QL1	4-5 years	$22,236	Unable to quantify	Major	Moderate	None
				Nearshore Bathy	Comparable to quality of jetski mounted fathometer	2-3 years	$36,281	$603	Major	Moderate	Major
				Offshore Bathy	Order 1b	6-10 years	$54,221	Unable to quantify	Moderate	Moderate	Moderate
BU 12 – Renewable Energy Resources	State of Maine	60208	Renewable Energy Resources	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	None
				Inland Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Offshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 15 – Flood Risk Management	Statewide County Emergency Management Agencies	1279	Flood Risk Assessment, Analysis, and Mitigation	Inland Topo	QL2	4-5 years	$289,440	$260,496	I don't know	I don't know	Major
BU 16 – Sea Level Rise and Subsidence	State of Maine	60209	Sea Level Rise and Subsidence	Inland Topo	QL1 HD	4-5 years	$1,706,237	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Minor
				Offshore Bathy	Order 2	6-10 years	Unable to quantify	Unable to quantify	Major	Major	Moderate
BU 18 – Homeland Security	State of Maine	60210	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management	Inland Topo	QL2	4-5 years	$956,063	$16,897	Major	Moderate	Major
				Inland Bathy	QL0B	4-5 years	$269,251	$17,178	Major	Moderate	Major
				Nearshore Bathy	QL1B	6-10 years	$8,136	$233	Moderate	Moderate	Major
				Offshore Bathy	Order 2	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 20 – Marine and Riverine Navigation	State of Maine	60211	Marine and Riverine Navigation and Safety	Inland Topo	QL0 HD	2-3 years	$1,241,523	Unable to quantify	None	None	Minor
				Inland Bathy	QL0B	2-3 years	$591,162	$77,803	Moderate	Moderate	Moderate
				Nearshore Bathy	QL0B	2-3 years	$677,066	$22,923	Minor	Major	Major
				Offshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 22 – Infrastructure Management	Maine Port Authority	32707	Infrastructure Management	Inland Topo	Cross sections and/or transects meet needs	2-3 years	$350,101	$1,038,968	I don't know	I don't know	None
				Inland Bathy	Cross sections and/or transects meet needs	6-10 years	$118,949	$12,351	I don't know	I don't know	I don't know
				Nearshore Bathy	Cross sections and/or transects meet needs	4-5 years	$17,775	$2,443	I don't know	I don't know	I don't know
				Offshore Bathy	Cross sections and/or transects meet needs	2-3 years	Unable to quantify	Unable to quantify	Minor	Major	Moderate
BU 23 – Urban and Regional Planning	State of Maine	60212	Urban and Regional Planning	Inland Topo	QL1	4-5 years	$8,719,930	$1,006,719	Moderate	Major	Major
				Inland Bathy	QL1B	6-10 years	$355,147	$449,292	Moderate	Moderate	Major
				Nearshore Bathy	QL2B	4-5 years	$161,656	$170,541	Moderate	Moderate	Moderate
BU 30 – Maritime and Land Boundary Management	State of Maine	60213	Maritime and Land Boundary Management	Inland Topo	QL1	6-10 years	$36,468	$139,821	Moderate	Minor	None
				Inland Bathy	QL2B	6-10 years	$27,368	Unable to quantify	Major	Major	Moderate
				Nearshore Bathy	QL0B	2-3 years	$202,887	Unable to quantify	Moderate	Major	Moderate
				Offshore Bathy	I don't know	2-3 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate

MCA Title: Watershed Assessments and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Watershed delineation for the purpose of accurately defining the point and non-point sources, as well as fates, of pollution and contaminants to the State's surface and ground waters. Elevation data are needed to delineate watersheds to determine land use, refine NHD, as input to hydrology GIS tools to identify permanent and ephemeral streams, for lake volume measurements and to identify reservoir sedimentation, and to formulate required treatments to reduce phosphate or aquatic infestations.
MCA Title	Watershed Assessments and Management
MCA ID	1452
Organization Type	State or U.S. Territorial government
Organization Name	Maine Department of Environmental Protection
Sub-Agency or Division	
Organization Mission	"Legislative mandate directs DEP to prevent, abate and control the pollution of the air, water and land. The charge is to preserve, improve and prevent diminution of the natural environment of the State. The Department is also directed to protect and enhance the public's right to use and enjoy the State's natural resources. The Department administers programs, educates and makes regulatory decisions that contribute to the achievement of this mission." Source and additional information: https://www.maine.gov/dep/about/index.html
Program Name	Watershed Management
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 02 - Riverine Ecosystem Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Houses and buildings, deepest point underwater and surface height, also substrate.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have

Inland Bathy Feature Size Requirements	Response
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Other	Nice to have
Other description	
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Required
Greater than 10 acres	Required
Other	Nice to have
Other description	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	Cross sections and/or transects meet needs		
Update Frequency	4-5 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI	QL2 data is currently available or soon to be available over most of the state, and is desirable or needed in the remainder			
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 1 meter		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs		Yes		
Cross section/transect requirement		Vertical accuracy: +/-1m sampling density: ~30m		

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Nice to have			Nice to have	
DEM for entire AOI needs to be seamless	Highly desirable	Nice to have			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Nice to have		
DTM	Highly desirable	Nice to have		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Nice to have	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Nice to have	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have	Highly desirable		
Land use/land cover	Highly desirable	Nice to have		
Wetlands	Highly desirable	Highly desirable		
Estuaries				
Inland surface water features	Highly desirable	Highly desirable		
Bridges/culverts	Highly desirable	Nice to have		
Landmark features	Not required	Not required		
Cultural resources	Not required	Not required		
Coastal and riverine structures	Nice to have	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Maine Office of GIS supplies digital terrain elevation model of Maine with a 2 meter by 2 meter square grid. The data are a combination of DEMs from various lidar collections in Maine ranging from 2006 to 2012. The data overall are accurate to RSMEz 15cm. Where overlapping projects came together, the ArcGIS mosaic raster tool was used and the values were "blended" using that tool. QL2 for ~75%, QL3 25%	State of Maine maintains a dataset of lake bathymetry, but only a small percentage of the state's lakes (~10%) have been surveyed. For most, the data is at least 20 years old and of widely varying density and quality. GIS point depth data is available to state users through an internal server, and PDF maps are available here: https://www.maine.gov/ifw/fishing-boating/fishing/fishing-resources/lake-survey-maps/index.html		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	LiDAR-derived topography data is available to Maine state employees through internal GIS servers, and also through the Maine Geolibrary Elevation Discovery and Download Tool (https://www.maine.gov/geolib/ediscovery/site/index.html).	State of Maine maintains a dataset of lake bathymetry, but only a small percentage of the state's lakes (~10%) have been surveyed. For most, the data is at least 20 years old and of widely varying density and quality. GIS point depth data is available to state users through an internal server, and PDF maps are available here: https://www.maine.gov/ifw/fishing-boating/fishing/fishing-resources/lake-survey-maps/index.html		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	None		
Cost savings/cost reduction	Moderate	None		
Cost avoidance	Minor	None		
Increased revenues	None	None		
Mission-driven performance improvements	Moderate	None		

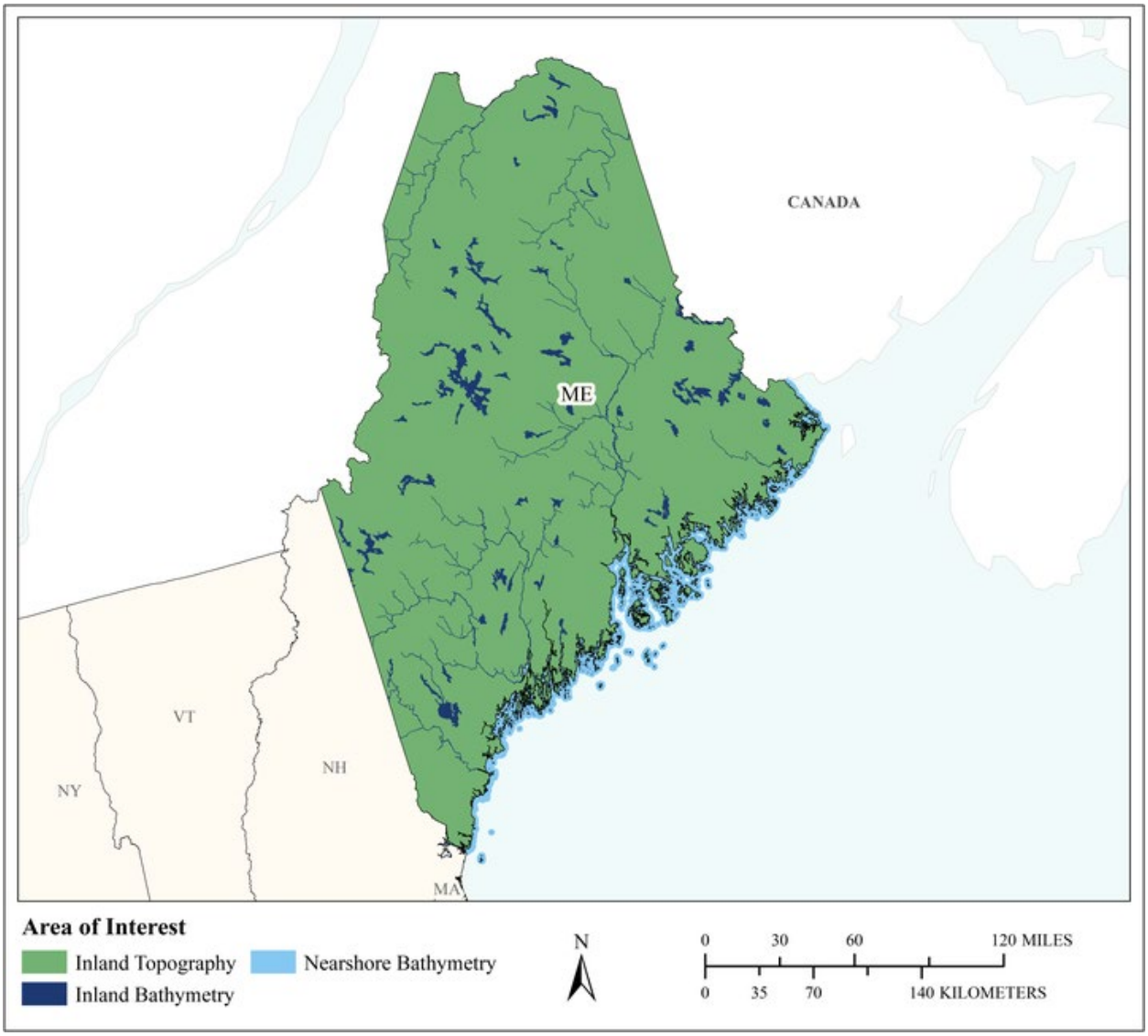
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	None		
Improved response or timeliness	Moderate	None		
Improved customer experience	Minor	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	None		
Environmental	Moderate	None		
Public safety, including life and property	None	None		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$603	Moderate	Annual dollars saved/realized	$4,221						
Time savings description				Would reduce the need for field work to do lake soundings. Would reduce time and errors in modeling, allow faster updates of online data.								
Cost savings/cost reduction	Minor	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction description				Amount spent varies widely depending on cooperation from other agencies, but potentially significant.								
Cost avoidance	Minor	Unable to provide		Moderate	Annual dollars saved/realized	$2,000						
Increased revenues	None			None								
Mission-driven performance improvements	Moderate	Annual percent improvement	50%	Moderate	Annual percent improvement	50%						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide		Minor	Unable to provide							
Improved response or timeliness	Minor	Unable to provide		Moderate	Annual dollars saved/realized	$904						
Improved response or timeliness description				Time and labor saved on having accurate data available online in a public location. Better modeling of waterbody pollution risks based on physical characteristics. Would replace data that is in some cases over 40 years old.								
Improved customer experience	Moderate	Unable to provide		Moderate	Annual dollars saved/realized	$302						
Improved customer experience description				Time and labor saved on having accurate data available online in a public location. Would replace data that is in some cases over 40 years old.								
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Moderate								
Education or outreach description	Improved data available to stakeholders and public for education and decision making about land use and protection			Improved data available to stakeholders and public for education and decision making about land use and protection								
Environmental	Moderate			Moderate								
Environmental description	Improved response to pollution risk factors			Improved response to pollution risk factors								
Public safety, including life and property	None			None								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Riverine Ecosystem Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Stream channel analysis and mapping. Stream bank erosion analysis. Aquatic and terrestrial species habitat management. Environmental management.
MCA Title	Riverine Ecosystem Management
MCA ID	60205
Organization Type	State or U.S. Territorial government
Organization Name	State of Maine
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B	QL0B	
Update Frequency	6-10 years	4-5 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable		Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Required		Highly desirable	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Required	Required		Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	
DTM	Required	Highly desirable	Required	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Nice to have	Nice to have	
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Not required	Nice to have	
Full waveform	Nice to have	Nice to have	Highly desirable	
Bathymetric Attributed Grid (BAG)		Not required	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Nice to have	
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Highly desirable	Required	
Underwater videography			Not required	
Bottom texture			Highly desirable	
Bottom type			Required	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Nice to have	Nice to have	Not required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates	Nice to have	Nice to have	Highly desirable	
Land use/land cover	Highly desirable	Nice to have	Required	
Wetlands	Highly desirable	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have	Not required	
Cultural resources	Nice to have	Nice to have	Not required	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	
Cost savings/cost reduction	Moderate	Minor	Moderate	
Cost avoidance	Moderate	None	None	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	None	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Minor	

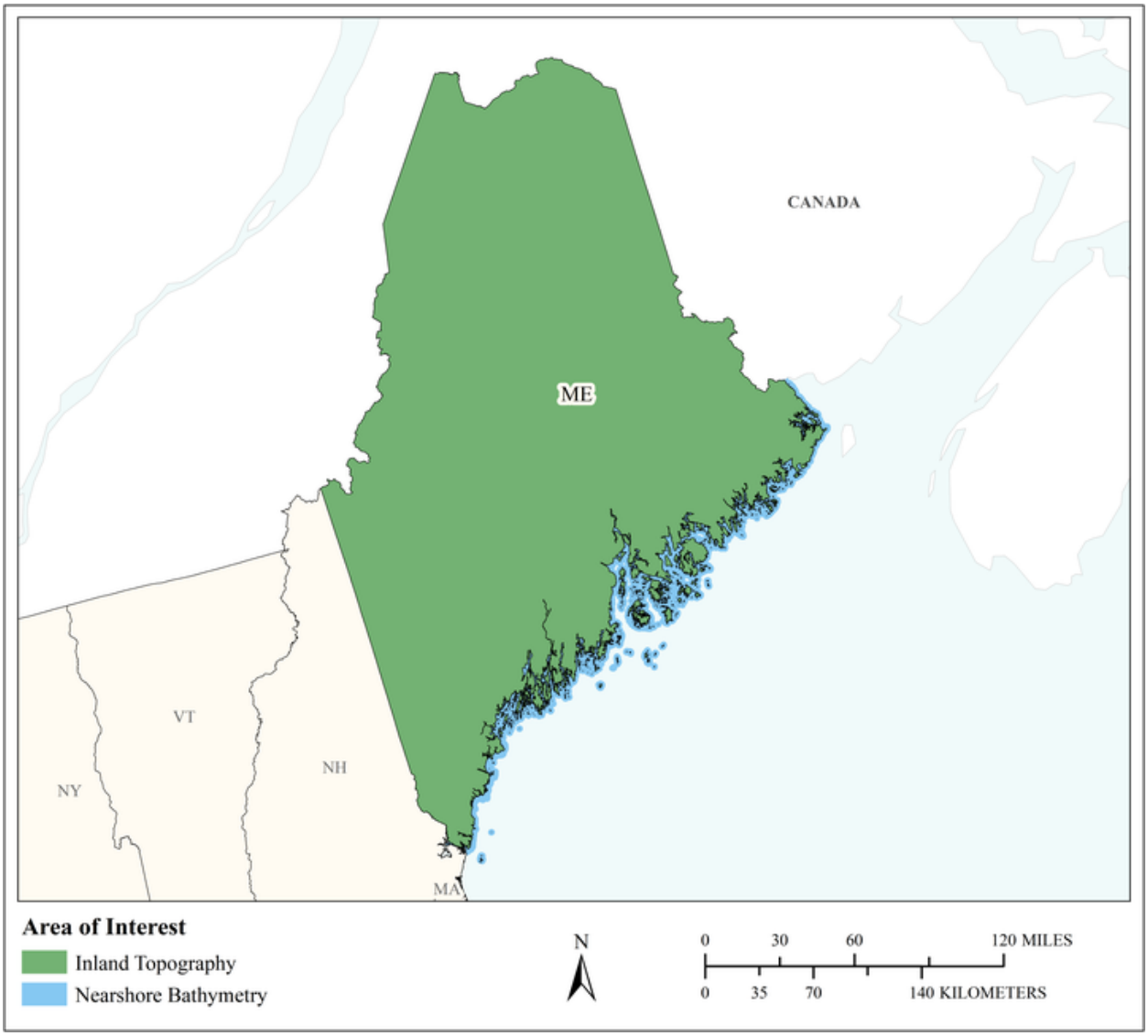
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Moderate	Minor	
Improved customer experience	Major	Minor	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Minor	
Environmental	Major	Major	Moderate	
Public safety, including life and property	Major	Moderate	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$49,605		Annual dollars saved/ realized	$26,406		Annual dollars saved/ realized	$88,345			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$4,954		Annual dollars saved/ realized	$1,862		Annual dollars saved/ realized	$67,510			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate					
Environmental	Major			Major			Moderate					
Public safety, including life and property	Major			Major			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps			Yes	
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints			Yes	
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Shoreland Zone Delineation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Shoreland zone delineation for inland and coastal waters and wetlands. Wetlands land use restrictions are applied within the shoreland zone around all ponds, rivers, and coastal zones. The shoreland zone is defined by a horizontal distance that varies by the type of water feature. Elevation data are needed to help define the shoreland zone. The Mandatory Shoreland Zoning Act (MSZA) requires municipalities to adopt, administer, and enforce local ordinances that regulate land use activities in the shoreland zone. The shoreland zone is comprised of all land areas within 250 feet, horizontal distance, of the: a) normal high-water line of any great pond or river; b) upland edge of a coastal wetland, including all areas affected by tidal action, and c) upland edge of defined freshwater wetlands; and d) all land areas within 75 feet, of the normal high-water line of certain streams.
MCA Title	Shoreland Zone Delineation
MCA ID	21531
Organization Type	State or U.S. Territorial government
Organization Name	State of Maine Department of Environmental Protection
Sub-Agency or Division	
Organization Mission	"Legislative mandate directs DEP to prevent, abate and control the pollution of the air, water and land. The charge is to preserve, improve and prevent diminution of the natural environment of the State. The Department is also directed to protect and enhance the public's right to use and enjoy the State's natural resources. The Department administers programs, educates and makes regulatory decisions that contribute to the achievement of this mission." Source and additional information: https://www.maine.gov/dep/about/index.html
Program Name	Shoreland Zoning The Mandatory Shoreland Zoning Act (MSZA) requires municipalities to adopt, administer, and enforce local ordinances that regulate land use activities in the shoreland zone. The shoreland zone is comprised of all land areas within 250 feet, horizontal distance, of the: a) normal high-water line of any great pond or river; b) upland edge of a coastal wetland, including all areas affected by tidal action, and c) upland edge of defined freshwater wetlands; and d) all land areas within 75 feet, of the normal high-water line of certain streams.
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 30 - Maritime and Land Boundary Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Docks, riparian and wetland vegetation

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2		QL3B	
Update Frequency	6-10 years		6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter		Up to 1 meter	
Acceptable Vertical Error	Up to 20 cm		Up to 40 cm	
How far onshore needed			500 meters inland	
How far down the beach profile needed	To MHW		To MLLW	
Tide correction requirement			MHW	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have		Nice to have			Nice to have
Entire AOI under same environmental conditions	Highly desirable		Highly desirable			Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable		Nice to have			Nice to have
DEM for entire AOI needs to be seamless	Highly desirable		Highly desirable			Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have		Nice to have	
DTM	Highly desirable		Highly desirable	
DEM	Required		Required	
Raw point cloud data	Nice to have		Nice to have	
Classified point cloud	Nice to have		Nice to have	
Edited/cube XYZ			Not required	
Full waveform	Not required		Not required	
Bathymetric Attributed Grid (BAG)			Not required	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)			Not required	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Not required		Nice to have	
Ground control/ground truthing	Highly desirable		Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required		Required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Not required	
Submerged features			Not required	
Subbottom characteristics			Not required	
Geologic and seismic data	Nice to have		Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Required	
Sea ice conditions			Not required	
Habitat distribution and classification			Not required	
Boundaries			Highly desirable	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Required		Required	
Land use/land cover	Highly desirable		Highly desirable	
Wetlands	Required		Required	
Estuaries			Highly desirable	
Inland surface water features	Required		Required	
Bridges/culverts	Highly desirable			
Landmark features	Nice to have		Nice to have	
Cultural resources	Not required		Nice to have	
Coastal and riverine structures	Highly desirable		Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Maine Office of GIS supplies digital terrain elevation models of Maine with a 2m x2m grid. The data are a combination of DEMs from various Lidar collections in Maine ranging from 2006-2012. The data overall are accurate to RSMEz 15cm. Where overlapping projects came together, rasters were blended using a mosaic tool.		State collected data and NOAA data	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast			Yes	
NCEI			Yes	
Open Topography				
NOAA nautical charts			Yes	

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Maine Office of GIS (MEGIS) hosts state lidar and derived products through the Maine Geolibrary Elevation Data Discovery Tool. https://www.maine.gov/geolib/ediscovery/site/index.html, LiDAR derived topography data is available to Maine State employees through internal GIS servers, and also through the Maine Geolibrary Elevation Discovery and Download tool (https://www.maine.gov/geolib/ediscovery/site/index.html).			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate		Minor	
Cost savings/cost reduction	Minor		Minor	
Cost avoidance	Minor		Minor	
Increased revenues	None		None	
Mission-driven performance improvements	Minor		Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor		None	
Improved response or timeliness	Minor		None	

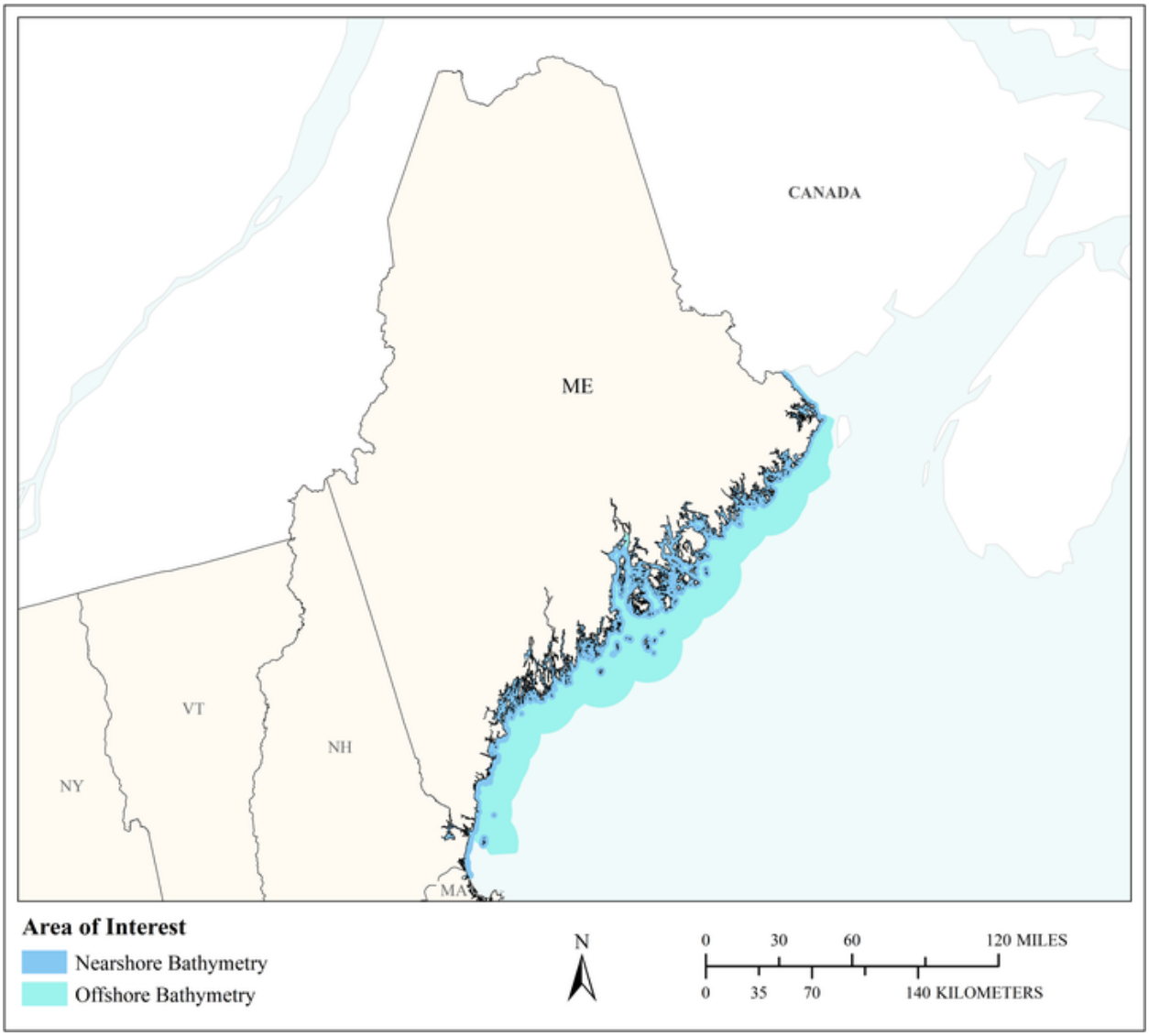
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved customer experience	Minor		None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor		Minor	
Environmental	Minor		Minor	
Public safety, including life and property	None		None	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$302				Moderate	Annual dollars saved/realized	$603			
Time savings description	More accurate derived property contours reduce need for field visits.						Creation of more accurate derived shoreline data will help reduce field survey time.					
Cost savings/cost reduction	Moderate	Unable to provide					Moderate	Unable to provide				
Cost savings/cost reduction description	Elevation data acquisition costs vary widely, difficult to estimate.						Cost of acquisition varies widely over time, difficult to estimate.					
Cost avoidance	Minor	Unable to provide					Minor	Unable to provide				
Increased revenues	None						None					
Mission-driven performance improvements	Moderate	Annual percent improvement	10%				Minor	Annual percent improvement	10%			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide					Moderate	Unable to provide				
Value added to products or services description							More accurate shoreline/waterbody delineation for use in zoning determinations by state and towns.					
Improved response or timeliness	Moderate	Annual dollars saved/realized	$603				Moderate	Annual dollars saved/realized	$302			
Improved response or timeliness description							Time saved in providing customers with accurate data through web services.					
Improved customer experience	Moderate	Annual dollars saved/realized	$302				Moderate	Annual dollars saved/realized	$302			
Improved customer experience description							Greater accuracy of shoreline data allows for greater confidence in zoning determinations. Time saved in providing customers with accurate data.					
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate						Minor					
Environmental	Moderate						Minor					
Public safety, including life and property	Minor						None					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes		Yes	
Hillshades	Yes		Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes		Yes	
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Seafloor Mapping and Habitat Classification



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type			Required	Required
Geographic Area Requirements			Nearshore areas along the coast (including the Great Lakes) off one or more Hydrologic Units (HUC4s)	Custom description
Sub Area Requirements				8 nautical miles from Maine's State/Federal line

MCA Description	Response
Mission Critical Activity	Seafloor Mapping; Seamless integration of LiDAR and Bathymetry, coastal hazards modeling, impervious surface ID and analysis, and storm response. The Maine seafloor mapping program needs topobathy to ½ mi offshore to connect the bathymetry to the topographic lidar. Bathymetry are needed for seafloor mapping and habitat classification as well as coastal hazards modeling.
MCA Title	Seafloor Mapping and Habitat Classification
MCA ID	22092
Organization Type	State or U.S. Territorial government
Organization Name	Maine Coastal Zone Management Program
Sub-Agency or Division	
Organization Mission	To conserve, develop, and enhance Maine's Coastal Zone.
Program Name	The Maine Coastal Mapping Initiative
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Tertiary Business Use	BU 16 - Sea Level Rise and Subsidence

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Submerged Aquatic Vegetation (SAV's), eelgrass in particular

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order			QL2B	Order 1a
Update Frequency			6-10 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error			Up to 1 meter	Up to 1 meter
Acceptable Vertical Error			Up to 40 cm	Less than 1 meter

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed			Below MLLW	
Tide correction requirement			MHW	MHW
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season			Nice to have	Nice to have		Highly desirable
Entire AOI under same environmental conditions			Required	Highly desirable		Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless			Highly desirable	Nice to have		Required
DEM for entire AOI needs to be seamless			Highly desirable	Required		Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM			Highly desirable	Highly desirable
DTM			Highly desirable	Highly desirable
DEM			Highly desirable	Highly desirable
Raw point cloud data			Required	Required
Classified point cloud			Highly desirable	
Edited/cube XYZ			Required	Highly desirable
Full waveform			Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)			Required	Required
Breaklines required for standard hydro-flattening				
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Required	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Nice to have
Intensity imagery/sidescan imagery			Required	Highly desirable
Ground control/ground truthing			Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Required	Required
Aerial and/or satellite imagery			Highly desirable	Highly desirable
Underwater videography			Required	Required
Bottom texture			Required	Required
Bottom type			Required	Required
Submerged features			Required	Required
Subbottom characteristics			Required	Highly desirable
Geologic and seismic data			Highly desirable	Nice to have
Water column properties - Physical			Highly desirable	Nice to have
Water column properties - Chemical			Highly desirable	Nice to have
Water column properties - Biological			Highly desirable	Nice to have
Currents			Nice to have	Nice to have
Tide/wave heights			Highly desirable	Nice to have
Sea ice conditions			Not required	Nice to have
Habitat distribution and classification			Not required	Highly desirable
Boundaries			Not required	Nice to have
Routes			Not required	Nice to have
Offshore cadastral			Not required	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Highly desirable	Nice to have
Floating observation/navigation systems			Highly desirable	Nice to have
Shorelines – current, historic, change rates			Highly desirable	
Land use/land cover			Highly desirable	Nice to have
Wetlands			Nice to have	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Nice to have	Nice to have
Inland surface water features			Nice to have	
Bridges/culverts				
Landmark features			Nice to have	
Cultural resources			Nice to have	
Coastal and riverine structures			Nice to have	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used			Currently there is very little nearshore bathymetric data available in the State of Maine. The MCMI only maps to about 1 mile from the coast due to hazards and diminishment of swath width in shallow waters.	Disparate data sets from different federal agencies collected during significantly varied time periods (with differing levels of technology).
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				Yes
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories			Yes	
State repositories used			Maine Office of GIS	
Data that meet my needs are not available				

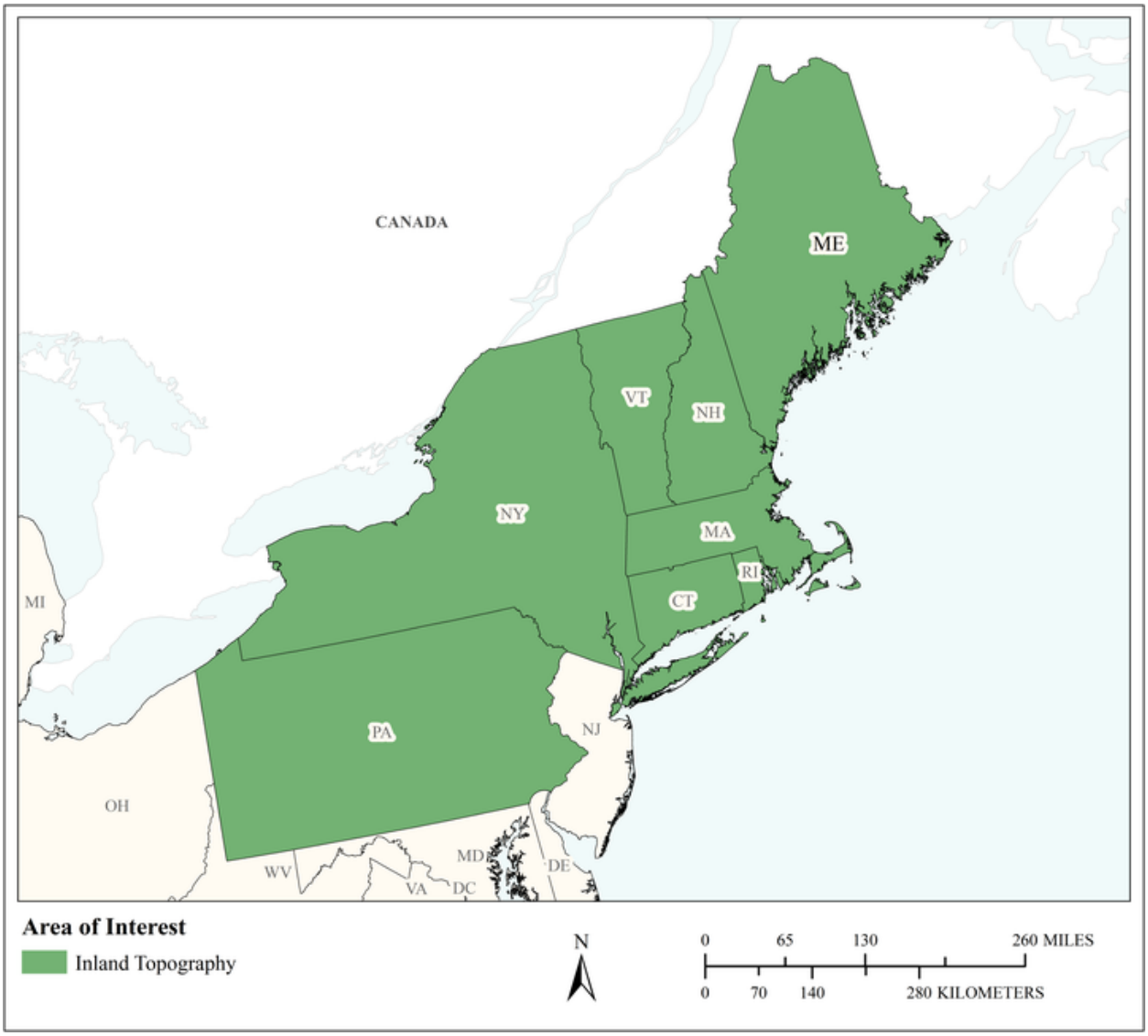
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings			Major	None
Cost savings/cost reduction			Major	None
Cost avoidance			Moderate	None
Increased revenues			None	None
Mission-driven performance improvements			Moderate	None
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services			Moderate	None
Improved response or timeliness			Moderate	None
Improved customer experience			Minor	None
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach			None	None
Environmental			Moderate	None
Public safety, including life and property			Moderate	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings							Major	Annual dollars saved/realized	$25,628	Minor	Unable to provide	
Cost savings/cost reduction							Major	Annual dollars saved/realized	$160,000	Major	Annual dollars saved/realized	$240,000
Cost avoidance							Major	Annual dollars saved/realized	$600,000	I don't know	Unable to provide	
Increased revenues							I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements							I don't know	Unable to provide		I don't know	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services							I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness							Major	Unable to provide		I don't know	Unable to provide	
Improved customer experience							Major	Unable to provide		I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach							Major			I don't know		
Environmental							Major			I don't know		
Public safety, including life and property							Major			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	
Contours			Yes	Yes
Hillshades			Yes	Yes
Slope maps			Yes	Yes
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness			Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Characterization of the Forest and Water Resource



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Characterization of the forest resource (biomass, species, habitat suitability). Change detection in aboveground vegetation (forest losses due to natural or manmade disturbances). Mapping of the digital terrain for soils, stream identification or depth to water table.
MCA Title	Characterization of the Forest and Water Resource
MCA ID	22115
Organization Type	Academic or Not-for-Profit
Organization Name	Cooperative Forestry Research Unit
Sub-Agency or Division	
Organization Mission	The mission of the CFRU is to develop applied information that can be used by member forestry organizations to improve forest management.
Program Name	Forest Inventory
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	BU 06 - Natural Resources Conservation
Tertiary Business Use	BU 07 - Wildlife and Habitat Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Individual branches on a tree. Species identification and structure.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Vertical Error	Less than 5 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Required			
Bathymetric Attributed Grid (BAG)				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Required			
Wetlands	Required			
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL2 2012 - present			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Maine Office of GIS			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			

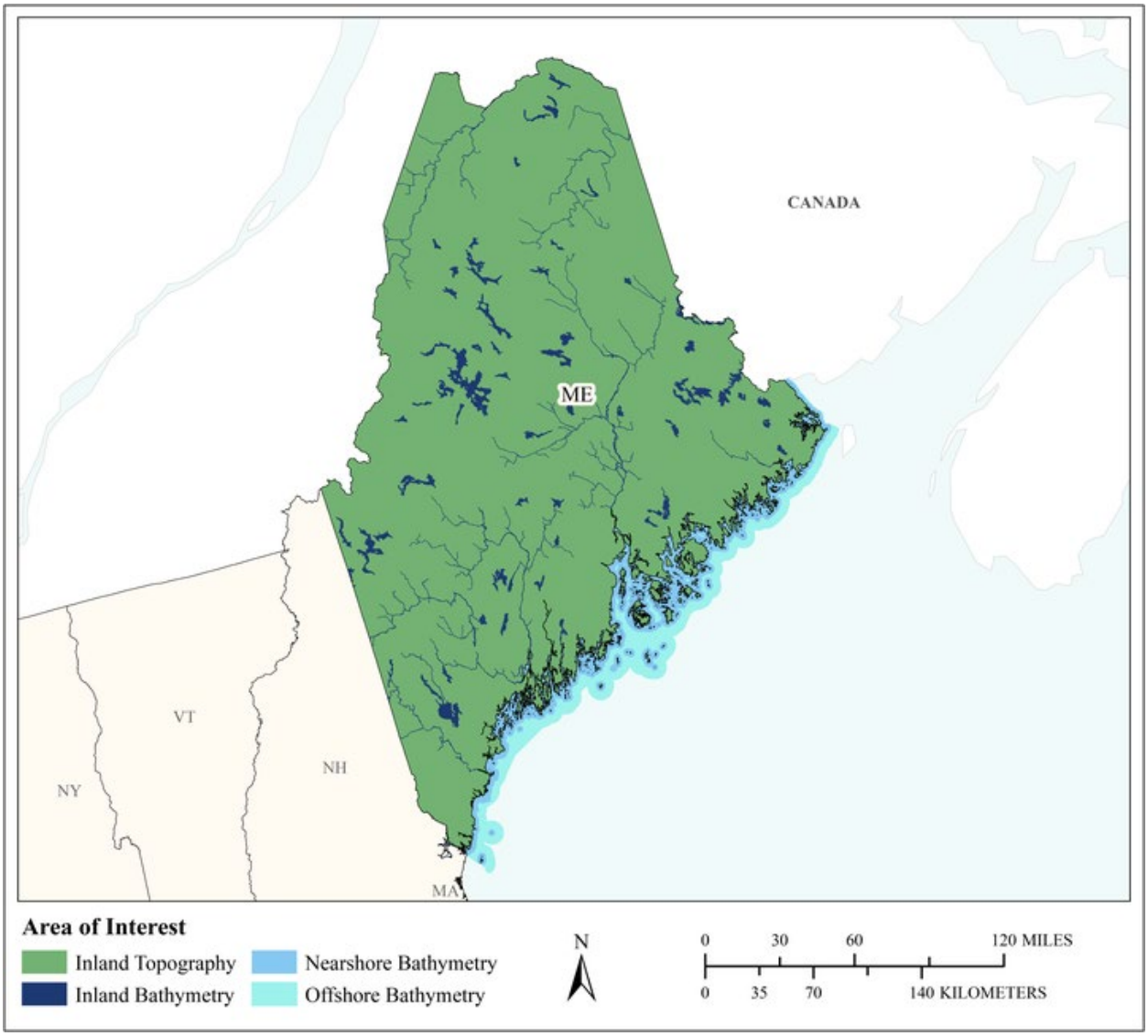
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor			
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	None			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$18,090									
Cost savings/cost reduction	Major	Annual dollars saved/realized	$200,000									
Cost savings/cost reduction description	Annual cost of obtaining data.											
Cost avoidance	I don't know	Unable to provide										
Increased revenues	Major	Annual dollars saved/realized	$1,100,000									
Mission-driven performance improvements	Major	Annual percent improvement	50%									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$500,000									
Value added to products or services description	Updated Risk/hazard maps. More detailed depth to water table maps.											
Improved response or timeliness	Major	Annual dollars saved/realized	$103,215									
Improved response or timeliness description	Risk of forest to insect or disease outbreak.											
Improved customer experience	Major	Annual dollars saved/realized	$606,030									
Improved customer experience description	New maps. Avoided violations of BMP's.											
Other customer service benefits	Major	Annual dollars saved/realized	$500,000									
Other customer service benefits description	Cost savings to landowners per year. Wet Areas Mapping.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Education or outreach description	Information for public and landowners about the resource											
Environmental	Major											
Environmental description	Provide habitat analysis											
Public safety, including life and property	Minor											
Public safety, including life and property description	Watershed mapping and stream flows/flood prediction											
Other	Sustainability											
Other benefits	Major											
Other description	Maintain ability to meet future needs for natural resources											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Natural Resources Conservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation engineering. Soils and wetlands mapping and characterization. Modeling of biological and ecological systems. Erosion control. Rainfall penetration studies, impervious surfaces. Assessment of blue carbon stocks.
MCA Title	Natural Resources Conservation
MCA ID	60206
Organization Type	State or U.S. Territorial government
Organization Name	State of Maine
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B	QL1B	Cross sections and/or transects meet needs
Update Frequency	4-5 years	6-10 years	6-10 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				Yes
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Highly desirable	Required	Required	Required	Required
Entire AOI under same environmental conditions	Required	Required	Required	Required	Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Required	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Required	Required	Required	Required
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Highly desirable	Required	Highly desirable
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Nice to have	Highly desirable
Ground control/ground truthing	Required	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Nice to have	Required
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Highly desirable
Underwater videography			Nice to have	Highly desirable
Bottom texture			Nice to have	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Highly desirable	Highly desirable
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Nice to have	Highly desirable
Habitat distribution and classification			Required	Highly desirable
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Highly desirable
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates	Highly desirable	Required	Highly desirable	
Land use/land cover	Required	Required	Highly desirable	Nice to have
Wetlands	Required	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Highly desirable
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Nice to have	Highly desirable	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	Major
Cost savings/cost reduction	Major	Major	Minor	Major
Cost avoidance	Major	Moderate	Minor	I don't know
Increased revenues	Minor	Minor	None	I don't know
Mission-driven performance improvements	Major	Major	Moderate	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Moderate	Major

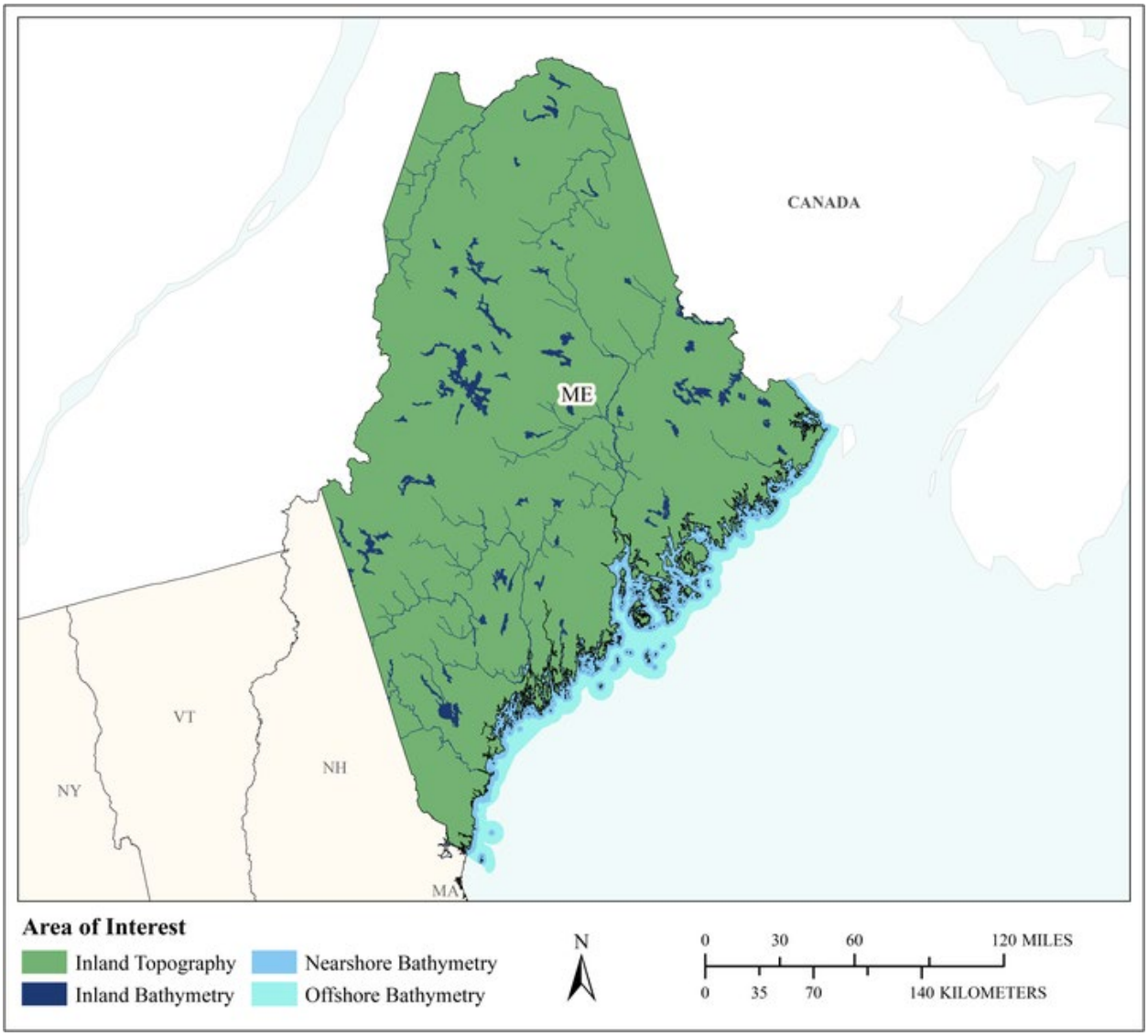
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major	Moderate	Major
Improved customer experience	Major	Moderate	Minor	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Moderate	Major
Environmental	Major	Major	Major	Major
Public safety, including life and property	Major	Moderate	Moderate	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		None			Moderate	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,271,164		Annual dollars saved/ realized	$172,292						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$4,668,105		Annual dollars saved/ realized	$7,756						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate			Moderate		
Environmental	Major			Major			Major			Major		
Public safety, including life and property	Major			Major			Moderate			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Fisheries and Wildlife Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Big game population management; protection and management of fish, non-game wildlife, and habitats; restoration of endangered species; enabling and promoting the safe enjoyment of Maine's outdoors.
MCA Title	Fisheries and Wildlife Management
MCA ID	21980
Organization Type	State or U.S. Territorial government
Organization Name	Maine Department of Inland Fisheries and Wildlife
Sub-Agency or Division	
Organization Mission	Maine Department of Inland Fisheries and Wildlife protects and manages Maine's fish and wildlife and their habitats, promotes Maine's outdoor heritage, and safely connects people with nature through responsible recreation, sport, and science.
Program Name	Fisheries and wildlife habitat mapping
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	BU 09 - Fisheries Management and Aquaculture
Tertiary Business Use	BU 27 - Recreation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Small wetland features (i.e. vernal pools); trees, shrubs, vegetation

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B	QL0B	Special Order
Update Frequency	6-10 years	6-10 years	>10 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm	Up to 1 meter	Up to 1 meter	Less than 1 meter
How far onshore needed			To Mean Lower Low Water (MLLW)	
How far down the beach profile needed	To MLLW		To MLLW	
Tide correction requirement			MLLW	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Required
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Required
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Nice to have	Highly desirable
DTM	Highly desirable	Highly desirable	Nice to have	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Not required	Nice to have	Nice to have	Highly desirable
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Not required	Not required	Nice to have
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Not required	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Not required	Highly desirable
Ground control/ground truthing	Nice to have	Nice to have	Nice to have	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Not required	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Not required	Nice to have
Bottom texture			Not required	Highly desirable
Bottom type			Highly desirable	Required
Submerged features			Nice to have	Required
Subbottom characteristics			Not required	Highly desirable
Geologic and seismic data	Not required	Not required	Not required	Highly desirable
Water column properties - Physical			Not required	Highly desirable
Water column properties - Chemical			Not required	Highly desirable
Water column properties - Biological			Not required	Highly desirable
Currents			Not required	Highly desirable
Tide/wave heights			Not required	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Not required	Highly desirable
Boundaries			Not required	Highly desirable
Routes			Not required	Nice to have
Offshore cadastral			Not required	Nice to have
Lease areas			Not required	Nice to have
Fixed obstructions			Nice to have	Highly desirable
Floating observation/navigation systems			Nice to have	Highly desirable
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Required	Required	Required	Highly desirable
Wetlands	Required	Required	Required	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Nice to have
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Not required	Nice to have	
Coastal and riverine structures	Highly desirable	Required	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Statewide DEM 10m Partial State DEM 2m 2ft contour high tide line	Statewide DEM 10m partial DEM 2m 2ft contour	Elev_bathy	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes	Yes	
State repositories used	State of Maine Geolibrary State servers	Maine geolibrary state servers	Maine geolibrary state servers	
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available	Major	Moderate
Cost savings/cost reduction	Major	Inland bathy data not available	Major	Minor

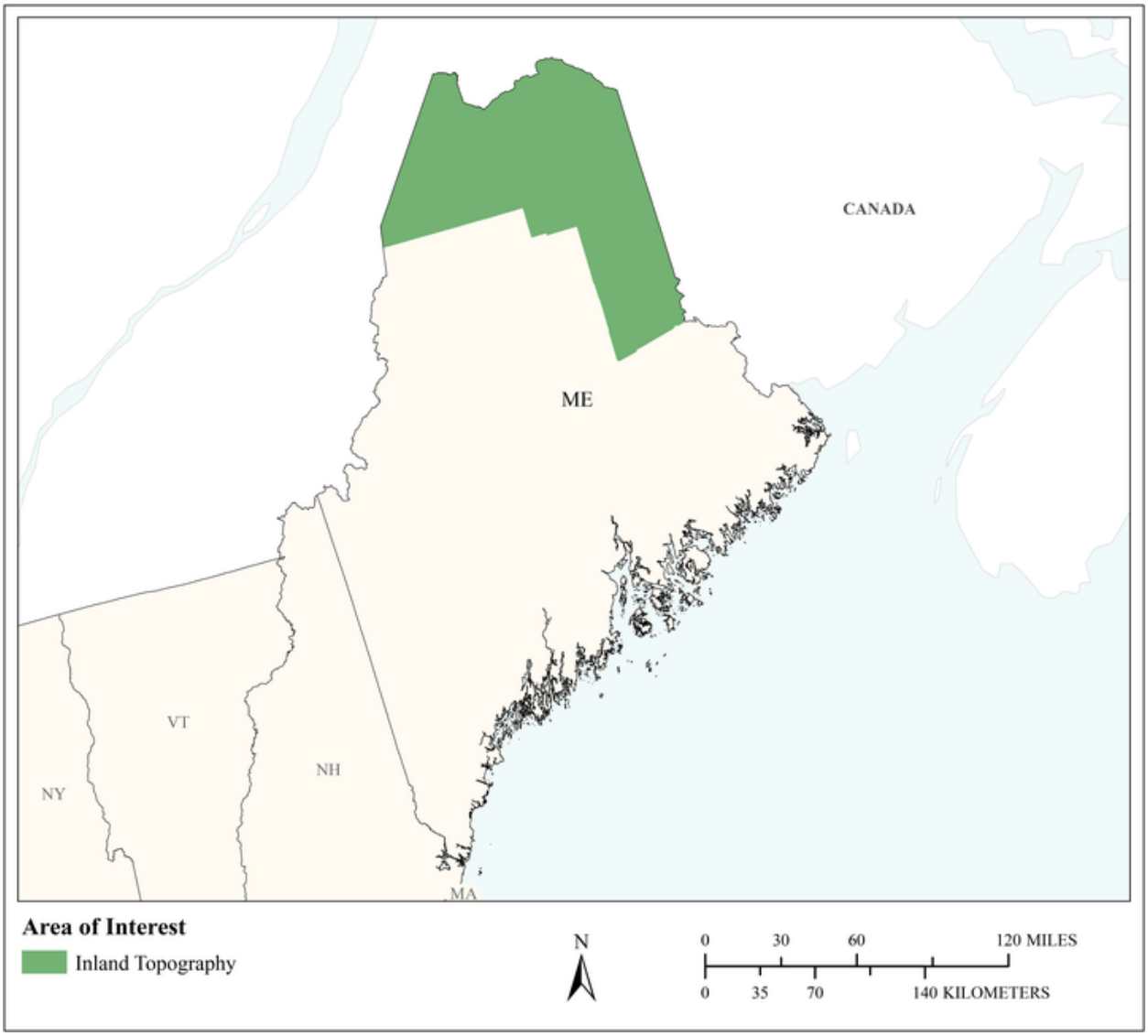
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost avoidance	Major	Inland bathy data not available	Major	Major
Increased revenues	Major	Inland bathy data not available	I don't know	None
Mission-driven performance improvements	Major	Inland bathy data not available	Major	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available	Major	Minor
Improved response or timeliness	Major	Inland bathy data not available	Major	Minor
Improved customer experience	Major	Inland bathy data not available	Major	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	Inland bathy data not available	I don't know	Minor
Environmental	Major	Inland bathy data not available	Major	Major
Public safety, including life and property	I don't know	Inland bathy data not available	I don't know	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Minor	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	I don't know	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$7,720		Annual dollars saved/ realized	$61,869		Annual dollars saved/ realized	$874		Annual dollars saved/ realized	$2,037
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$22,297		Annual dollars saved/ realized	$37,396		Annual dollars saved/ realized	$51		Annual dollars saved/ realized	$141
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know			I don't know			Moderate		
Environmental	Major			Major			I don't know			Major		
Public safety, including life and property	I don't know			I don't know			I don't know			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes	Yes	Yes	Yes
Curvature maps				
Cross sections				Yes
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Agriculture and Precision Farming



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements	Aroostoock County, ME			

MCA Description	Response
Mission Critical Activity	Agriculture and Precision Farming. With LiDAR, accurate drainage systems at large-scale can be mapped to help farmers manage drainage and flooding and deal with soil erosion issues.
MCA Title	Agriculture and Precision Farming
MCA ID	50003
Organization Type	Academic or Not-for-Profit
Organization Name	University of Maine Presque Isle
Sub-Agency or Division	Environmental Science and Sustainability Program
Organization Mission	We deliver exceptional experiences for learners of all ages to become informed leaders, engaged citizens, and prepared professionals within their communities and beyond.
Program Name	GIS and Precision Agriculture
Total Annual Program Budget	
Primary Business Use	BU 08 - Agriculture and Precision Farming
Secondary Business Use	BU 06 - Natural Resources Conservation
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Intermittent stream channels in relatively flat and/or hilly terrain

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm			
Acceptable Vertical Error	Up to 20 cm			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Best available point cloud data and DEMs			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Maine GeoLibrary			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			

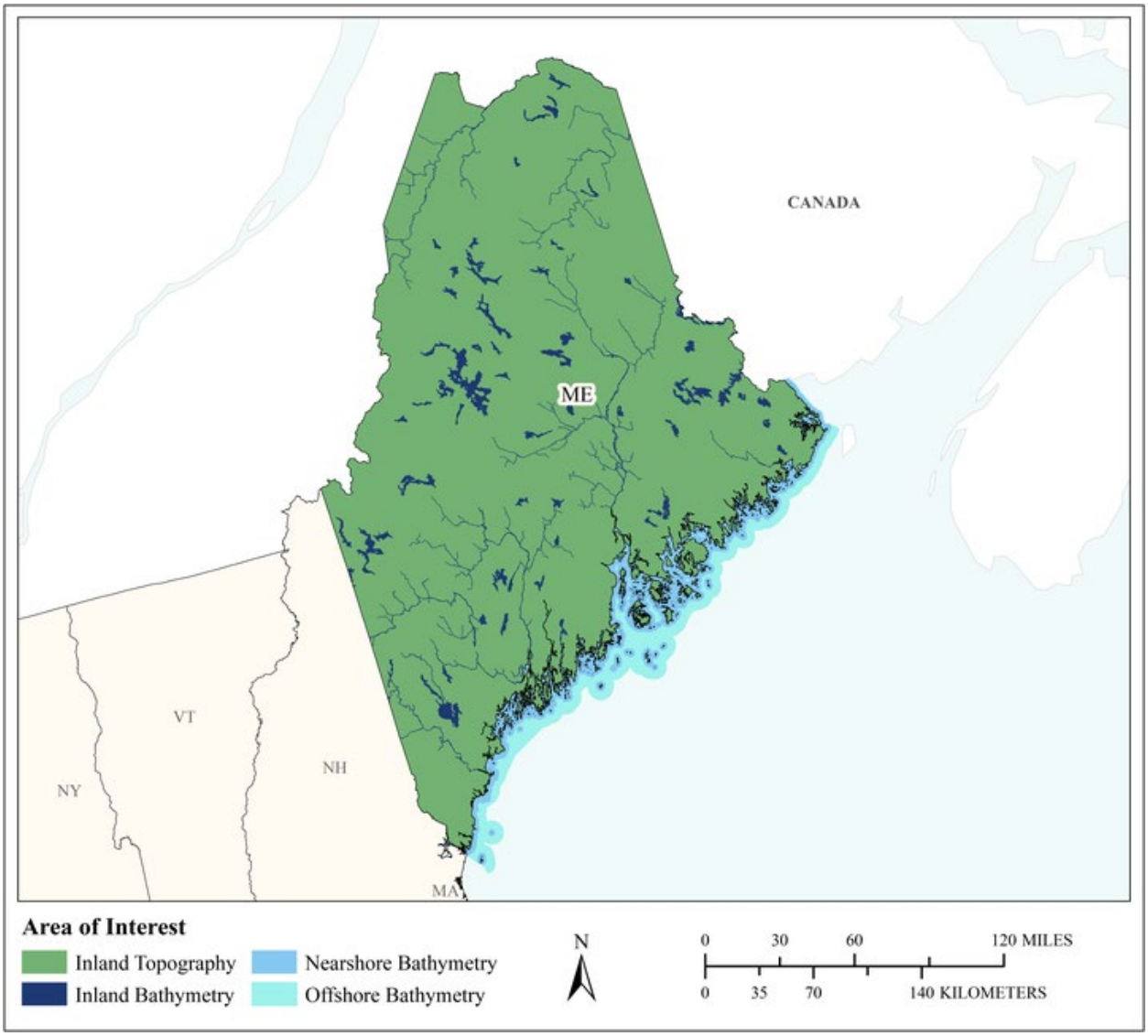
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know			
Improved response or timeliness	I don't know			
Improved customer experience	I don't know			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	I don't know			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Fisheries Management and Aquaculture



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Management of fisheries. Sustainable aquaculture.
MCA Title	Fisheries Management and Aquaculture
MCA ID	60207
Organization Type	State or U.S. Territorial government
Organization Name	State of Maine
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B	QL0B	Special Order
Update Frequency	2-3 years	6-10 years	6-10 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Nice to have	Nice to have	Required	Nice to have
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Required	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Required
DTM	Required	Highly desirable	Highly desirable	Nice to have
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Nice to have	Highly desirable	Nice to have
Classified point cloud	Highly desirable	Nice to have	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Nice to have
Tide Predictions			Not required	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Highly desirable	Required
Ground control/ground truthing	Required	Highly desirable	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Nice to have	Required
Acoustic imagery of the seafloor			Highly desirable	Required
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Required
Underwater videography			Nice to have	Highly desirable
Bottom texture			Nice to have	Required
Bottom type			Highly desirable	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Highly desirable	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Required
Floating observation/navigation systems			Nice to have	Required
Shorelines – current, historic, change rates	Required	Highly desirable	Highly desirable	
Land use/land cover	Required	Highly desirable	Nice to have	Nice to have
Wetlands	Required	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Highly desirable
Inland surface water features	Required	Required	Nice to have	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Not required	
Coastal and riverine structures	Required	Highly desirable	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	Moderate
Cost savings/cost reduction	Major	Moderate	Major	Minor
Cost avoidance	Moderate	Moderate	Minor	Minor
Increased revenues	Moderate	Moderate	Minor	None
Mission-driven performance improvements	Major	Major	Moderate	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Minor	Moderate

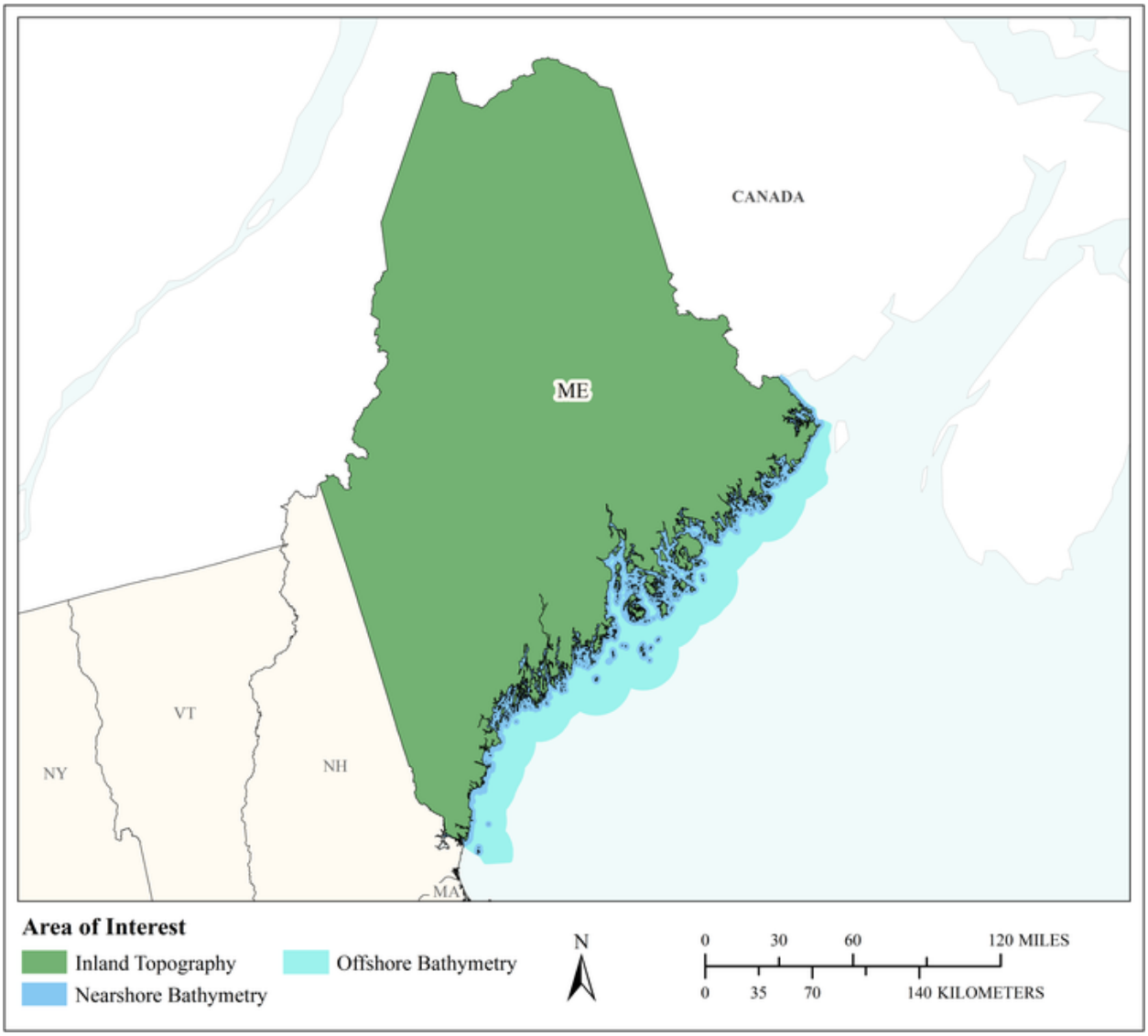
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major	Moderate	Minor
Improved customer experience	Moderate	Major	Minor	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Moderate	Moderate
Environmental	Major	Moderate	Moderate	Minor
Public safety, including life and property	Moderate	Minor	Minor	None

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		None		
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		None		
Increased revenues	Minor	Unable to provide		None			Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$33,128		Annual dollars saved/ realized	$64,846		Annual dollars saved/ realized	$138,756			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$71,957		Annual dollars saved/ realized	$29,514		Annual dollars saved/ realized	$10,190			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Moderate			Moderate		
Environmental	Moderate			Major			Major			Moderate		
Public safety, including life and property	Moderate			Moderate			Minor			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes		Yes	Yes
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic Mapping, Resource Assessment, and Hazard Mitigation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	Required
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Custom description
Sub Area Requirements				8 nautical miles from Maine's State/Federal line

MCA Description	Response
Mission Critical Activity	Geologic mapping, resource assessment, and hazard mitigation. Geologic mapping involves identifying and mapping the distribution of consolidated and unconsolidated geological materials. This is the first step in resource assessment, such as for aggregate and water resources. Hazard mitigation involves identifying landslide-prone geological materials and the characteristics that contribute to landslide failures. The department currently captures nearshore bathymetry using a jet-ski outfitted with high end GPS and a fathometer to identify sand resources within the beach systems; it can get closer to shore than boats.
MCA Title	Geologic Mapping, Resource Assessment, and Hazard Mitigation
MCA ID	1205
Organization Type	State or U.S. Territorial government
Organization Name	Maine Geological Survey
Sub-Agency or Division	
Organization Mission	The Maine Geological Survey provides the people and businesses of Maine with essential geologic information about the land where we live and work. Our experienced geologists collect and summarize information about groundwater, mineral resources, surface deposits and bedrock materials, stability of coastal properties, and natural hazards such as storms, floods, landslides, and earthquakes. The Maine Department of Agriculture, Conservation and Forestry (DACF), the State of Maine's support center for our many land-based, natural resource interests. The Department balances for and develops the state's various land-based, natural-resources including Maine agriculture, forests, outdoor recreation and public-access.
Program Name	Geologic mapping, resource assessment, and hazard mitigation. Geologic mapping involves identifying and mapping the distribution of consolidated and unconsolidated geological materials. This is the first step in resource assessment, such as for aggregate and water resources. Hazard mitigation involves identifying landslide-prone geological materials and the characteristics that contribute to landslide failures.
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 03 - Coastal Zone Management
Tertiary Business Use	BU 15 - Flood Risk Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)

General Geographic Area and Size	
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Fine geographic features as opposed to generalized landscapes. These include corrugated ridge lines that represent exposed fractured bedrock, subtle glacial moraines and raised beaches, finely divided glacial meltwater channels, and similar features.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1		Comparable to quality of jetski mounted fathometer	Order 1b
Update Frequency	4-5 years		2-3 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need		The best horizontal accuracy achievable for the vertical accuracy I need	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm		Less than 10 cm	Less than 1 meter
How far onshore needed			500 meters inland	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MLLW	MLLW
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required		Not required	Not required		Not required
Entire AOI under same environmental conditions	Required		Required	Required		Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Required	Required		Required
DEM for entire AOI needs to be seamless	Required		Required	Required		Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have		Nice to have	Highly desirable
DTM	Required		Nice to have	Highly desirable
DEM	Required		Required	Required
Raw point cloud data	Required		Required	Required
Classified point cloud	Required		Required	
Edited/cube XYZ			Nice to have	Nice to have
Full waveform	Nice to have		Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)			Required	Required

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Nice to have
Tide Predictions			Highly desirable	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Highly desirable		Highly desirable	Nice to have
Ground control/ground truthing	Highly desirable		Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Highly desirable
Nautical and/or navigation charts			Highly desirable	Required
Acoustic imagery of the seafloor			Highly desirable	Nice to have
Aerial and/or satellite imagery	Highly desirable		Highly desirable	Nice to have
Underwater videography			Not required	Nice to have
Bottom texture			Required	Nice to have
Bottom type			Required	Highly desirable
Submerged features			Required	Required
Subbottom characteristics			Not required	Nice to have
Geologic and seismic data	Required		Highly desirable	Highly desirable
Water column properties - Physical			Highly desirable	Highly desirable
Water column properties - Chemical			Not required	Nice to have
Water column properties - Biological			Not required	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Not required	Nice to have
Routes			Not required	Nice to have
Offshore cadastral			Not required	Nice to have
Lease areas			Highly desirable	Nice to have
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Required		Required	
Land use/land cover	Nice to have		Not required	Not required
Wetlands	Highly desirable		Nice to have	Not required
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required		Not required	
Bridges/culverts	Highly desirable			
Landmark features	Not required		Not required	
Cultural resources	Not required		Not required	
Coastal and riverine structures	Nice to have		Nice to have	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Lidar collected over multiple years from 2002 to present at QL2 level.		Use current NOAA bathymetric datasets. Use many datasets acquired by State of Maine programs using multibeam sonar and fathometers.	Currently using NOAA data. Currently using data collected by several State of Maine programs.
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	Yes
NCEI				Yes
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes		Yes	
State repositories used	Maine GeoLibrary - https://www.maine.gov/geolib/index.html		Maine GeoLibrary and internal datasets.	

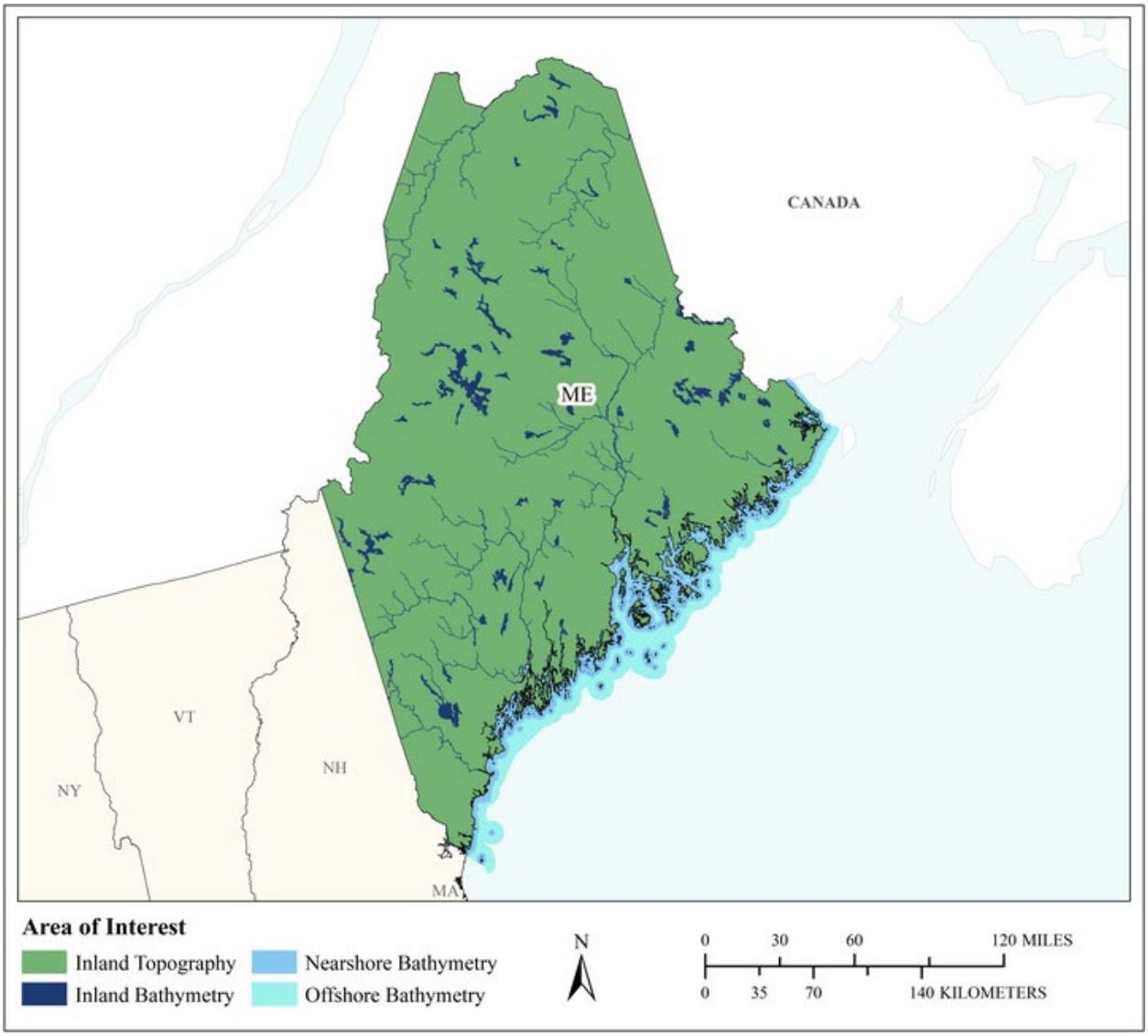
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate		None	Moderate
Cost savings/cost reduction	Minor		None	Moderate
Cost avoidance	Minor		None	Minor
Increased revenues	None		None	None
Mission-driven performance improvements	Major		Moderate	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		Major	Moderate
Improved response or timeliness	Minor		Moderate	Minor
Improved customer experience	Minor		Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major		Major	Major
Environmental	Moderate		Major	Moderate
Public safety, including life and property	None		Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$7,236				Major	Annual dollars saved/realized	$16,281	Major	Annual dollars saved/realized	$4,221
Time savings description	Better pre-planning for field data acquisition. Avoid fieldwork in areas that will not meet program objectives.						Could eliminate coastal nearshore bathymetric data collection if adequate quality 3D bathymetry were available. Improved wave run-up modeling.			Reduced field data acquisition.		
Cost savings/cost reduction	Moderate	Annual dollars saved/realized	$15,000				Major	Annual dollars saved/realized	$20,000	Major	Annual dollars saved/realized	$50,000
Cost savings/cost reduction description	Improved efficiency of field projects.						Savings from avoided field data acquisition.			Reduced data acquisition costs.		
Cost avoidance	None						None			None		
Increased revenues	None						None			None		
Mission-driven performance improvements	Major	Annual percent improvement	5%				Major	Annual percent improvement	8%	Moderate	Unable to provide	
Mission-driven performance improvements description	Improved efficiency of field projects.						Improved decisions regarding coastal hazards. Improved field work effectiveness. Improved acceptance by the public of work products.					
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Major	Unable to provide		Moderate	Unable to provide	
Value added to products or services description							Better modeling of coastal hazards.					
Improved response or timeliness	Moderate	Unable to provide					Major	Annual dollars saved/realized	$603	Moderate	Unable to provide	
Improved response or timeliness description	Improved flood zone delineations, coastal hazard identification. Improved coastal zone management.						Improved assessments of coastal hazards. Improved visualization. Improved coastal hazard identification.					
Improved customer experience	Moderate	Unable to provide					Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience description	Better coastal hazard, flood zone tools.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major						Major			Moderate		
Education or outreach description	Better visualization of geological features						Improved visualization of coastal hazards			Better visualization of offshore features		
Environmental	Moderate						Moderate			Moderate		
Environmental description	Better coastal environment identification						Improved assessments of coastal hazards			Better assessments of coastal hazards		
Public safety, including life and property	None						Major			Moderate		
Public safety, including life and property description							Improved identification of hazard-prone coastal areas.			Better assessments of coastal hazards		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	Yes
Contours	Yes		Yes	Yes
Hillshades				
Slope maps	Yes		Yes	Yes
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Renewable Energy Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Alternate energy development – solar, tidal, wind, wave, and ocean current. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Low head power potential for hydropower.
MCA Title	Renewable Energy Resources
MCA ID	60208
Organization Type	State or U.S. Territorial government
Organization Name	State of Maine
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	I don't know
Rivers and Streams	
Less than 10 ft	I don't know
10 - 50 ft	I don't know
51 - 100 ft	I don't know
101 - 500 ft	I don't know
501 - 2,500 ft	I don't know
Greater than 2,500 ft	I don't know
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	I don't know
½ - 1 acre	I don't know
1.1 – 2 acres	I don't know
2.1 – 5 acres	I don't know

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	I don't know
Greater than 10 acres	I don't know

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	I don't know	I don't know	I don't know
Update Frequency	6-10 years	I don't know	I don't know	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	I don't know	I don't know	I don't know
Acceptable Vertical Error	Up to 20 cm	I don't know	I don't know	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					I don't know	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	I don't know	I don't know	I don't know	I don't know	I don't know
Entire AOI under same environmental conditions	Highly desirable	I don't know	I don't know	I don't know	I don't know	I don't know
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	I don't know	I don't know	I don't know	I don't know	I don't know
DEM for entire AOI needs to be seamless	Highly desirable	I don't know	I don't know	I don't know	I don't know	I don't know
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	I don't know	I don't know	I don't know
DTM	Required	I don't know	I don't know	I don't know
DEM	Required	I don't know	I don't know	I don't know
Raw point cloud data	Highly desirable	I don't know	I don't know	I don't know
Classified point cloud	Highly desirable	I don't know	I don't know	
Edited/cube XYZ		I don't know	I don't know	I don't know
Full waveform	Nice to have	I don't know	I don't know	I don't know
Bathymetric Attributed Grid (BAG)		I don't know	I don't know	I don't know
Breaklines required for standard hydro-flattening	Nice to have	I don't know		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			I don't know	I don't know
Tide Predictions			I don't know	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			I don't know	I don't know
Intensity imagery/sidescan imagery	Not required	I don't know	I don't know	I don't know
Ground control/ground truthing	Highly desirable	I don't know	I don't know	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			I don't know	I don't know
Nautical and/or navigation charts			I don't know	I don't know
Acoustic imagery of the seafloor			I don't know	I don't know
Aerial and/or satellite imagery	Highly desirable	I don't know	I don't know	I don't know
Underwater videography			I don't know	I don't know
Bottom texture			I don't know	I don't know
Bottom type			I don't know	I don't know
Submerged features			I don't know	I don't know
Subbottom characteristics			I don't know	I don't know
Geologic and seismic data	Not required	I don't know	I don't know	I don't know
Water column properties - Physical			I don't know	I don't know
Water column properties - Chemical			I don't know	I don't know
Water column properties - Biological			I don't know	I don't know
Currents			I don't know	I don't know
Tide/wave heights			I don't know	I don't know
Sea ice conditions			I don't know	I don't know
Habitat distribution and classification			I don't know	I don't know
Boundaries			I don't know	I don't know
Routes			I don't know	I don't know
Offshore cadastral			I don't know	I don't know
Lease areas			I don't know	I don't know
Fixed obstructions			I don't know	I don't know
Floating observation/navigation systems			I don't know	I don't know
Shorelines – current, historic, change rates	Nice to have	I don't know	I don't know	
Land use/land cover	Highly desirable	I don't know	I don't know	I don't know
Wetlands	Nice to have	I don't know	I don't know	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			I don't know	I don't know
Inland surface water features	Nice to have	I don't know	I don't know	
Bridges/culverts	Nice to have	I don't know		
Landmark features	Nice to have	I don't know	I don't know	
Cultural resources	Not required	I don't know	I don't know	
Coastal and riverine structures	Nice to have	I don't know	I don't know	
Overhead structures			I don't know	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	I don't know	I don't know	I don't know
Cost savings/cost reduction	Moderate	I don't know	I don't know	I don't know
Cost avoidance	Moderate	I don't know	I don't know	I don't know
Increased revenues	None	I don't know	I don't know	I don't know
Mission-driven performance improvements	Minor	I don't know	I don't know	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	I don't know	I don't know	I don't know

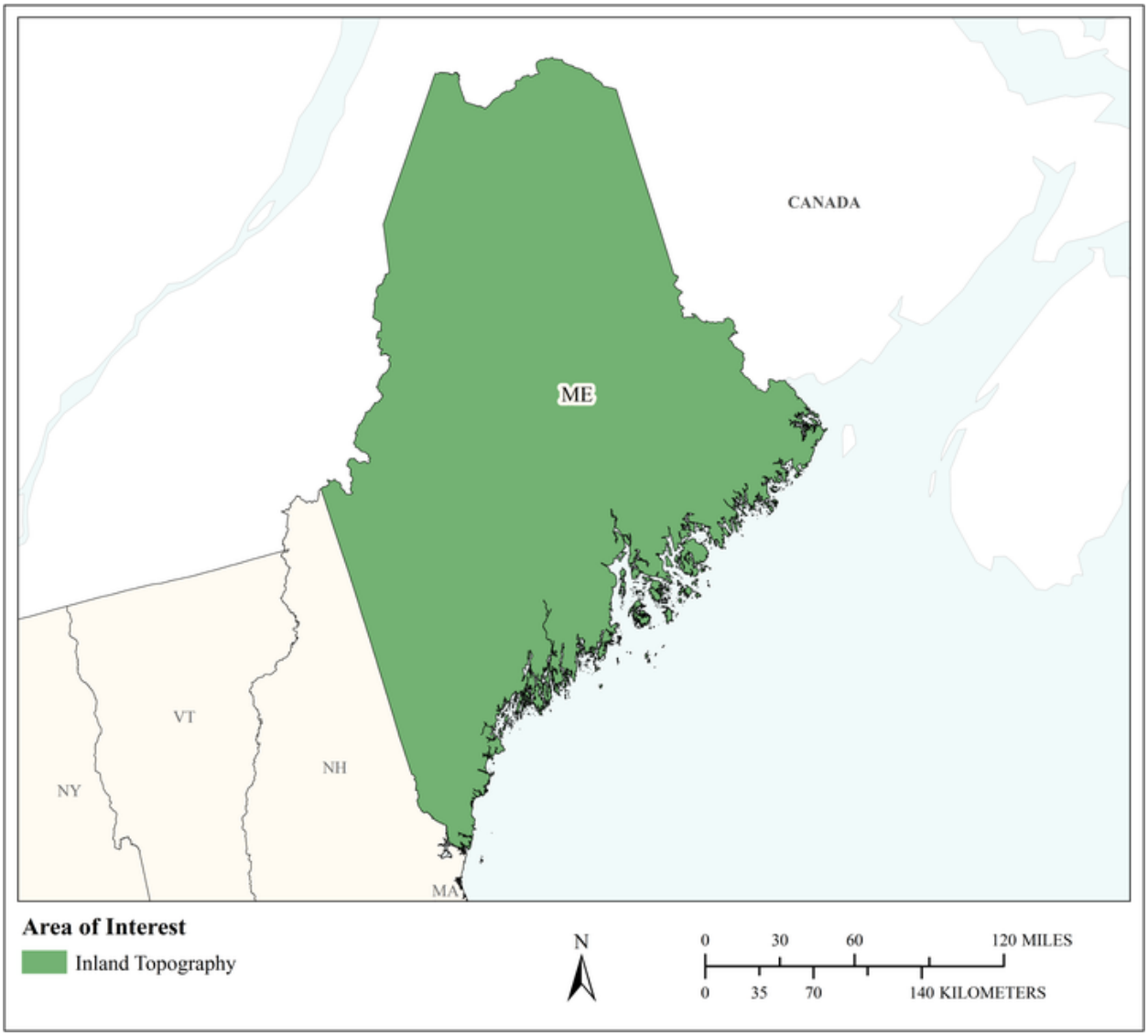
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor	I don't know	I don't know	I don't know
Improved customer experience	Minor	I don't know	I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	I don't know	I don't know	I don't know
Environmental	Minor	I don't know	I don't know	I don't know
Public safety, including life and property	Minor	I don't know	I don't know	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Minor	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			I don't know			I don't know			I don't know		
Environmental	Minor			I don't know			I don't know			I don't know		
Public safety, including life and property	None			I don't know			I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Flood Risk Assessment, Analysis, and Mitigation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Flood Risk Assessment, Analysis, and Mitigation. Elevation data are needed for hazard mitigation planning, use within Hazus, sea level rise mapping, and municipal GIS services for flood risk analysis and mapping.
MCA Title	Flood Risk Assessment, Analysis, and Mitigation
MCA ID	1279
Organization Type	Regional, County, City, or other local government
Organization Name	Statewide County Emergency Management Agencies
Sub-Agency or Division	
Organization Mission	The County Emergency Management Agencies support county emergency response when a disaster or emergency incident extends beyond the normal mutual aid boundaries of the affected community, or several communities. The agency provides guidance, planning models, home study and classroom courses, and workshops on emergency management and related topics to residents, local communities, local EMA personnel and members of area first responder communities. The Director also hosts regular Local EMA Director meetings to keep county municipal directors provided with up to date information. During emergencies, the County Emergency Operations Center is activated to provide coordination and resources support along with a range of other services to assist municipalities. The county EMA manages multi-year preparedness training and exercise programs to help communities, agencies, emergency responders, volunteer teams and other public/private sector partners maintain readiness. EMA maintains the County's All-Hazard Emergency Operations Plan along with other contingency, mitigation and recovery plans. In Maine, county-level EMA Directors can access emergency alerting systems.
Program Name	Emergency Management
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 03 - Coastal Zone Management
Tertiary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Small dam or small harbor fishing pier

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed	Below MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Elevation DEM LiDAR derivative, QL2, 2010 2011 2012 MEGIS statewide LiDAR Areas 2 & 3 (Midcoast Cleanup) 2011 USGS Lidar Northeast (NY to ME)			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes			
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Maine Office of GIS			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know			
Environmental	I don't know			
Public safety, including life and property	Major			

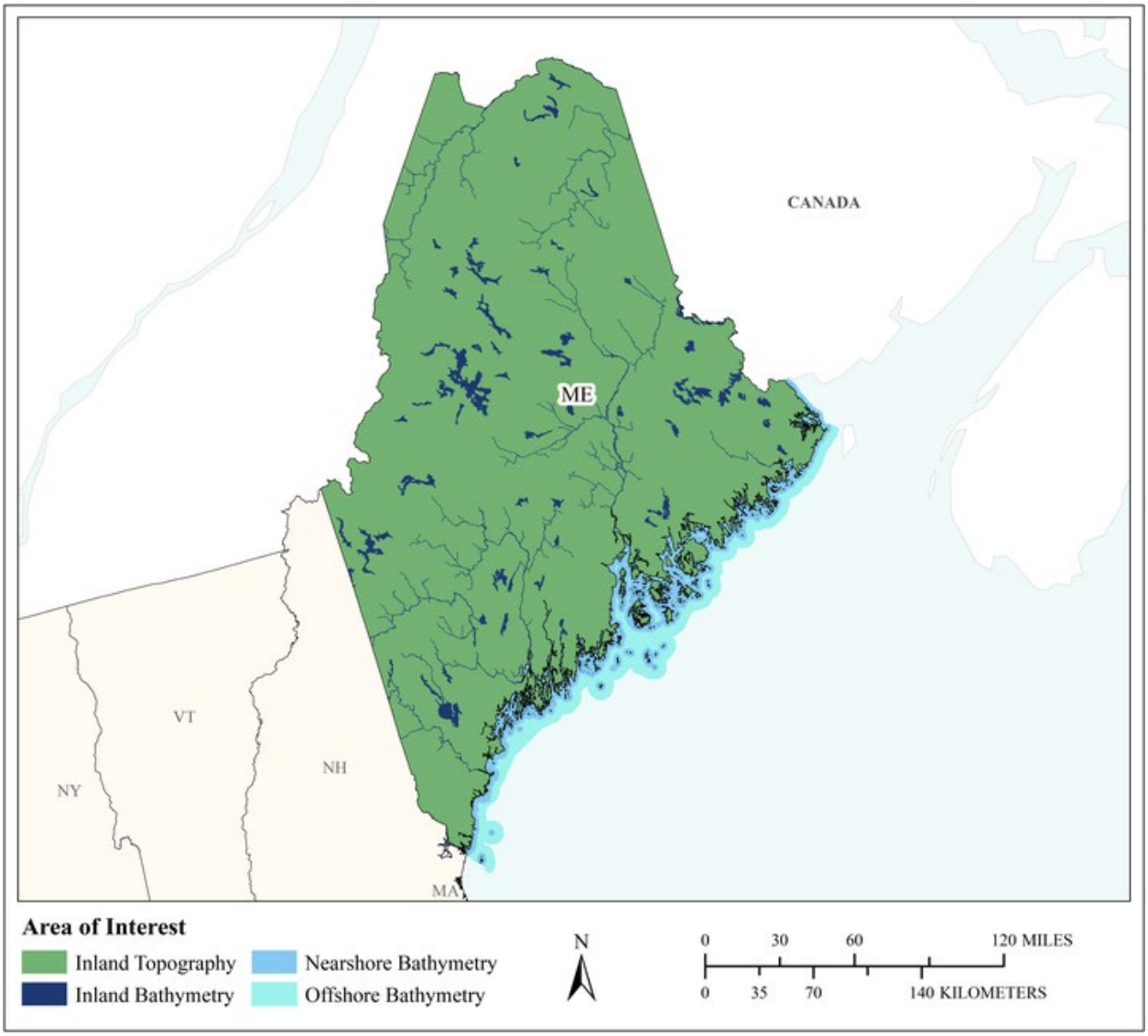
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$260,496									
Time savings description	Maximizes limited resources - 1hr/week (4-5 weeks per month depending) in one county * 20 to scale up to statewide. Increases efficiency of support to towns - 1hr/week (4-5 weeks per month depending) in one county * 20 to scale up to statewide. Expands availability of service- 2hr/week (4-5 weeks per month depending) in one county * 20 to scale up to statewide. Focuses limited resources - 1hr/week (4-5 weeks per month depending) in one county * 20 to scale up to statewide. Increases efficiency of service - 2hr/week (4-5 weeks per month depending) in one county * 20 to scale up to statewide.											
Cost savings/cost reduction	Major	Unable to provide										
Cost savings/cost reduction description	County is not purchasing data at this time.											
Cost avoidance	Major	Unable to provide										
Cost avoidance description	County is not purchasing data at this time.											
Increased revenues	None											
Mission-driven performance improvements	Major	Annual percent improvement	90%									
Mission-driven performance improvements description	Absolute necessity - equalizes availability of resource & service between small towns and larger municipalities.											
Other operational benefits	Major	Annual dollars saved/realized	$28,944									
Other operational benefits description	Mission Critical - 1hr/week (4-5 weeks per month depending) in one county * 20 to scale up to statewide. Access to Quality Data.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$57,888									
Value added to products or services description	Increases quality of service - 2hr/week (4-5 weeks per month depending) in one county * 20 to scale up to statewide.											
Improved response or timeliness	Major	Annual dollars saved/realized	$144,720									

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Improved response or timeliness description	Maximizes limited resources - 1hr/week (4-5 weeks per month depending) in one county * 20 to scale up to statewide. Increases access to service & resources - 1hr/week (4-5 weeks per month depending) in one county * 20 to scale up to statewide. Expands availability of resources - 1hr/week (4-5 weeks per month depending) in one county * 20 to scale up to statewide. Focuses service & preparedness - 1hr/week (4-5 weeks per month depending) in one county * 20 to scale up to statewide. Increases efficacy of support to towns - 1hr/week (4-5 weeks per month depending) - assist towns in one county * 20 to scale up to statewide.											
Improved customer experience	Major	Annual dollars saved/realized	$57,888									
Improved customer experience description	Confidence exists - 1hr/week (4-5 weeks per month depending) in one county * 20 to scale up to statewide. Maximizes service & limited resources - 1hr/week (4-5 weeks per month depending) in one county * 20 to scale up to statewide.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	Major											
Public safety, including life and property description	Essential to provision of these services											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Sea Level Rise and Subsidence



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Modeling and mapping the effects of sea level rise or subsidence. Population and economic vulnerability assessments. Coastal inundation and infrastructure assessment.
MCA Title	Sea Level Rise and Subsidence
MCA ID	60209
Organization Type	State or U.S. Territorial government
Organization Name	State of Maine
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 16 - Sea Level Rise and Subsidence
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL1B	QL2B	Order 2
Update Frequency	4-5 years	4-5 years	2-3 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	Up to 20 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	Up to 2 meters
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Required	Required	Highly desirable	Highly desirable	Required
Entire AOI under same environmental conditions	Highly desirable	Required	Required	Highly desirable	Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Required	Required	Highly desirable	Required
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have	Highly desirable	Highly desirable
DTM	Required	Required	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Highly desirable	Nice to have	Nice to have
Classified point cloud	Required	Nice to have	Highly desirable	
Edited/cube XYZ		Not required	Not required	Not required
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Not required	Not required	Not required
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	Required
Tide Predictions			Required	Required
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Required
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Highly desirable	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Required
Nautical and/or navigation charts			Highly desirable	Required
Acoustic imagery of the seafloor			Nice to have	Not required
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Not required	Not required
Bottom texture			Not required	Not required
Bottom type			Nice to have	Nice to have
Submerged features			Nice to have	Not required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Not required
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Not required
Water column properties - Biological			Not required	Not required
Currents			Nice to have	Nice to have
Tide/wave heights			Required	Required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Required
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Not required	Not required
Lease areas			Not required	Not required
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Required	Required	Highly desirable	Highly desirable
Wetlands	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Required	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes	Yes	Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Major	Major
Cost savings/cost reduction	Major	Major	Major	Major
Cost avoidance	Major	Major	Major	Major
Increased revenues	None	Minor	Minor	None
Mission-driven performance improvements	Major	Major	Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	Major

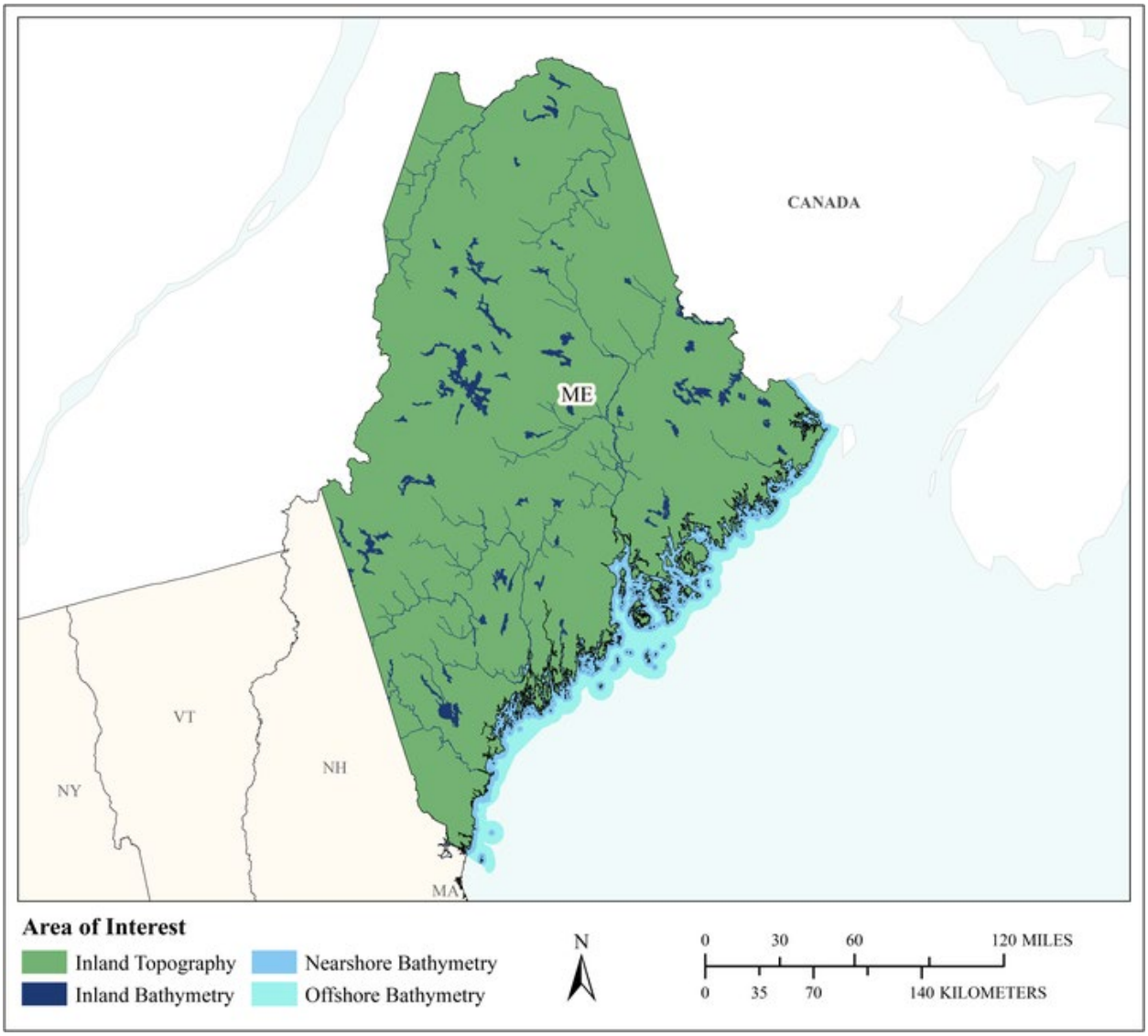
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Minor	Major	Major
Improved customer experience	Moderate	Moderate	Major	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Major	Moderate
Environmental	Moderate	Moderate	Major	Major
Public safety, including life and property	Major	Moderate	Major	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Increased revenues	Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,706,237									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Major			Major		
Environmental	Moderate			Major			Major			Major		
Public safety, including life and property	Moderate			Major			Minor			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		Yes
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Homeland Security, Law Enforcement, Disaster Response, and Emergency Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Infrastructure and border protection. Coastal search and rescue. Population dynamics. Emergency fuel supply and movement. Line of sight analysis in urban areas. Disaster response. Flood risk analysis resulting from acts of terrorism.
MCA Title	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
MCA ID	60210
Organization Type	State or U.S. Territorial government
Organization Name	State of Maine
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B	QL1B	Order 2
Update Frequency	4-5 years	4-5 years	6-10 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 20 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Up to 2 meters
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable	Highly desirable	Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Required	Required
DTM	Required	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Nice to have	Highly desirable	Highly desirable	Required
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Highly desirable	Highly desirable	Highly desirable
Full waveform	Nice to have	Nice to have	Highly desirable	Highly desirable
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Highly desirable
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Nice to have	Highly desirable
Bottom texture			Nice to have	Highly desirable
Bottom type			Nice to have	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Highly desirable	Highly desirable
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Highly desirable	Required
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Nice to have	Nice to have
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Highly desirable	Highly desirable
Routes			Highly desirable	Highly desirable
Offshore cadastral			Nice to have	Highly desirable
Lease areas			Nice to have	Highly desirable
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Required
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	Major
Cost savings/cost reduction	Major	Major	Major	Major
Cost avoidance	Major	Moderate	Moderate	Major
Increased revenues	None	None	None	Major
Mission-driven performance improvements	Major	Moderate	Moderate	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Minor	Major

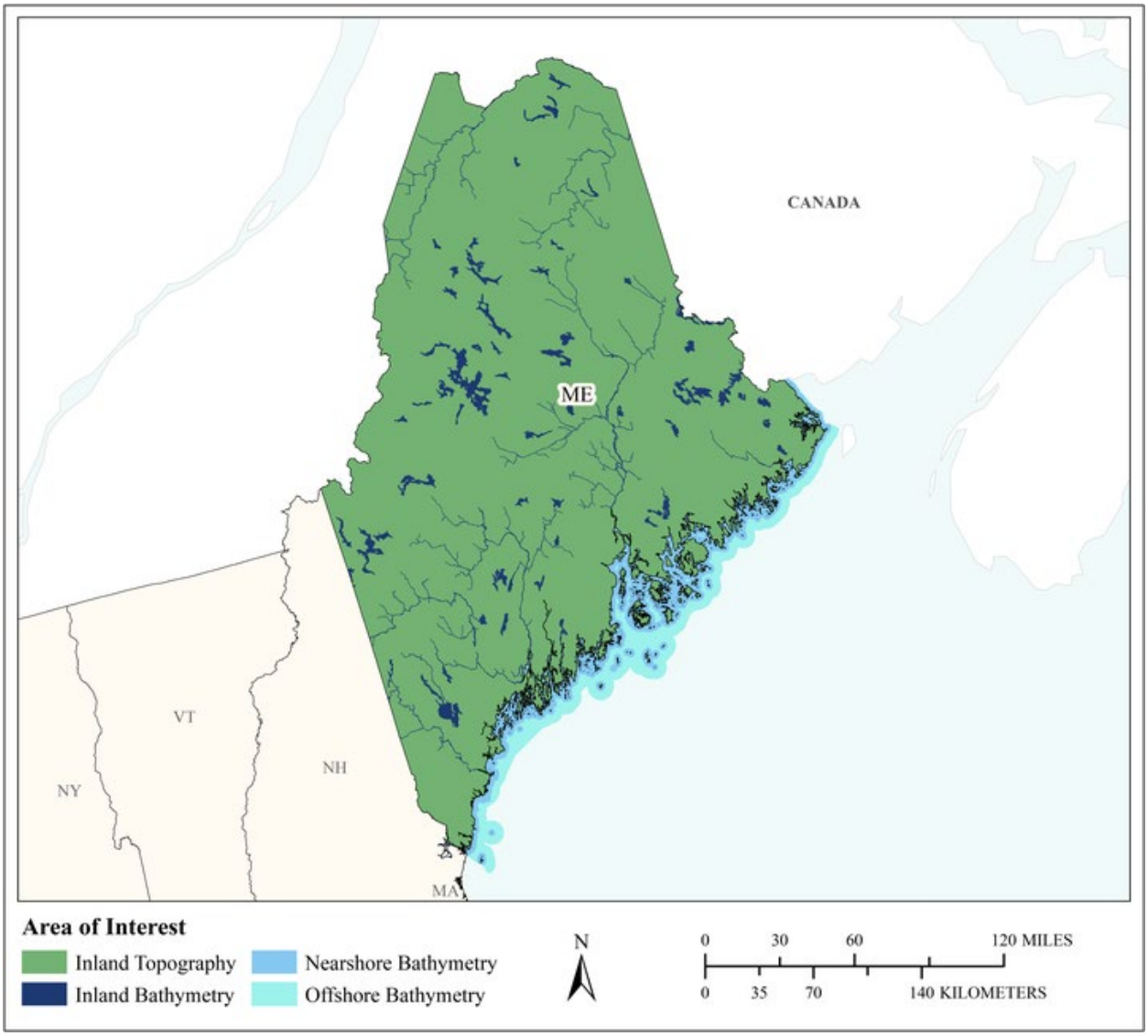
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major	Minor	Major
Improved customer experience	Major	Moderate	Minor	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	Minor	Major
Environmental	Minor	Moderate	Minor	Major
Public safety, including life and property	Major	Major	Moderate	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$956,063		Annual dollars saved/ realized	$269,251		Annual dollars saved/ realized	$8,136			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$16,897		Annual dollars saved/ realized	$17,178		Annual dollars saved/ realized	$233			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate			Major		
Environmental	Moderate			Moderate			Moderate			Major		
Public safety, including life and property	Major			Major			Major			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes		Yes
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Marine and Riverine Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Nautical charting. Bathymetric measurements of nearshore submerged coastal topography. Identification of hazards to navigation. Sediment management at coastal navigation projects. Precision marine navigation. Movement of goods and fishing vessels.
MCA Title	Marine and Riverine Navigation and Safety
MCA ID	60211
Organization Type	State or U.S. Territorial government
Organization Name	State of Maine
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Nice to have
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B	QL0B	I don't know
Update Frequency	2-3 years	2-3 years	2-3 years	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	Up to 2 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have	Nice to have	I don't know	Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Nice to have	Nice to have	I don't know	Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required	I don't know	Required	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required	I don't know	Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Required	I don't know
DTM	Required	Highly desirable	Required	I don't know
DEM	Required	Required	Required	I don't know
Raw point cloud data	Required	Nice to have	Required	I don't know
Classified point cloud	Required	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Highly desirable	I don't know
Full waveform	Not required	Not required	Not required	I don't know
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	I don't know
Breaklines required for standard hydro-flattening	Highly desirable	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	I don't know
Tide Predictions			Required	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	I don't know
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Highly desirable	I don't know
Ground control/ground truthing	Required	Nice to have	Highly desirable	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	I don't know
Nautical and/or navigation charts			Highly desirable	I don't know
Acoustic imagery of the seafloor			Highly desirable	I don't know
Aerial and/or satellite imagery	Required	Required	Highly desirable	I don't know
Underwater videography			Nice to have	I don't know
Bottom texture			Highly desirable	I don't know
Bottom type			Highly desirable	I don't know
Submerged features			Highly desirable	I don't know
Subbottom characteristics			Nice to have	I don't know
Geologic and seismic data	Not required	Not required	Nice to have	I don't know
Water column properties - Physical			Nice to have	I don't know
Water column properties - Chemical			Nice to have	I don't know
Water column properties - Biological			Nice to have	I don't know
Currents			Highly desirable	I don't know
Tide/wave heights			Highly desirable	I don't know
Sea ice conditions			Nice to have	I don't know
Habitat distribution and classification			Highly desirable	I don't know
Boundaries			Nice to have	I don't know
Routes			Required	I don't know
Offshore cadastral			Nice to have	I don't know
Lease areas			Nice to have	I don't know
Fixed obstructions			Required	I don't know
Floating observation/navigation systems			Required	I don't know
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Nice to have	Nice to have	Nice to have	I don't know
Wetlands	Highly desirable	Required	Highly desirable	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	I don't know
Inland surface water features	Highly desirable	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Required	Nice to have	Nice to have	
Cultural resources	Highly desirable	Highly desirable	Nice to have	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts		Yes	Yes	
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	I don't know
Cost savings/cost reduction	Major	I don't know	Minor	I don't know
Cost avoidance	Moderate	Major	Minor	I don't know
Increased revenues	Moderate	None	Minor	I don't know
Mission-driven performance improvements	Moderate	Minor	Minor	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	None	Minor	I don't know

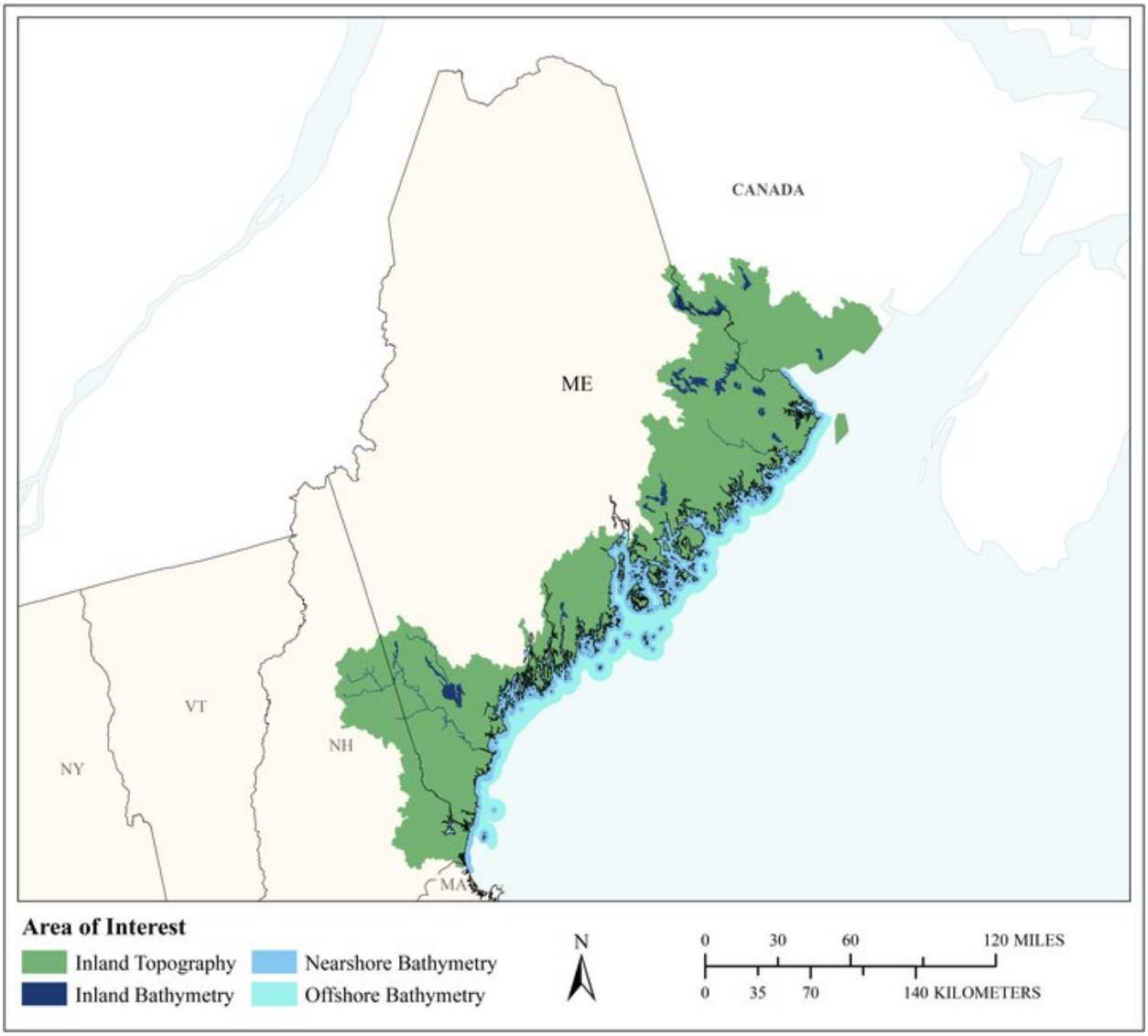
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Minor	None	Minor	I don't know
Improved customer experience	Moderate	None	Minor	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	None	Minor	I don't know
Environmental	Moderate	None	Minor	I don't know
Public safety, including life and property	Major	None	Major	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Increased revenues	None			Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,241,523		Annual dollars saved/ realized	$591,162		Annual dollars saved/ realized	$677,066			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Future annual customer service benefits added during validation					Annual dollars saved/ realized	$77,803		Annual dollars saved/ realized	$22,923			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			Moderate			Minor			I don't know		
Environmental	None			Moderate			Major			I don't know		
Public safety, including life and property	Minor			Moderate			Major			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			
Slope maps				
Aspect maps				
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps				Yes
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				Yes

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Infrastructure Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)	One or more Hydrologic Units (HUC4s)	Nearshore areas along the coast (including the Great Lakes) off one or more Hydrologic Units (HUC4s)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Infrastructure Management - The Maine Port Authority is responsible for a marine terminal that receives oceangoing vessels to import and export freight.
MCA Title	Infrastructure Management
MCA ID	32707
Organization Type	Quasi-Governmental Organization
Organization Name	Maine Port Authority
Sub-Agency or Division	
Organization Mission	It is the mission of the Maine Port Authority to improve the global competitiveness of Maine businesses by developing and operating marine and rail facilities, in a responsible fashion, for the intermodal movement of people and cargo.
Program Name	The Maine Port Authority, per its mission, seeks to increase transportation options available to regional businesses. Managing an intermodal facility supports this program.
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Nice to have
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Not required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Submerged obstacles - whatever might impact the channel approach to our facility and impede our ability to receive vessels.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Nice to have
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	Cross sections and/or transects meet needs	Cross sections and/or transects meet needs	Cross sections and/or transects meet needs	Cross sections and/or transects meet needs
Update Frequency	2-3 years	6-10 years	4-5 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI	Primarily, our interest would be in the Fore River, in particular the channel approach to our facility			
Acceptable Horizontal Error	Up to 2 meters	Up to 5 meters	Up to 5 meters	I don't know
Acceptable Vertical Error	Up to 1 meter	Up to 1 meter	Up to 1 meter	I don't know
How far onshore needed			1 kilometer inland	
How far down the beach profile needed	To MLLW		To MLLW	
Tide correction requirement			MLLW	
Cross sections and/or transects meet needs	Yes	Yes	Yes	Yes
Cross section/transect requirement		Our interest is primarily in the bathymetric data regarding the channel approach to our facility	We are primarily interested in the integrity of the channel approach to our facility.	

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Not required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required	Not required	Highly desirable	Not required	Not required
Entire AOI under same environmental conditions	Not required	Not required	Not required	Highly desirable	Not required	Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Not required	Not required	Not required	Nice to have	Not required	Not required
DEM for entire AOI needs to be seamless	Not required	Not required	Not required	Nice to have	Not required	Not required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Highly desirable	Highly desirable	Highly desirable
DTM	Not required	Not required	Not required	Highly desirable
DEM	Highly desirable	Highly desirable	Highly desirable	Required
Raw point cloud data	Not required	Not required	Not required	Highly desirable
Classified point cloud	Not required	Not required	Not required	
Edited/cube XYZ		Not required	Not required	Nice to have
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	Nice to have
Breaklines required for standard hydro-flattening	Not required	Not required		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Not required	Nice to have
Tide Predictions			Not required	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Nice to have
Intensity imagery/sidescan imagery	Not required	Not required	Not required	Nice to have
Ground control/ground truthing	Not required	Not required	Not required	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Not required	Highly desirable
Nautical and/or navigation charts			Highly desirable	Nice to have
Acoustic imagery of the seafloor			Not required	Nice to have
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Highly desirable	Nice to have
Underwater videography			Not required	Nice to have
Bottom texture			Not required	Nice to have
Bottom type			Not required	Nice to have
Submerged features			Highly desirable	Nice to have
Subbottom characteristics			Not required	Nice to have
Geologic and seismic data	Not required	Not required	Not required	Highly desirable
Water column properties - Physical			Not required	Highly desirable
Water column properties - Chemical			Not required	Highly desirable
Water column properties - Biological			Not required	Highly desirable
Currents			Nice to have	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Nice to have	Nice to have
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Highly desirable	Nice to have
Offshore cadastral			Not required	Nice to have
Lease areas			Not required	Nice to have
Fixed obstructions			Highly desirable	Nice to have
Floating observation/navigation systems			Highly desirable	Nice to have
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Not required	Not required	Not required	Highly desirable
Wetlands	Not required	Not required	Not required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Not required	Required
Inland surface water features	Not required	Nice to have	Not required	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Not required	Not required	Not required	
Cultural resources	Not required	Not required	Not required	
Coastal and riverine structures	Nice to have	Nice to have	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We use NOAA data for depth of the channel approach, and Google Earth for shoreside mapping	We are using NOAA charts for shoreline bathymetric data	NOAA Charts	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts		Yes	Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	Google Earth			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	I don't know	Minor	Moderate
Cost savings/cost reduction	Minor	I don't know	Minor	Moderate

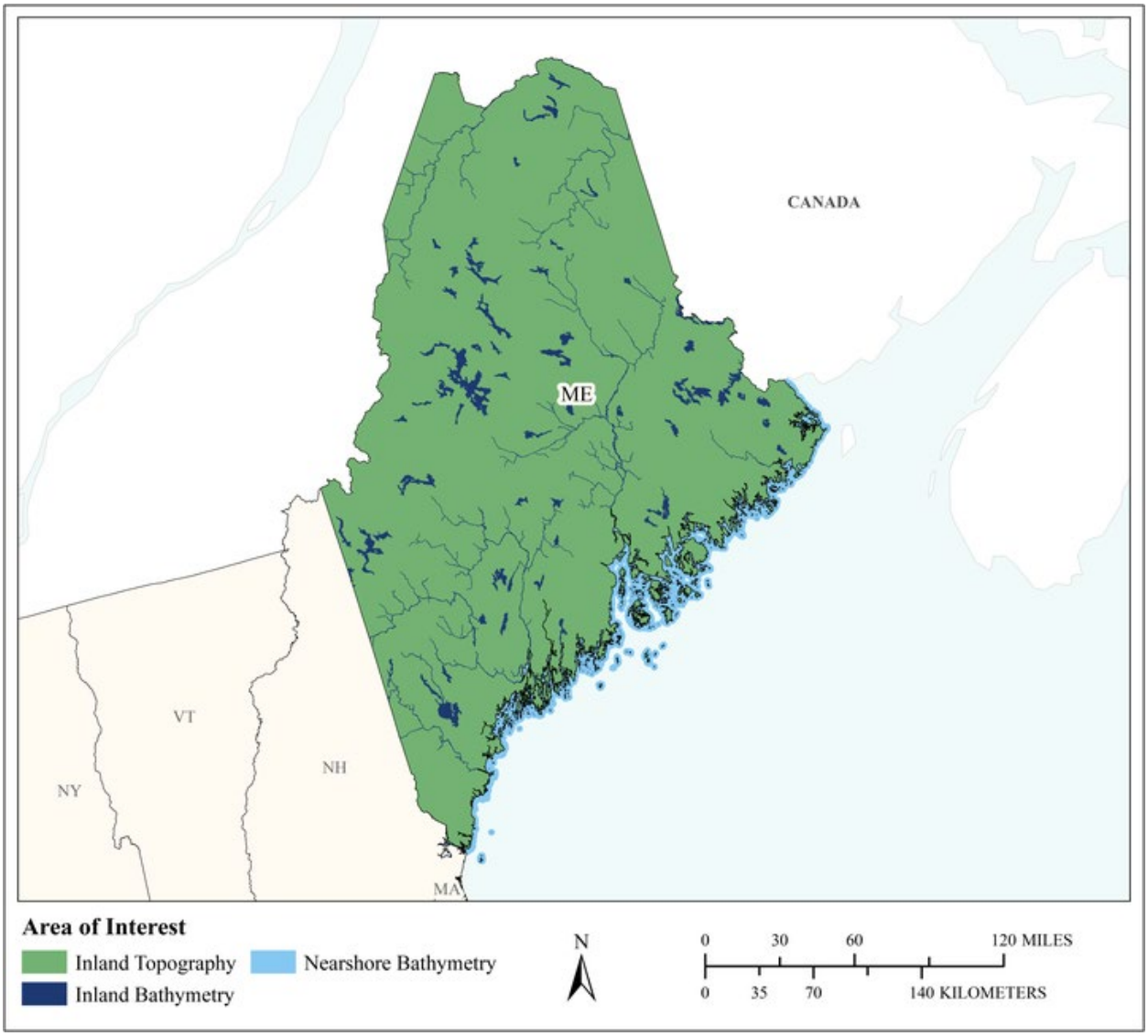
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost avoidance	I don't know	I don't know	Minor	Moderate
Increased revenues	I don't know	I don't know	I don't know	Moderate
Mission-driven performance improvements	Moderate	I don't know	Minor	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	I don't know	I don't know	Moderate
Improved response or timeliness	Minor	I don't know	I don't know	Moderate
Improved customer experience	I don't know	I don't know	I don't know	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	I don't know	I don't know	Moderate
Environmental	I don't know	I don't know	I don't know	Moderate
Public safety, including life and property	I don't know	I don't know	I don't know	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	I don't know	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide	
Cost avoidance	I don't know	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide	
Increased revenues	Moderate	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide		None		
Mission-driven performance improvements	Moderate	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide	
Other operational benefits	Moderate	Annual dollars saved/realized	$3,015									
Other operational benefits description	Streamlined operational planning. Accurate modeling will allow us to streamline our use of laydown area for cargo operations while preserving travel lanes and other operational requirements.											
Future annual operational benefits added during validation		Annual dollars saved/ realized	$347,086		Annual dollars saved/ realized	$118,949		Annual dollars saved/ realized	$17,775			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Minor	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide	
Improved customer experience	I don't know	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,038,968		Annual dollars saved/ realized	$12,351		Annual dollars saved/ realized	$2,443			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know			I don't know			Minor		
Environmental	I don't know			I don't know			I don't know			Major		
Public safety, including life and property	None			I don't know			I don't know			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Urban and Regional Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Land development and zoning. Municipal mapping of building footprints and elevations. Port resilience planning. Parks and transportation planning. Virtual city creation. Urban ecology planning.
MCA Title	Urban and Regional Planning
MCA ID	60212
Organization Type	State or U.S. Territorial government
Organization Name	State of Maine
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL2B	
Update Frequency	4-5 years	6-10 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Required	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Required	Nice to have	Highly desirable	
Classified point cloud	Required	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Required	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Nice to have	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Minor	
Cost savings/cost reduction	Major	Minor	Minor	
Cost avoidance	Major	Minor	Minor	
Increased revenues	Minor	Minor	None	
Mission-driven performance improvements	Major	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Minor	

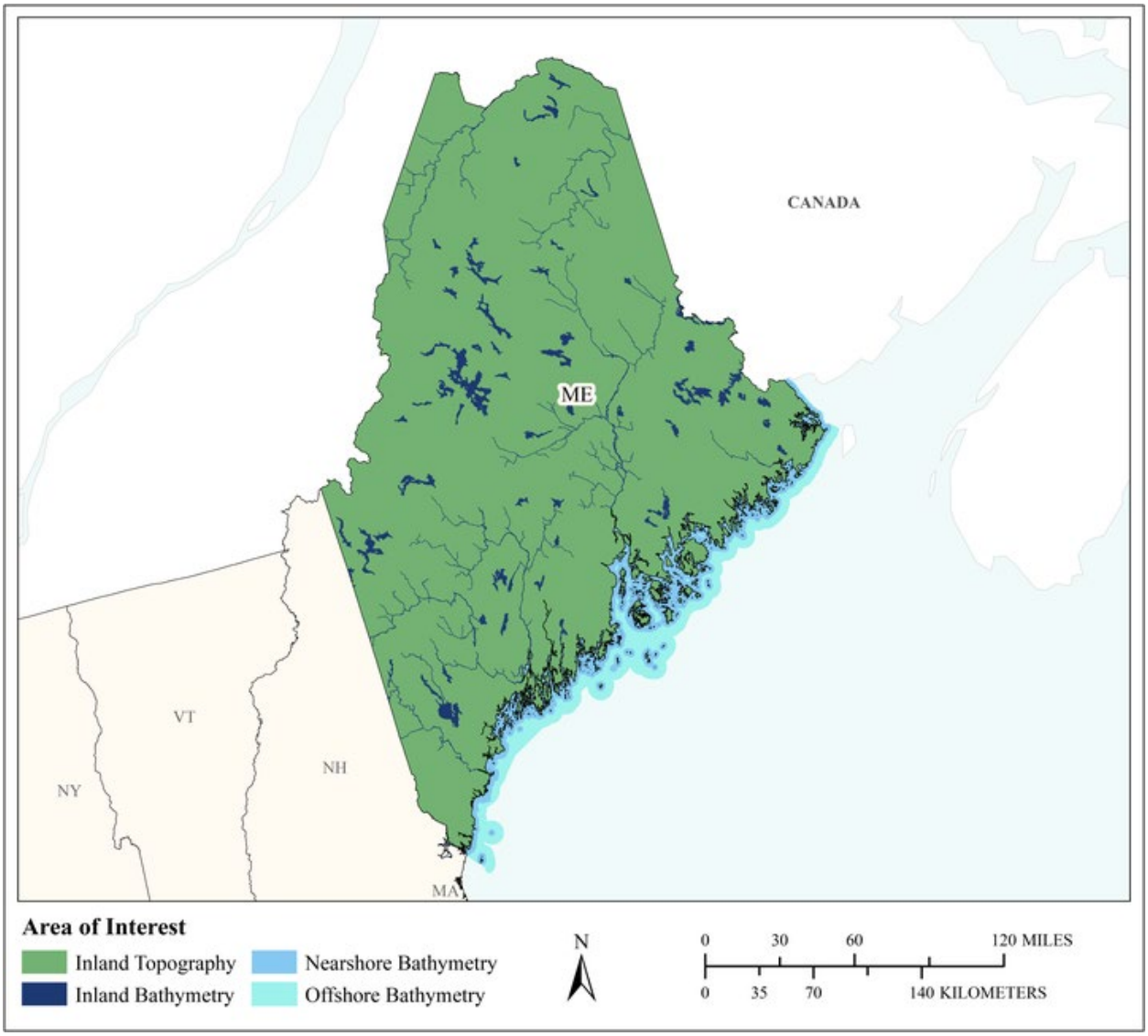
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	Minor	
Improved customer experience	Major	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	
Environmental	Major	Minor	Minor	
Public safety, including life and property	Major	Minor	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$8,719,930		Annual dollars saved/ realized	$355,147		Annual dollars saved/ realized	$161,656			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,006,719		Annual dollars saved/ realized	$449,292		Annual dollars saved/ realized	$170,541			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate					
Environmental	Major			Moderate			Moderate					
Public safety, including life and property	Major			Major			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	
Hillshades	Yes		Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Maritime and Land Boundary Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Delimitation of legal and other coastal boundaries, inland boundaries, and ordinary high water lines (OHWL).
MCA Title	Maritime and Land Boundary Management
MCA ID	60213
Organization Type	State or U.S. Territorial government
Organization Name	State of Maine
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 30 - Maritime and Land Boundary Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B	QL0B	I don't know
Update Frequency	6-10 years	6-10 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Highly desirable	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Nice to have	Nice to have	Highly desirable	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable	Highly desirable	Required	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable	Highly desirable	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	Required
DTM	Required	Required	Required	Required
DEM	Highly desirable	Required	Required	Required
Raw point cloud data	Nice to have	Highly desirable	Required	Required
Classified point cloud	Highly desirable	Highly desirable	Required	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Not required	Nice to have
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Not required
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Nice to have	Required	Not required	Not required
Ground control/ground truthing	Highly desirable	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Required	Highly desirable	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Nice to have
Water column properties - Biological			Not required	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Highly desirable	Nice to have
Routes			Nice to have	Highly desirable
Offshore cadastral			Highly desirable	Nice to have
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Required	Required
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Nice to have
Wetlands	Required	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Highly desirable	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Minor	None	I don't know
Cost savings/cost reduction	Moderate	None	Minor	Moderate
Cost avoidance	Moderate	None	Minor	Moderate
Increased revenues	Minor	None	None	I don't know
Mission-driven performance improvements	Major	None	Moderate	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None	None	I don't know

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	None	Minor	Moderate
Improved customer experience	Major	None	Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	Moderate
Environmental	Major	Minor	Minor	Moderate
Public safety, including life and property	Moderate	None	Minor	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	Minor	Unable to provide		None			None			I don't know	Unable to provide	
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$36,468		Annual dollars saved/ realized	$27,368		Annual dollars saved/ realized	$202,887			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$139,821									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Moderate			Moderate		
Environmental	Minor			Major			Major			Major		
Public safety, including life and property	None			Moderate			Moderate			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps		Yes		
Cross sections		Yes		
Height-Above-Ground maps		Yes		
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

Maryland

Maryland's most prominent geographic feature, the Chesapeake Bay, provides a wealth of history, recreation activities, attendant infrastructure, transportation, and natural resources. Therefore, it follows that coastal zones and tidal watersheds figure prominently into the state's elevation primary Business Use (BU) cases and Mission Critical Activities (MCAs). For each of the 18 listed primary BU cases, the MCAs enumerate a coastal component or their spatial distribution encompasses coastal or related features for which elevation data are used. In a further aggregation of BU cases, Maryland has three broad areas of elevation data needed for regular state agency use: Natural and Cultural Resource Assessment and Management; Hazard Assessment and Mitigation Planning; and Infrastructure Monitoring and Regional and Urban Planning.

Rising sea level poses a threat for each of the BU cases in terms of changing habitat for plants and animals, and increased risk to infrastructure, population centers and the economy (e.g. farming) especially for considerable parts of low elevation areas on the eastern shore of the Chesapeake Bay. Elevation data assists in planning to maintain economic viability for sea and bayside resort communities, dock and mooring infrastructure for commercial fishing, inundation modeling for hurricane evacuation, and bridges and commercial shipping infrastructure. All the mentioned BU cases listed will depend on quality elevation data and the trends established from change detection. Enhanced risk from sea level rise for federal facilities is of concern, such as the U.S. Naval Academy, Patuxent Naval Air Station, and Blackwater National Wildlife Refuge. Maryland requires Quality Level 1 (QL1) inland topography, QL1B inland and nearshore bathymetry, and Order 1a offshore bathymetry all updated every 4-5 years.

Maryland at present has statewide lidar coverage, which varies in age and quality level. The state initiated lidar coverage in 2003-2008 for the eastern shore counties. Subsequently a significant portion of the state has been acquired by federal agency initiatives such as the 2014 Hurricane Sandy Supplemental acquisition and the Federal Emergency Management Agency (FEMA) 2012 acquisition. Maryland State agencies are not presently funded for large regional or statewide data acquisitions such as lidar or orthoimagery. The mechanism in place successfully employed for orthoimagery acquisition is to request funding from the E-911 Board by a County sponsor, and the state contract is used to acquire spatial data. To date no lidar acquisition has been funded in this manner. The explanation from the E-911 Board is that orthoimagery has a direct positive benefit for the E-911 call centers, and as yet a similar benefit for lidar acquisition has not been accepted by the E-911 Board. Several counties have funded their own data collection through the state contract, including Anne Arundel and Calvert in 2017 at QL1 specifications. Cecil and Queen Anne's counties funded collection of lidar in 2012 at QL3, and Harford County using those same specifications in 2013 was acquired via the state contract. The Maryland National Capital Parks and Planning Commission funded and contracted for QL2 lidar in 2018 for Montgomery and Prince George's counties using their own funding and the state contract, and they coordinated with the Maryland State Geographic Information Committee's Elevation Work Group.

Maryland has not submitted data for inclusion into the 3D Elevation Program holdings as the requirements and data to be assembled for analysis is a considerable task for the small staff of a county GIS department, and in the past the wait for acceptance notification has been considerable with no measurable benefit to the county. The state has posted lidar from all sources on its imap.maryland.gov elevation portal which provides access via download and REST services to countywide DEMs and the following DEM derivative products: slope, aspect, hillshade, and shaded relief. MD iMAP also provides options to download point cloud data in bulk or by smaller area of interest. Additionally, MD iMAP provides access to metadata, tutorials (pdf and video), and acquisition status maps.

Future acquisitions are funded for Worcester, Wicomico, and Somerset counties on the lower eastern shore thanks to the USDA-Natural Resources Conservation Service. Queen Anne's and Harford counties

will be funded by the USGS Core Science Systems in support of USGS Chesapeake Bay science activity. These acquisitions will be tide-coordinated, whereas all previous lidar collections in Maryland were not tide-coordinated. Recent coordination by the Maryland Geological Survey with the NOAA Remote Sensing Division has resulted in greatly expanded nearshore topo/bathymetric lidar in the Chesapeake Bay.

Prognosis for the State of Maryland participation in the 3DEP Broad Agency Announcement proposal process is not promising as a result of the in-place funding mechanism for large data acquisitions. The Maryland geospatial data coordinating body, the Maryland State Geographic Information Committee (MSGIC), formed an Elevation Work Group in 2017 that is coordinating acquisition as best it can but is limited by participation from not all county jurisdictions. The Elevation Work Group has promoted the 3DEP lidar standards so that the state contract will follow 3DEP base specifications and guidance should individual counties decide to pursue acquisition. The Elevation Work Group has proposed to the State Geographic Information Officer an Elevation Data Return-on-Investment (ROI) study for Maryland elevation data which all agree makes sense. As yet funding has not been identified to conduct such a study. A completed Elevation ROI report would be presented to the E911 Board and legislators in order to identify a funding source for periodic lidar acquisition. Paired with the 3D Nation survey data and assessments, a strong case for state elevation data funding can be assembled.

The State of Maryland has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

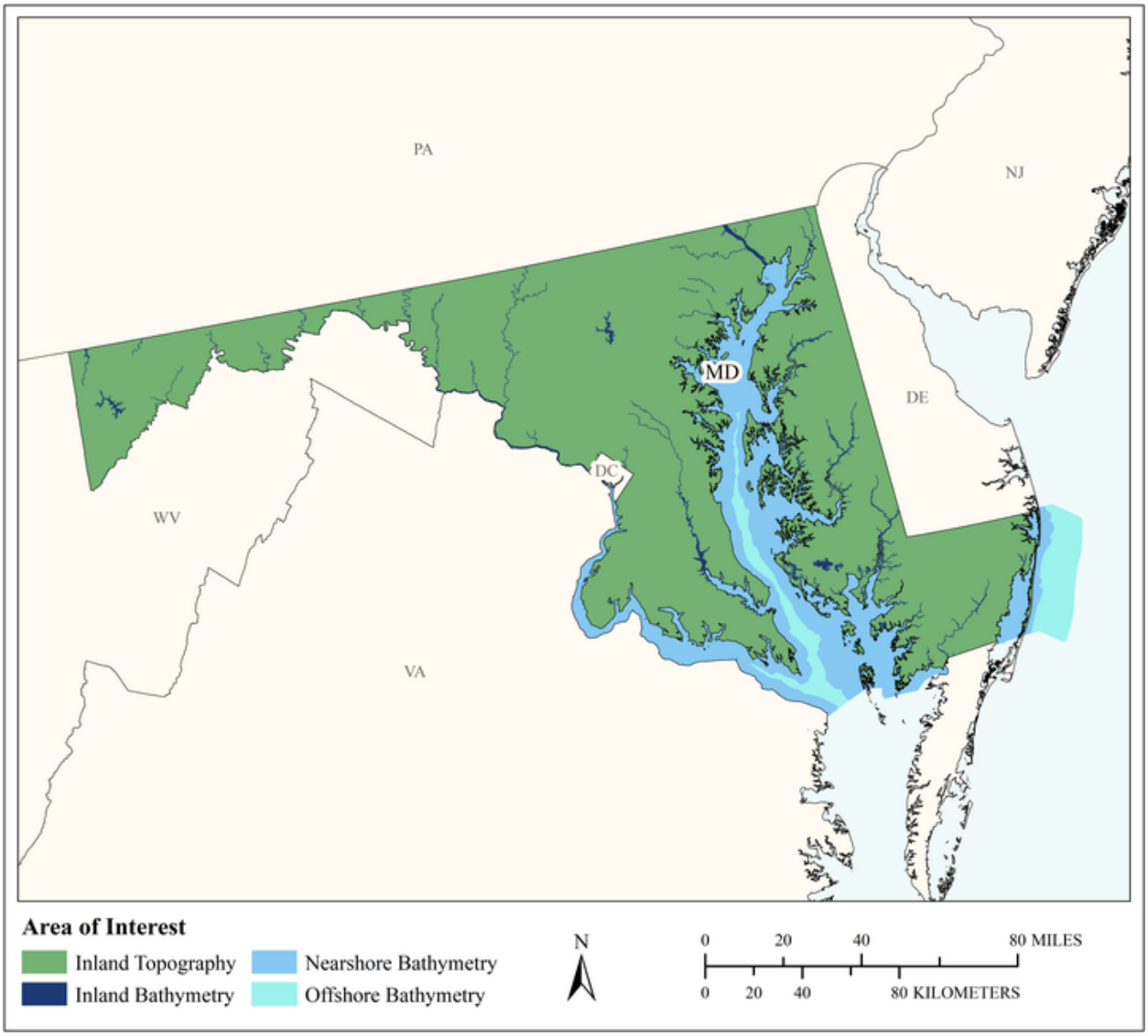
MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 03 – Coastal Zone Management	Maryland Department of Natural Resources	1388	Maintain Sustainable Populations of Living Resources and Aquatic Habitat	Inland Topo	QL1	4-5 years	$510,444	$89,473	Major	Major	Major
				Inland Bathy	QL1B	4-5 years	$219,434	$128,420	Minor	Major	Major
				Nearshore Bathy	QL1B	2-3 years	$54,993	$66,923	Minor	Major	Major
				Offshore Bathy	Order 1b	4-5 years	$38,208	$11,577	Minor	Major	Major
BU 06 – Natural Resource Management	State of Maryland	60214	Natural Resources Conservation	Inland Topo	QL1 HD	4-5 years	$387,814	$1,424,172	Major	Major	Major
				Inland Bathy	Better than options	6-10 years	$52,563	$2,366	Major	Major	Major
				Nearshore Bathy	More accurate than options provided	6-10 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate
BU 07 – Wildlife and Habitat Management	State of Maryland	60215	Wildlife and Habitat Management	Inland Topo	QL2	4-5 years	$2,355	$6,802	Moderate	Major	Moderate
				Nearshore Bathy	QL0B	4-5 years	$173	$10	Moderate	Major	Moderate
BU 08 – Agriculture	State of Maryland	60216	Agriculture and Precision Farming	Inland Topo	QL2	2-3 years	$11,447	$9,075	Major	Major	Minor
BU 09 – Fisheries Management and Aquaculture	State of Maryland	60217	Fisheries Management and Aquaculture	Nearshore Bathy	QL0B	6-10 years	$27,600	$2,027	Moderate	Major	Minor
BU 10 – Geologic Assessment	Maryland Geological Survey	1198	Geologic Mapping and Analysis	Inland Topo	QL2	>10 years	$70,300	$3,015	Moderate	Moderate	Moderate

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 10 – Geologic Assessment	Maryland Geological Survey	22160	Sediment Studies	Inland Bathy	QL0B	4-5 years	$21,105	Unable to quantify	Moderate	Moderate	Major
				Nearshore Bathy	I do not need any of the QLs listed. We need vertical accuracies of 1-2cm throughout the beach profile and down to -18 feet.	4-5 years	$3,015	Unable to quantify	I don't know	I don't know	I don't know
				Offshore Bathy	I do not need any of the QLs listed. We need vertical accuracies of 1-2 cm throughout the beach profile and down to -18 feet.	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 14 – Cultural Resource Management	Maryland Department of Planning	21633	Cultural Resources Management and Preservation	Inland Topo	QL1 HD	4-5 years	Unable to quantify	Unable to quantify	Minor	None	None
				Inland Bathy	QL0B	4-5 years	$6,633 to $6,874	Unable to quantify	I don't know	None	None
				Nearshore Bathy	QL0B	4-5 years	$6,633 to $6,874	Unable to quantify	Minor	Moderate	None
				Offshore Bathy	Order 1a	4-5 years	$1,206	Unable to quantify	Minor	Moderate	None
BU 15 – Flood Risk Management	MD Dept. of the Environment	1397	Statewide Environmental Management	Inland Topo	QL1 HD	2-3 years	$462,751	$80,967	Major	Major	Major
				Inland Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL1B	2-3 years	$11,088	$8,217	Major	Major	Major
				Offshore Bathy	Cross sections meet needs		Unable to quantify	Unable to quantify	Major	Major	Major
BU 15 – Flood Risk Management	Eastern Shore Regional GIS Cooperative at Salisbury University	21576	Hazard Modeling and Mapping	Inland Topo	QL2	2-3 years	$462,875	$80,967	Moderate	None	Major
				Inland Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	Moderate
				Nearshore Bathy	QL2B	2-3 years	$11,088	$8,217	Minor	I don't know	Minor
				Offshore Bathy	Order 3	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 15 – Flood Risk Management	Maryland Emergency Management	22422	Statewide Emergency Management	Inland Topo	QL2	4-5 years	$462,751	$80,967	I don't know	I don't know	I don't know
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	QL1B	Event driven	$11,088	$8,217	I don't know	I don't know	I don't know
BU 16 – Sea Level Rise and Subsidence	Maryland DOT State Highway Administration	21676	Multi-Modal Transportation Asset Management	Inland Topo	QL1 HD	2-3 years	$291,681	$5,155	Major	Major	Major
				Inland Bathy	QL1B	2-3 years	$82,144	$5,240	Major	Major	Major
				Nearshore Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Offshore Bathy	(a) Order 1a (b) Order 1	(a) 6 months (b) 2-3 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 17 – Wildfire Management	State of Maryland	60218	Wildfire Management, Planning, and Response	Inland Topo	QL1	4-5 years	$53,123	Unable to quantify	Major	Major	Major
BU 18 – Homeland Security	Maryland Department of Information Technology	11478	Statewide Geospatial Services	Inland Topo	QL2	2-3 years	Unable to quantify	Unable to quantify	Minor	Moderate	Major
				Inland Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	Minor	Major	Major
				Nearshore Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
BU 19 – Land Navigation	State of Maryland	60219	Land Navigation and Safety	Inland Topo	QL0	2-3 years	$128,085	$10,343	Minor	Major	Major
BU 21 – Aviation Navigation	State of Maryland	60220	Aviation Navigation and Safety	Inland Topo	QL1 HD	Annually	$33,424	$41,629	Minor	Moderate	Moderate
BU 22 – Infrastructure Management	State of Maryland	60221	Infrastructure and Construction Management	Inland Topo	QL0 HD	4-5 years	$444,339	$1,307,601	Minor	Moderate	Major
				Inland Bathy	QL0B	4-5 years	$149,705	$15,545	Minor	Moderate	Moderate
				Nearshore Bathy	QL1B	4-5 years	$3,671	$504	Minor	Moderate	Major
BU 23 – Urban and Regional Planning	Talbot County Public Works	1113	Talbot County Government	Inland Topo	QL1	6-10 years	$396,215	$711,807	Moderate	Moderate	Moderate
				Inland Bathy	QL2B	6-10 years	$392,981	$414,125	Moderate	Moderate	Moderate
				Nearshore Bathy	QL2B	>10 years	$392,981	$414,125	Moderate	Moderate	Moderate
BU 23 – Urban and Regional Planning	Maryland Department of Planning	1263	Land Use Planning and Analysis	Inland Topo	QL2	4-5 years	$2,660,327	$307,136	I don't know	I don't know	I don't know
				Inland Bathy	QL2B	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	QL2B	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 23 – Urban and Regional Planning	Washington County Maryland Government	11480	Mapping and GIS Support of Elevation Dependent County Government Activities	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Inland Bathy	Cross sections and/or transects meet needs	Event driven	Unable to quantify	Unable to quantify	Major	Major	Major
BU 23 – Urban and Regional Planning	Maryland National Capital Planning Commission (MNCPPC)	21525	Development Review, Floodplain Management, Property Mapping, and Parks Planning and Management	Inland Topo	QL2	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 25 – Real Estate, Banking, and Insurance	State of Maryland	60222	Real Estate, Banking, Mortgage, and Insurance	Inland Topo	QL1 HD	4-5 years	$343,543	Unable to quantify	Minor	Minor	Major
BU 26 – Education and Basic Research	State of Maryland	60223	Education K12 and Beyond, Basic Research	Inland Topo	QL1 HD	2-3 years	$51,959	$124,198	Major	Major	Major
				Inland Bathy	QL1B	4-5 years	$13,588	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL2B	4-5 years	$1,152	$45	Major	Major	Minor
BU 28 – Telecom-munications	State of Maryland	60224	Telecommunications	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

MCA Title: Maintain Sustainable Populations of Living Resources and Aquatic Habitat



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Custom description
Sub Area Requirements				10 miles off Maryland

MCA Description	Response
Mission Critical Activity	Maintain Sustainable Populations of Living Resources and Aquatic Habitat. Elevation data are needed for fisheries management, habitat analysis, flood assessment, shoreline stabilization, management of oyster leases and bottom habitat, recreational and commercial boating, siting for BMPs, and dredging sand to protect shorelines. An additional Business Use is BU 27 – Recreation.
MCA Title	Maintain Sustainable Populations of Living Resources and Aquatic Habitat
MCA ID	1388
Organization Type	State or U.S. Territorial government
Organization Name	Maryland Department of Natural Resources
Sub-Agency or Division	
Organization Mission	The Department of Natural Resources leads Maryland in securing a sustainable future for our environment, society, and economy by preserving, protecting, restoring, and enhancing the State's natural resources.
Program Name	Maryland's Chesapeake & Coastal Service
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 07 - Wildlife and Habitat Management
Tertiary Business Use	BU 09 - Fisheries Management and Aquaculture

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Buildings, docks, roads, hydrography, ditches, submerged vegetation

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Required

Inland Bathy Feature Size Requirements	Response
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL1B	Order 1b
Update Frequency	4-5 years	4-5 years	2-3 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	Up to 2 meters	Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Up to 60 cm
How far onshore needed			500 meters inland	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MHW	MHW
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have	Nice to have	Nice to have
DTM	Highly desirable	Nice to have	Nice to have	Nice to have
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Required	Required	Required
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Nice to have
Ground control/ground truthing	Nice to have	Nice to have	Nice to have	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Nice to have	Nice to have	Nice to have	Nice to have
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Nice to have	Nice to have
Submerged features			Nice to have	Nice to have
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Not required	Not required	Not required	Not required
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Not required	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Nice to have	Nice to have	Nice to have	Nice to have
Wetlands	Highly desirable	Highly desirable	Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Highly desirable	Required	Required	
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Not required	Not required	Not required	
Cultural resources	Not required	Not required	Not required	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Data currently used is outlined in the following file: http://imap.maryland.gov/Pages/lidar-metadata.aspx	Partial coverage of reservoirs single beam or multi beam, side scan sonar	Partial coverage of inland bays	https://coast.noaa.gov/inventory/
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				Yes
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes		Yes	
State repositories used	Maryland MD iMap: http://imap.maryland.gov/Pages/lidar.aspx		MD iMap, Maryland Geological Survey	
Other		Yes		
Other description		Maryland DNR		
Data that meet my needs are not available		Yes		

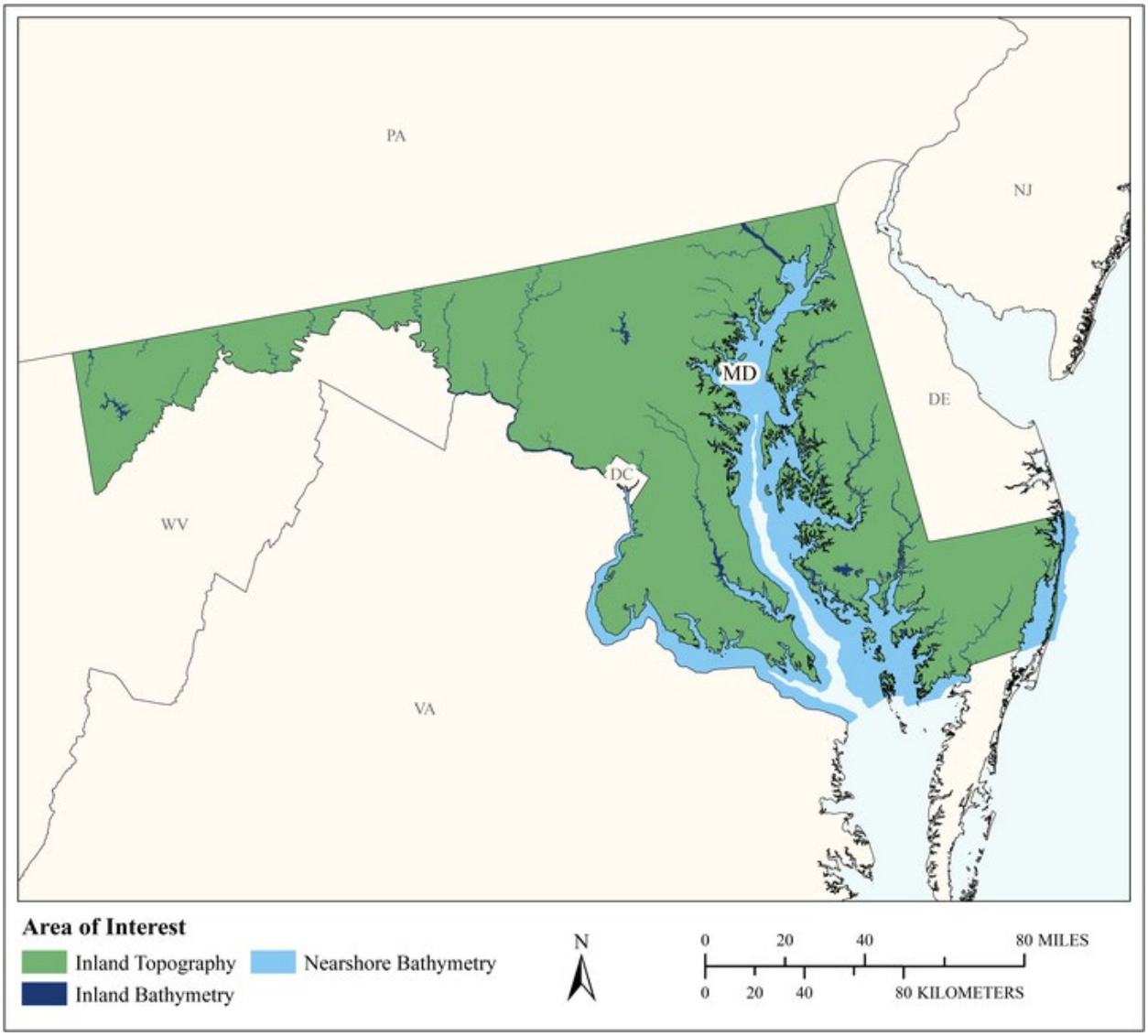
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Moderate	Moderate	Moderate
Cost savings/cost reduction	Moderate	Moderate	Moderate	Moderate
Cost avoidance	None	Minor	Minor	Minor
Increased revenues	None	None	None	None
Mission-driven performance improvements	Major	Major	Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	Moderate
Improved response or timeliness	Major	Major	Major	Moderate
Improved customer experience	Major	Major	Major	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major	Major	Moderate
Environmental	Major	Major	Major	Moderate
Public safety, including life and property	Major	Major	Major	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$33,286	Moderate	Annual dollars saved/realized	$33,286	Moderate	Annual dollars saved/realized	$54,994	Minor	Annual dollars saved/realized	$5,789
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues	None			None			None			None		
Mission-driven performance improvements	Major	Annual percent improvement	33%	Moderate	Annual percent improvement	20%	Major	Annual percent improvement	37%	Major	Annual percent improvement	33%
Future annual operational benefits added during validation		Annual dollars saved/ realized	$477,158		Annual dollars saved/ realized	$186,148					Annual dollars saved/ realized	$32,419
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	None			I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Major	Annual dollars saved/realized	$17,366	Moderate	Annual dollars saved/realized	$8,683	Major	Annual dollars saved/realized	$17,366	Major	Annual dollars saved/realized	$11,578
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$72,106		Annual dollars saved/ realized	$119,737		Annual dollars saved/ realized	$49,556			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Minor			Minor			Minor		
Education or outreach description	Provide an understanding of areas affected by flooding and sea level rise, environmental easement monitoring for new or removed buildings/structures											
Environmental	Major			Major			Major			Major		
Environmental description	Tree canopy height estimates, biomass estimates, stream and shoreline delineation, identification of areas subject to erosion						Location of SAV, stream and shoreline delineation					
Public safety, including life and property	Major			Major			Major			Major		
Public safety, including life and property description	Flood and sea level rise models						Locating underwater hazards					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Natural Resources Conservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation engineering. Soils and wetlands mapping and characterization. Modeling of biological and ecological systems. Erosion control. Rainfall penetration studies, impervious surfaces. Assessment of blue carbon stocks.
MCA Title	Natural Resources Conservation
MCA ID	60214
Organization Type	State or U.S. Territorial government
Organization Name	State of Maryland
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	BU 04 - Forest Resources Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	Better than options	More accurate than options provided	
Update Frequency	4-5 years	6-10 years	6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Highly desirable	Required		Required	Required
Entire AOI under same environmental conditions	Required	Required	Required		Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required		Required	Required
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Required	Required	Required	
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Highly desirable	Required	
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Nice to have	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Highly desirable	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Required	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Highly desirable	Required	Highly desirable	
Land use/land cover	Required	Required	Highly desirable	
Wetlands	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Nice to have	Highly desirable	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	
Cost savings/cost reduction	Major	Major	Minor	
Cost avoidance	Major	Moderate	Minor	
Increased revenues	Minor	Minor	None	
Mission-driven performance improvements	Major	Major	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Moderate	

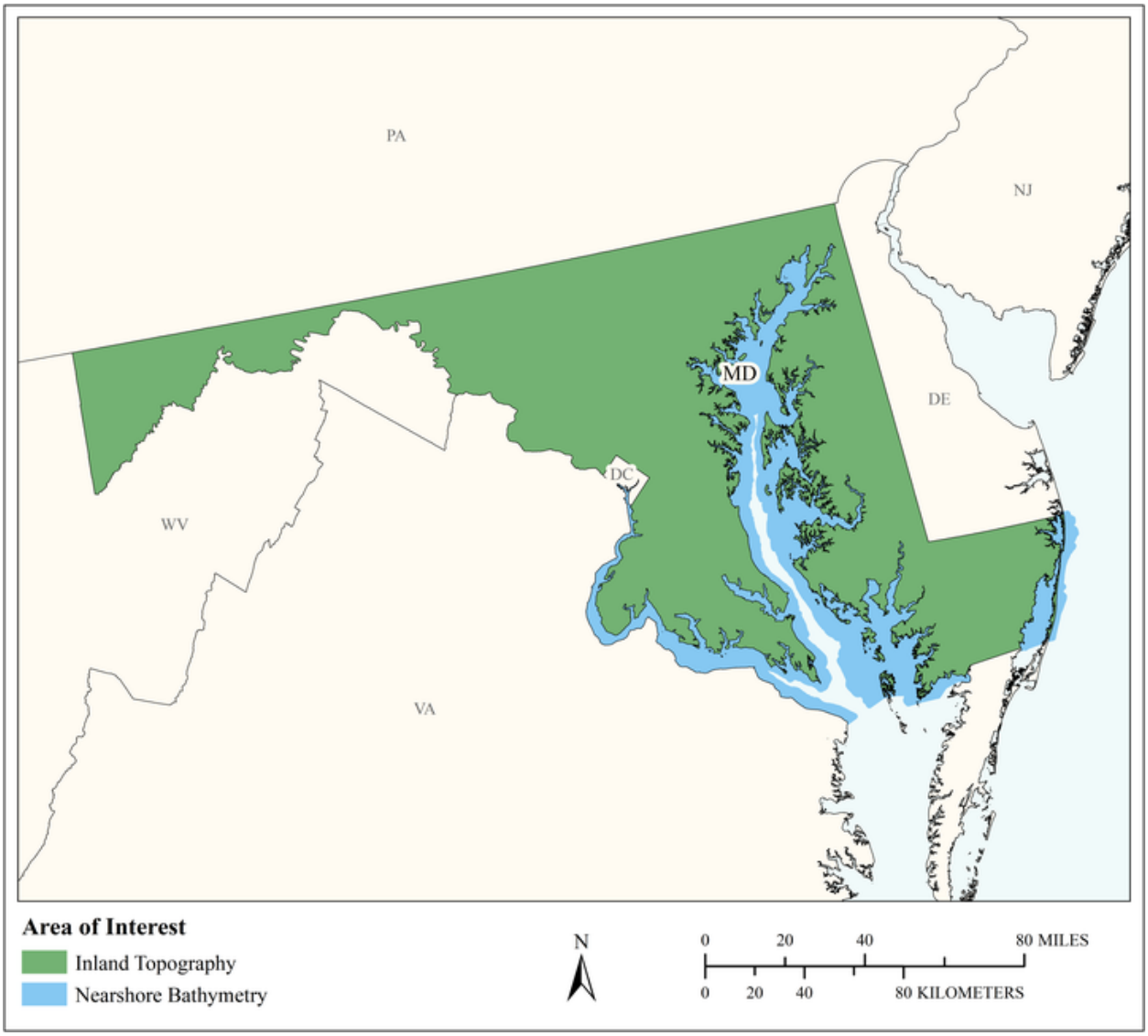
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major	Moderate	
Improved customer experience	Major	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Moderate	
Environmental	Major	Major	Major	
Public safety, including life and property	Major	Moderate	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		None					
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$387,814		Annual dollars saved/ realized	$52,563						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,424,172		Annual dollars saved/ realized	$2,366						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate					
Environmental	Major			Major			Major					
Public safety, including life and property	Major			Major			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes		Yes	
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Wildlife and Habitat Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation planning for wildlife refuges and marine sanctuaries. Conservation of critical habitats. Management of diverse migratory bird habitats, coral reef and coral communities, marine mammals, protected fish species, and trust resources.
MCA Title	Wildlife and Habitat Management
MCA ID	60215
Organization Type	State or U.S. Territorial government
Organization Name	State of Maryland
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2		QL0B	
Update Frequency	4-5 years		4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter		Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm		Up to 30 cm	
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable		Highly desirable			Highly desirable
Entire AOI under same environmental conditions	Highly desirable		Highly desirable			Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Highly desirable			Highly desirable
DEM for entire AOI needs to be seamless	Required		Highly desirable			Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable		Highly desirable	
DTM	Highly desirable		Highly desirable	
DEM	Required		Required	
Raw point cloud data	Highly desirable		Nice to have	
Classified point cloud	Highly desirable		Nice to have	
Edited/cube XYZ			Nice to have	
Full waveform	Not required		Not required	
Bathymetric Attributed Grid (BAG)			Nice to have	
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have		Nice to have	
Ground control/ground truthing	Highly desirable		Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required		Required	
Underwater videography			Nice to have	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have		Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Highly desirable	
Routes			Nice to have	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Highly desirable		Highly desirable	
Land use/land cover	Highly desirable		Highly desirable	
Wetlands	Highly desirable		Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required		Highly desirable	
Bridges/culverts	Nice to have			
Landmark features	Nice to have		Nice to have	
Cultural resources	Nice to have		Nice to have	
Coastal and riverine structures	Nice to have		Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Minor	
Cost savings/cost reduction	Major		Minor	
Cost avoidance	Major		Moderate	
Increased revenues	None		None	
Mission-driven performance improvements	Moderate		Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate		Minor	

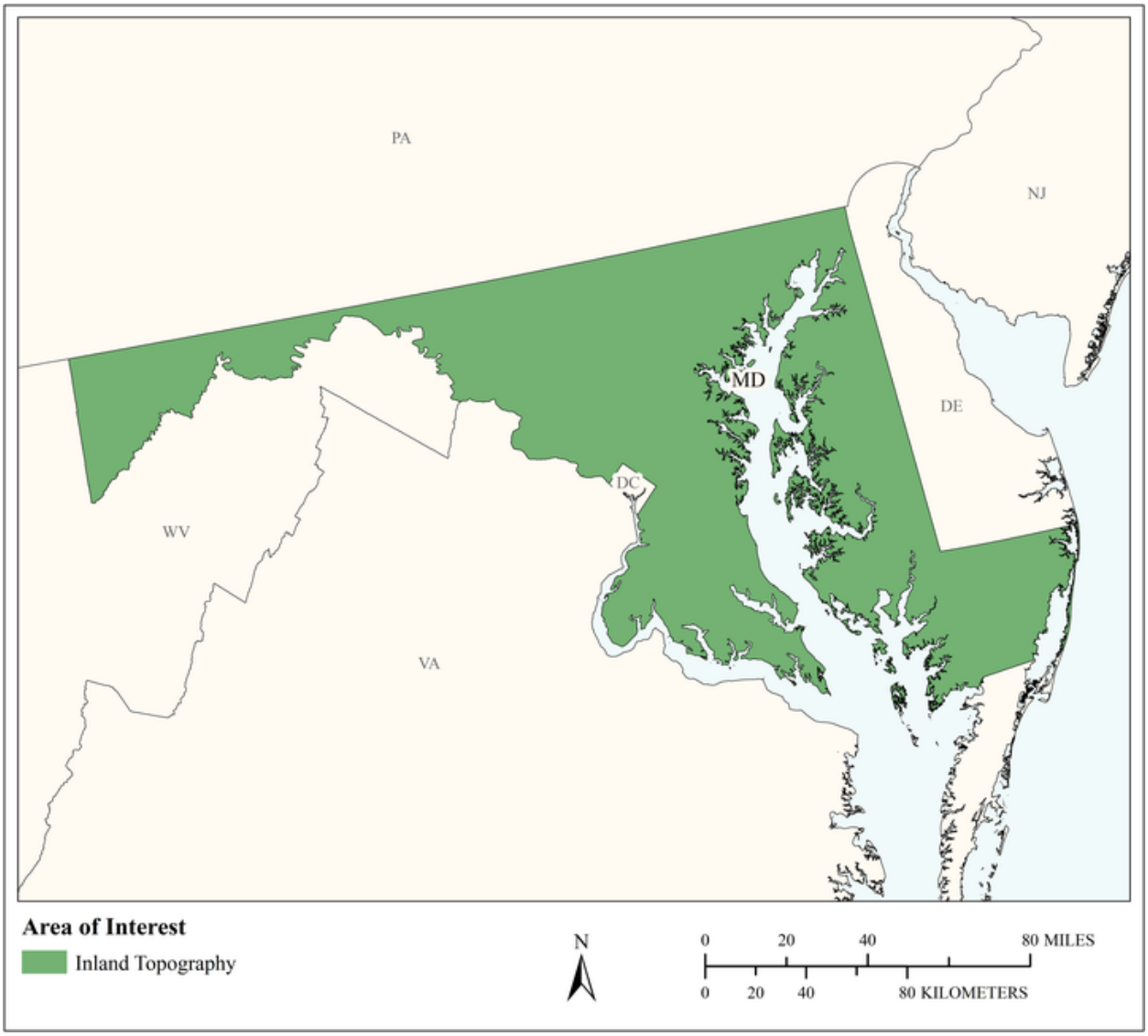
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Minor		Minor	
Improved customer experience	Minor		Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor		Minor	
Environmental	Moderate		Moderate	
Public safety, including life and property	Minor		Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					Major	Unable to provide				
Cost savings/cost reduction	Minor	Unable to provide					Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide					Major	Unable to provide				
Increased revenues	Minor	Unable to provide					Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide					Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,355					Annual dollars saved/ realized	$173			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide					Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide					Moderate	Unable to provide				
Improved customer experience	Moderate	Unable to provide					Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$6,802					Annual dollars saved/ realized	$10			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate						Moderate					
Environmental	Major						Major					
Public safety, including life and property	Moderate						Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	
Contours	Yes		Yes	
Hillshades	Yes			
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Agriculture and Precision Farming



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Farm pond design. Irrigation system design. Detailed site analysis to support precision farming. Analysis of farm sedimentation and runoff. Calibration of fertilizer application, fertilizer management, and irrigation planning. Optimized terraforming.
MCA Title	Agriculture and Precision Farming
MCA ID	60216
Organization Type	State or U.S. Territorial government
Organization Name	State of Maryland
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 08 - Agriculture and Precision Farming
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

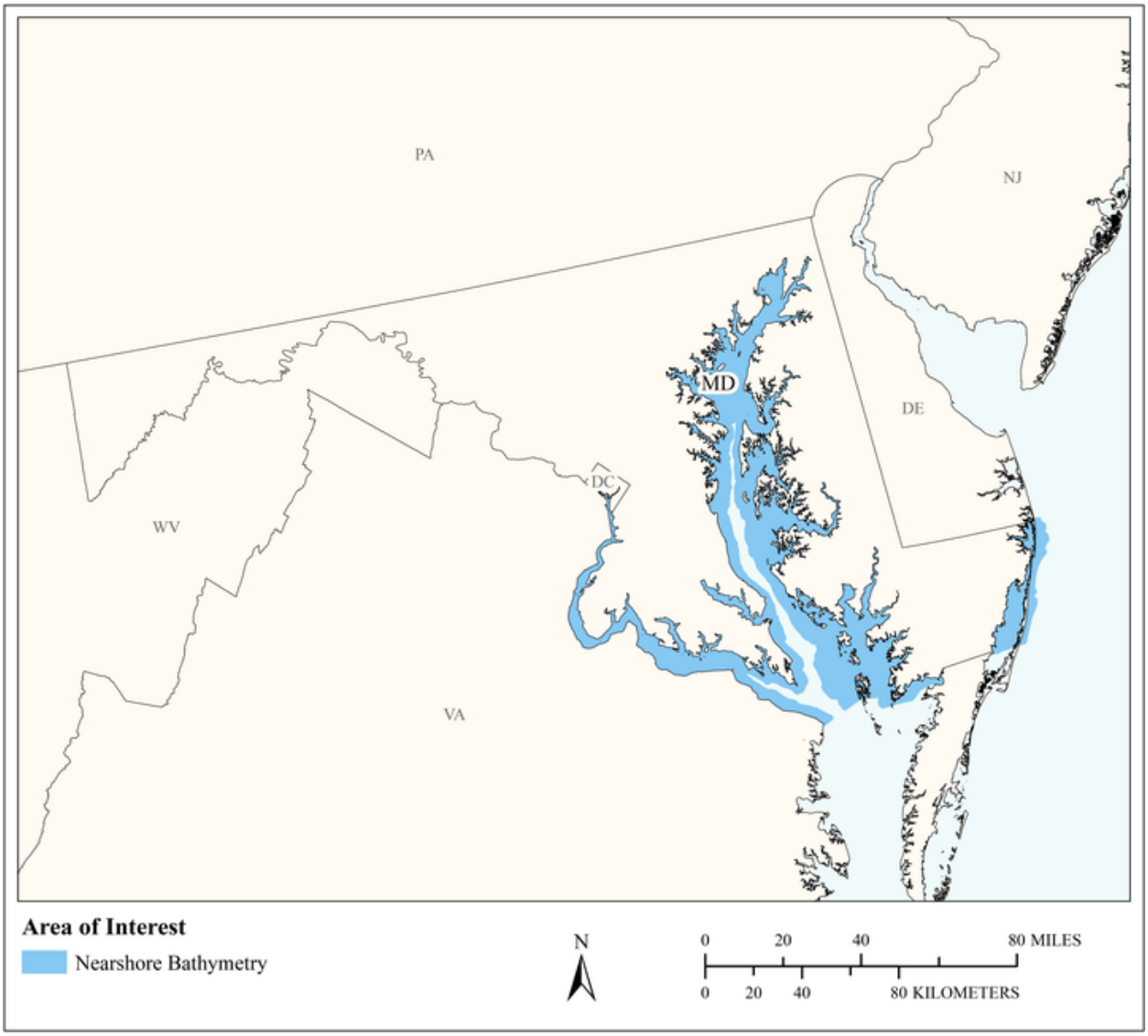
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$11,447									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$9,075									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Minor											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Fisheries Management and Aquaculture



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type			Required	
Geographic Area Requirements			Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Management of fisheries. Sustainable aquaculture.
MCA Title	Fisheries Management and Aquaculture
MCA ID	60217
Organization Type	State or U.S. Territorial government
Organization Name	State of Maryland
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Nice to have
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order			QL0B	
Update Frequency			6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error			Up to 2 meters	
Acceptable Vertical Error			Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season			Nice to have			
Entire AOI under same environmental conditions			Highly desirable			
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless			Highly desirable			
DEM for entire AOI needs to be seamless			Highly desirable			
Amount of acceptable vertical manipulation to achieve spatial seamlessness			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM			Highly desirable	
DTM			Highly desirable	
DEM			Required	
Raw point cloud data			Highly desirable	
Classified point cloud			Highly desirable	
Edited/cube XYZ			Nice to have	
Full waveform			Nice to have	
Bathymetric Attributed Grid (BAG)			Highly desirable	
Breaklines required for standard hydro-flattening				
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery			Highly desirable	
Ground control/ground truthing			Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery			Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data			Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates			Highly desirable	
Land use/land cover			Nice to have	
Wetlands			Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features			Nice to have	
Bridges/culverts				
Landmark features			Nice to have	
Cultural resources			Not required	
Coastal and riverine structures			Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings			Moderate	
Cost savings/cost reduction			Major	
Cost avoidance			Minor	
Increased revenues			Minor	
Mission-driven performance improvements			Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services			Minor	

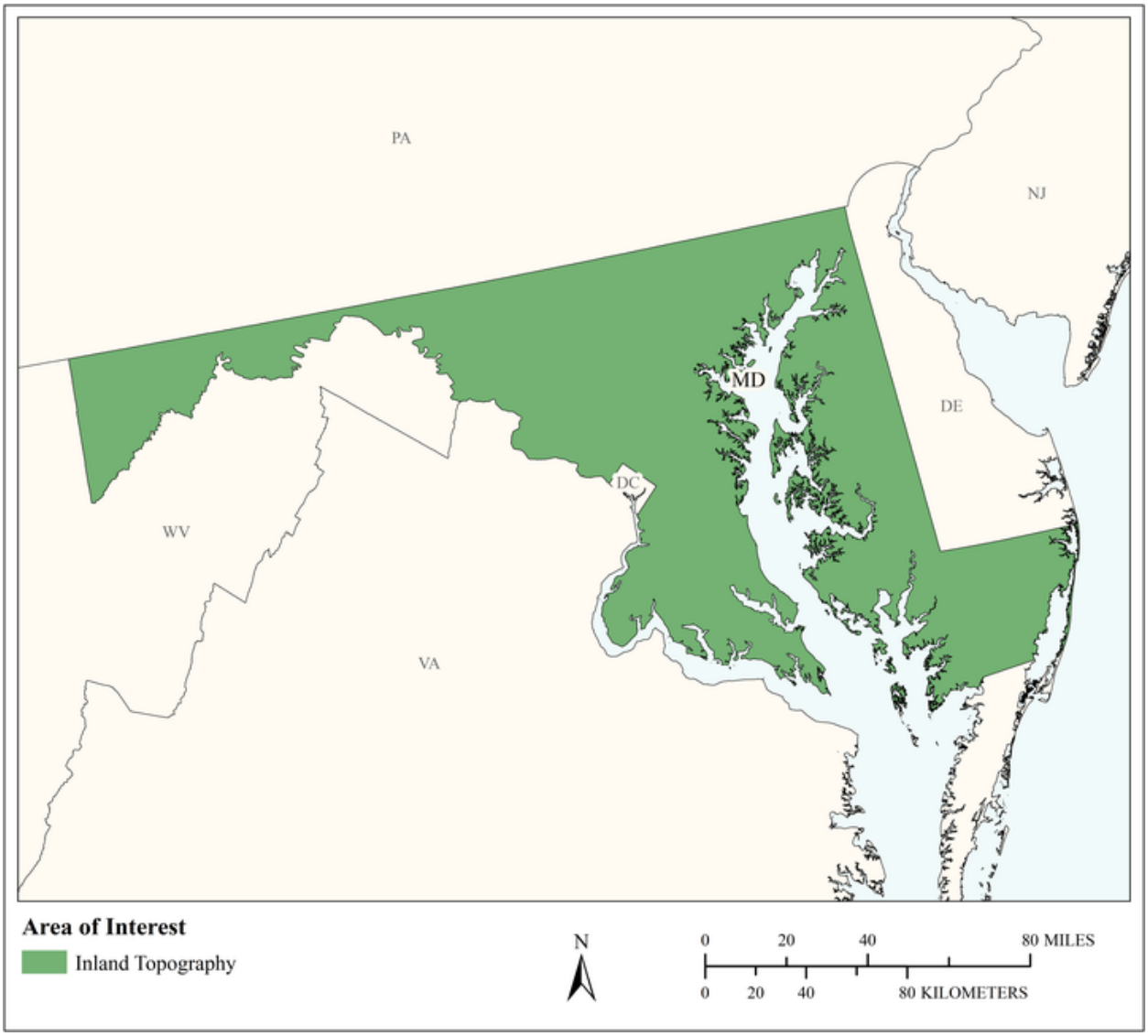
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness			Moderate	
Improved customer experience			Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach			Moderate	
Environmental			Moderate	
Public safety, including life and property			Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings							Major	Unable to provide				
Cost savings/cost reduction							Moderate	Unable to provide				
Cost avoidance							Moderate	Unable to provide				
Increased revenues							Minor	Unable to provide				
Mission-driven performance improvements							Major	Unable to provide				
Future annual operational benefits added during validation								Annual dollars saved/ realized	$27,600			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services							Minor	Unable to provide				
Improved response or timeliness							Major	Unable to provide				
Improved customer experience							Moderate	Unable to provide				
Future annual customer service benefits added during validation								Annual dollars saved/ realized	$2,027			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach							Moderate					
Environmental							Major					
Public safety, including life and property							Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours			Yes	
Hillshades			Yes	
Slope maps			Yes	
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic Mapping and Analysis



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Geologic mapping and analysis. Sinkhole and steephead mapping, monitoring, and analysis. Identification of geomorphologic units. Landslide hazard mapping and assessment. Karst mapping, including springs and caves. Aquifer recharge.
MCA Title	Geologic Mapping and Analysis
MCA ID	1198
Organization Type	State or U.S. Territorial government
Organization Name	Maryland Geological Survey
Sub-Agency or Division	
Organization Mission	Maryland Geological Survey is charged with the many-faceted role of investigating the earth resources of Maryland through the application of the various disciplines within the general field of earth science. Thus, its primary mission concerns geologic studies, including geologic mapping, environmental geology, geology of mineral resources, water-resources investigations, coastal and estuarine geology, and topographic and geophysical mapping.
Program Name	Environmental Geology
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Rock outcrops (1 meter cubed)

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	>10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed	To MHHW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We are currently using LIDAR at various quality levels. Over 50% of the State is QL2 or acceptable. The rest of the state is covered with LIDAR but at a slightly lesser accuracy and resolution.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Salisbury University holds all of the LIDAR collected data. This data is also accessed through DEMs on the State GIS servers.			

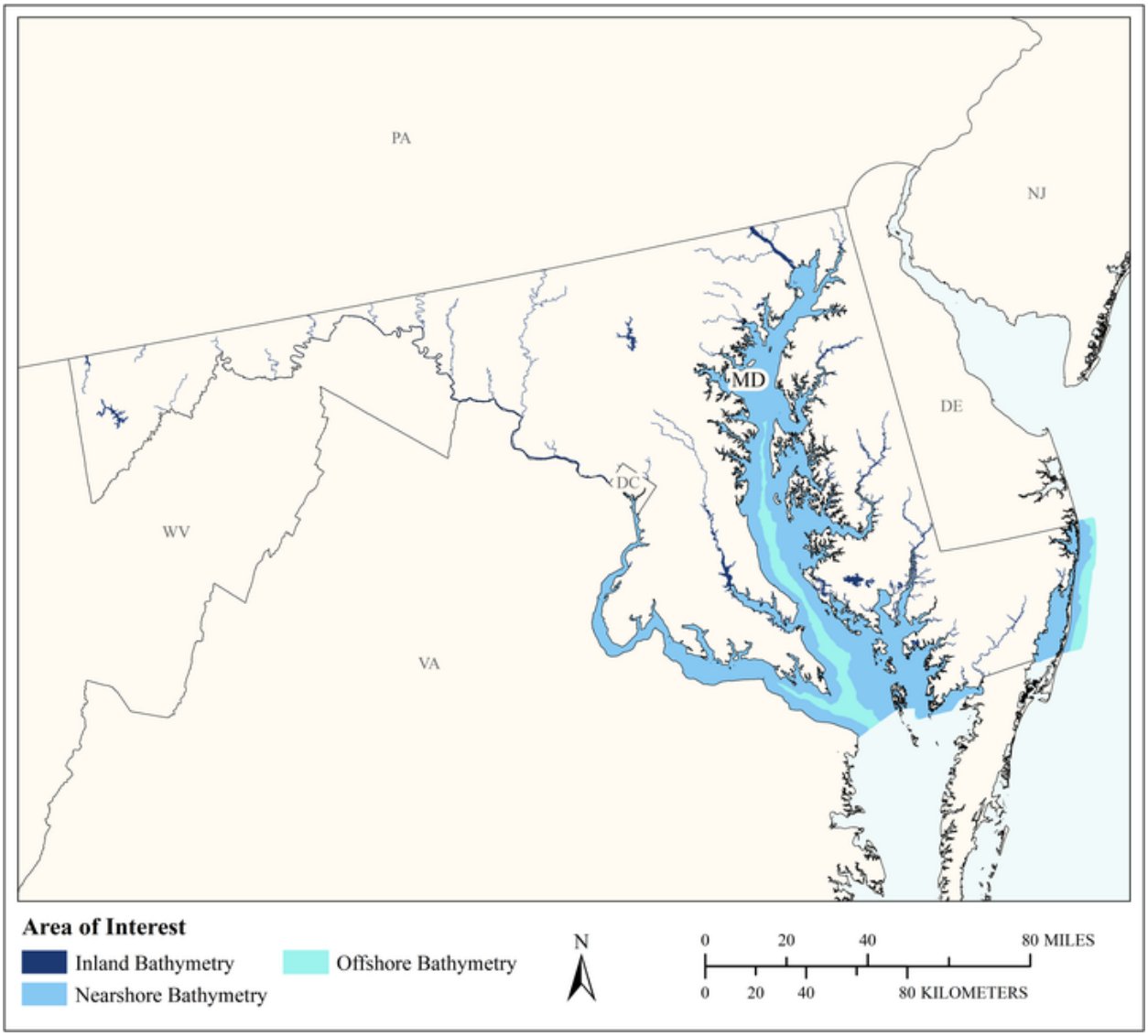
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$60,300									
Time savings description	Field mappers will be able to identify rock outcrops. Easier site selections. Mappers will be able to differentiate layers more readily.											
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Minor	Annual dollars saved/realized	$10,000									
Cost avoidance description	Labor time.											
Increased revenues	None											
Mission-driven performance improvements	Moderate	Annual percent improvement	150%									
Mission-driven performance improvements description	Better use of on the ground mapper time. Creation of more detailed maps at greater scales. Selection of better field locations for work.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Value added to products or services description	I think this is duplicative of benefits characterized above for a state research agency.											
Improved response or timeliness	Minor	Unable to provide										
Improved customer experience	Moderate	Annual dollars saved/realized	$3,015									
Improved customer experience description	Saves time gathering data.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Education or outreach description	Being able to 3D print areas and show areas where people live develops a connection											
Environmental	Moderate											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades				
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Sediment Studies



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type		Required	Required	Required
Geographic Area Requirements		One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Coastal Sediment Studies. Elevation data are needed for habitat assessment based on depth and sediment type, sand resources assessment, sediment classification for grain size, monitor for bottom of reservoir sedimentation, transport of sediments in inland waters, beach nourishment, pipeline assessments, CO2 sequestration, and wind platform siting.
MCA Title	Sediment Studies
MCA ID	22160
Organization Type	State or U.S. Territorial government
Organization Name	Maryland Geological Survey
Sub-Agency or Division	
Organization Mission	Maryland Geological Survey is charged with the many-faceted role of investigating the earth resources of Maryland through the application of the various disciplines within the general field of earth science. Thus, its primary mission concerns geologic studies, including geologic mapping, environmental geology, geology of mineral resources, water-resources investigations, coastal and estuarine geology, and topographic and geophysical mapping.
Program Name	Coastal and Estuarine Geology
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 03 - Coastal Zone Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Shoreline shelfs. Typically, these are less than 6 inches tall in silty areas and marshes where the tidal erosion line is located.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order		QL0B	I do not need any of the QLs listed. We need vertical accuracies of 1-2cm throughout the beach profile and down to -18 feet.	I do not need any of the QLs listed. We need vertical accuracies of 1-2 cm throughout the beach profile and down to -18 feet.
Update Frequency		4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error		Up to 1 meter	Less than 50 cm	Less than 50 cm
Acceptable Vertical Error		Less than 10 cm	Less than 10 cm	Less than 10 cm
How far onshore needed			500 meters inland	
How far down the beach profile needed			Below MLLW	
Tide correction requirement			MHW	MHW
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season		Nice to have	Nice to have	Nice to have		Nice to have
Entire AOI under same environmental conditions		Required	Required	Nice to have		Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless		Required	Required	Nice to have		Nice to have
DEM for entire AOI needs to be seamless		Required	Required	Nice to have		Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness		None	None	None		None

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM		Not required	Not required	Not required
DTM		Not required	Not required	Not required
DEM		Required	Required	Required
Raw point cloud data		Required	Required	Required
Classified point cloud		Nice to have	Highly desirable	
Edited/cube XYZ		Nice to have	Not required	Not required
Full waveform		Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening		Highly desirable		
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	Required
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery		Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing		Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Nice to have	Nice to have
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery		Required	Required	Required
Underwater videography			Not required	Not required
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data		Required	Highly desirable	Highly desirable
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Highly desirable	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Not required	Not required
Shorelines – current, historic, change rates		Required	Required	
Land use/land cover		Required	Highly desirable	Highly desirable
Wetlands		Required	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Nice to have	Nice to have
Inland surface water features		Required	Highly desirable	
Bridges/culverts		Nice to have		
Landmark features		Nice to have	Not required	
Cultural resources		Nice to have	Nice to have	
Coastal and riverine structures		Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used		We collect our own at much greater accuracy than QL0.	We use our own data from transects that is not meeting our needs, but the best we can obtain. We also use the NOAA CUSP shorelines that are critical to be maintained. We are a geological survey and we can collect sidescan, seismic, and bottom classification so that is not needed.	We use our own data from transects that is not meeting our needs, but the best we can obtain. We also use the NOAA CUSP shorelines that are critical to be maintained. We are a geological survey and we can collect sidescan, seismic, and bottom classification so that is not needed.
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast		Yes	Yes	Yes
NCEI				
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories		Yes	Yes	

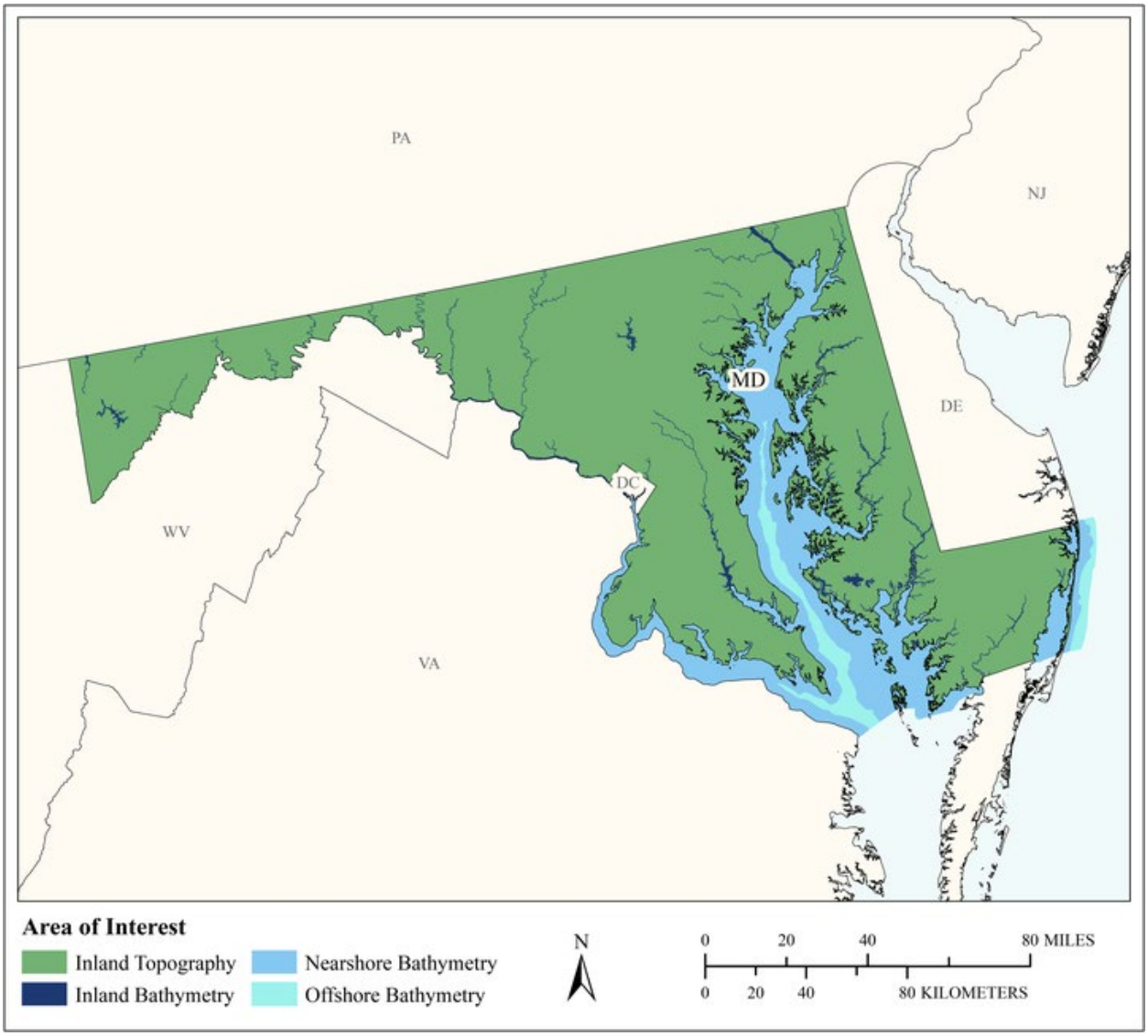
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
State repositories used		Our own, and previously collected data from contractors.	Our own	
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings		Moderate	Moderate	Minor
Cost savings/cost reduction		Moderate	Moderate	Minor
Cost avoidance		I don't know	Moderate	Minor
Increased revenues		None	None	None
Mission-driven performance improvements		Moderate	Moderate	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services		Moderate	Moderate	Minor
Improved response or timeliness		Moderate	Moderate	Minor
Improved customer experience		Moderate	Moderate	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach		Moderate	Minor	Minor
Environmental		Moderate	Minor	Minor
Public safety, including life and property		Major	Minor	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings				Major	Annual dollars saved/realized	$21,105	Moderate	Annual dollars saved/realized	$3,015	I don't know	Unable to provide	
Time savings description				Complete datasets allow complete analysis rather than interpolation. Sites can be identified remotely.								
Cost savings/cost reduction				None			I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance				Minor	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance description				We will process the point cloud data.								
Increased revenues				Minor	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements				Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements description				Could save field time if accuracies are obtainable.								
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services				None			I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness				Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness description				Would allow more recent analyses to be run on reservoir siltation.								
Improved customer experience				Minor	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach				Moderate			I don't know			I don't know		
Environmental				Moderate			I don't know			I don't know		
Public safety, including life and property				Major			I don't know			I don't know		
Public safety, including life and property description				Divers are always looking for updated maps of reservoirs								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				
Other (please specify)		Yes	Yes	Yes
Other description	We would generate our own derivatives.			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Cultural Resources Management and Preservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Cultural resources management and preservation. Identification of cultural resources through research, survey and analysis. Protection and preservation of resources through outreach and education as well as planning (including hazard mitigation). Elevation data are needed for permit reviews, research on natural resources, Management of cultural habitat and cultural resources, historical landscaping, discovery of historic roads and trails, identification of changed paths of waterways, and viewshed analysis.
MCA Title	Cultural Resources Management and Preservation
MCA ID	21633
Organization Type	State or U.S. Territorial government
Organization Name	Maryland Department of Planning
Sub-Agency or Division	
Organization Mission	The Maryland Department of Planning collaborates with state agencies, local governments and the private sector, providing assistance and data so that each community can shape their future in a way that reflects local values, honors its heritage and presents opportunities for Maryland to flourish. Planning facilitates the coordination of planning efforts statewide. Planning provides essential planning data, information and analysis for the state of Maryland. Planning plays an important role in preserving Maryland's heritage and conserving its natural resources
Program Name	State Historic Preservation Office
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Not required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Small dock, small outbuildings, roadside markers/monuments,

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required

Inland Bathy Feature Size Requirements	Response
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B	QL0B	Order 1a
Update Frequency	4-5 years	4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 30 cm	Up to 1 meter	Up to 1 meter	Up to 1 meter
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed			To cover the beach slope	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MLLW	MLLW
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have	Nice to have	Required	Nice to have	Nice to have
Entire AOI under same environmental conditions	Required	Nice to have	Nice to have	Required	Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Nice to have	Highly desirable	Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Required	Nice to have	Nice to have	Highly desirable	Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Required	Required
DTM	Required	Not required	Not required	Not required
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Not required	Not required	Not required
Classified point cloud	Highly desirable	Not required	Not required	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery	Not required	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Required	Required
Aerial and/or satellite imagery	Required	Highly desirable	Required	Required
Underwater videography			Not required	Not required
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Required	Required
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Nice to have	Highly desirable	Highly desirable	Highly desirable
Water column properties - Physical			Not required	Highly desirable
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Highly desirable	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Highly desirable	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Not required	Not required
Lease areas			Nice to have	Nice to have
Fixed obstructions			Required	Required
Floating observation/navigation systems			Required	Required
Shorelines – current, historic, change rates	Required	Highly desirable	Required	
Land use/land cover	Nice to have	Highly desirable	Highly desirable	Highly desirable
Wetlands	Nice to have	Highly desirable	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Nice to have	Highly desirable	Required	
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Nice to have	Highly desirable	Highly desirable	
Cultural resources	Required	Highly desirable	Required	
Coastal and riverine structures	Nice to have	Highly desirable	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	LiDAR data from state	-NOAA charts -Acquire data in house +/- 30 cm H&V for project-specific areas	NOAA charts -Acquire data in house +/- 30 cm H&V for project-specific areas	Offshore NOAA charts
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	MD iMap			
Other		Yes	Yes	
Other description		See above + DNR shorelines, Current/historic; georeferencing of historic charts	Department of Natural Resources (DNR) GIS data	
Data that meet my needs are not available				

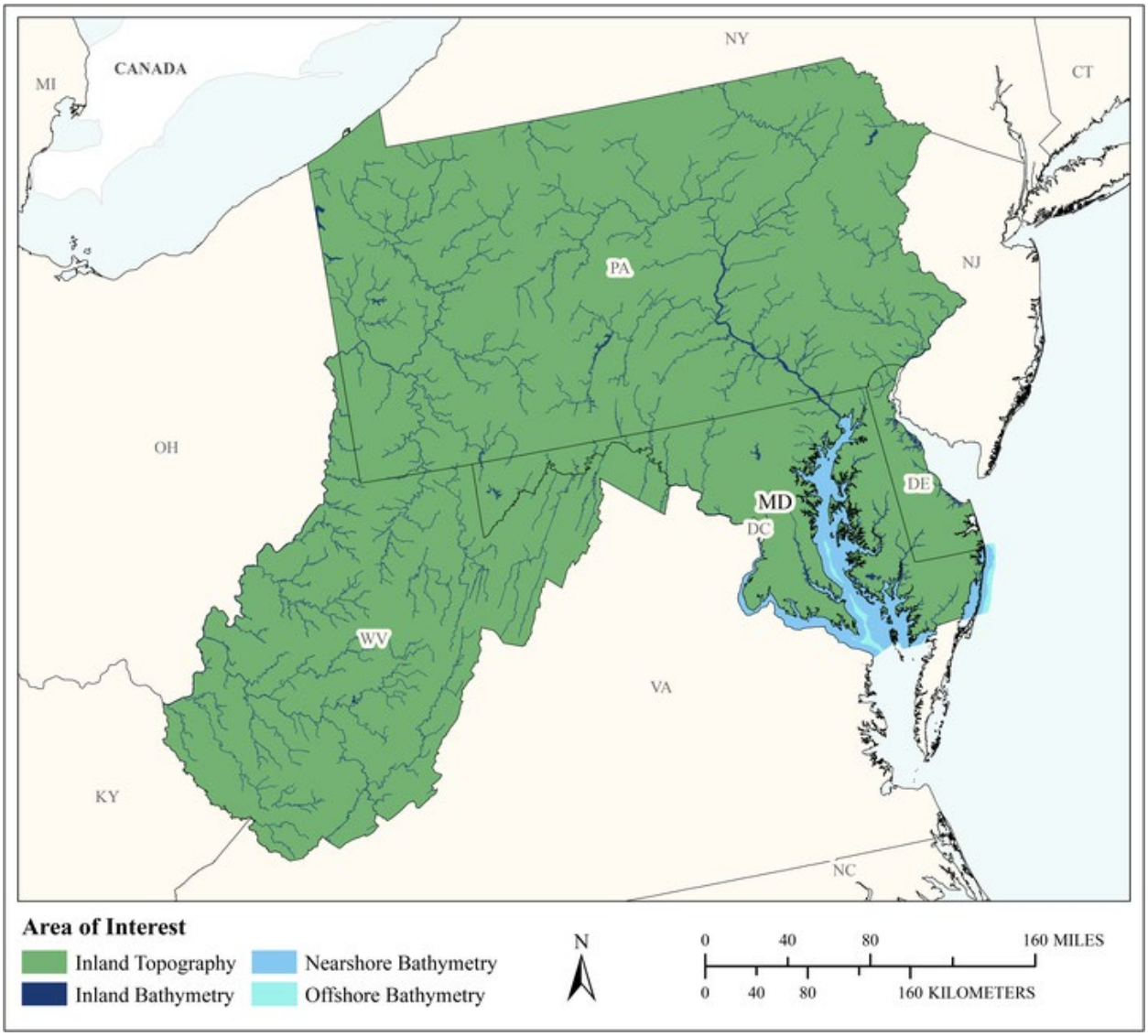
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Moderate	Moderate	Moderate
Cost savings/cost reduction	Major	None	None	None
Cost avoidance	Moderate	None	None	None
Increased revenues	None	None	None	None
Mission-driven performance improvements	Major	Minor	Minor	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None	None	None
Improved response or timeliness	Major	Moderate	Moderate	Moderate
Improved customer experience	Moderate	Moderate	Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor	Minor	Minor
Environmental	None	Moderate	Moderate	Moderate
Public safety, including life and property	None	None	None	None

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Minor	Unable to provide		Minor	Annual dollars saved/realized	$6,633 to $6,874	Minor	Annual dollars saved/realized	$6,633 to $6,874	Minor	Annual dollars saved/realized	$1,206
Time savings description				0-8 hours saved. Expected avoided site visits. Collect/process data.			0-8 hours saved.					
Cost savings/cost reduction	Minor	Unable to provide		None			None			Minor	Unable to provide	
Cost avoidance	Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Increased revenues	None			None			None			None		
Mission-driven performance improvements	Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Other operational benefits				Minor	Unable to provide		Minor	Unable to provide				
Other operational benefits description												
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Improved customer experience	Minor	Unable to provide		None			Minor	Unable to provide		Minor	Unable to provide	
Other customer service benefits							Minor	Unable to provide				
Other customer service benefits description												
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			I don't know			Minor			Minor		
Education or outreach description	Hazard mitigation for historical and cultural resources											
Environmental	None			None			Moderate			Moderate		
Public safety, including life and property	None			None			None			None		
Other												
Other benefits							Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Statewide Environmental Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	FEMA Floodplain Coordination/Mitigation; Wetland regulation; Submerged Aquatic Vegetation (SAV); Water Quality; Ground water/Drinking water; NHD/WBD State Steward; Oil Control; Voluntary Clean-up Program (VCP)/Land Restoration; Mining
MCA Title	Statewide Environmental Management
MCA ID	1397
Organization Type	State or U.S. Territorial government
Organization Name	MD Dept. of the Environment
Sub-Agency or Division	
Organization Mission	To protect and restore the environment for the health and well-being of all Marylanders.
Program Name	NFIP - National Flood Insurance Program; Environmental Assessment and Standards; Integrated Water Planning; Sediment, Stormwater, and Dam Safety; Water Supply; Oil Control; Voluntary Clean-up/Land Restoration; Wetlands and Waterways; Mining
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 02 - Riverine Ecosystem Management
Tertiary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Building/house, 1st order stream. Underwater habitat features in inland waters, shellfish and oyster beds, submerged aquatic vegetation.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Nice to have
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL1B	QL1B	
Update Frequency	2-3 years	2-3 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Less than 50 cm	Less than 50 cm	
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm	Less than 10 cm	
How far onshore needed			To MHW	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MHW	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Required	Required	Required	Required	Required
Entire AOI under same environmental conditions	Required	Required	Required	Required	Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Required	Required	Required
DTM	Required	Required	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Nice to have	Nice to have	Nice to have	Nice to have
Classified point cloud	Required	Nice to have	Nice to have	
Edited/cube XYZ		Not required	Not required	Not required
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Not required	Not required	Not required
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Required	Nice to have	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Highly desirable	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Nice to have	Nice to have
Submerged features			Nice to have	Nice to have
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Required	Required	Not required	Not required
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Nice to have	Nice to have
Tide/wave heights			Required	Required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Required	Required
Boundaries			Nice to have	Nice to have
Routes			Not required	Not required
Offshore cadastral			Not required	Not required
Lease areas			Not required	Not required
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Required	Required	Nice to have	Nice to have
Wetlands	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Required	Required	Nice to have	
Cultural resources	Required	Required	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	USGS QL-2 for all of Maryland	NOAA 2010 data and Older data derived by the Maryland Geologic Survey 2000.	NOAA 2010 - 3 meter and 6 meter. Maryland Geologic Survey data from 2000?? Otherwise, a little of this and a little of that. Whatever we can get our hands on.	NOAA 2010 - 3 meter and 6 meter. Maryland Geologic Survey data from 2000?? Otherwise, a little of this and a little of that. Whatever we can get our hands on.
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI		Yes	Yes	Yes
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes	Yes	Yes	
State repositories used	Maryland Dept of IT/GIS has a statewide data server which includes Lidar data.	Maryland Dept of IT/DOIT has a statewide data server which includes Lidar/Elevation data	Maryland Dept of IT/DOIT has a statewide data server which includes Lidar/elevation data	
Data that meet my needs are not available				

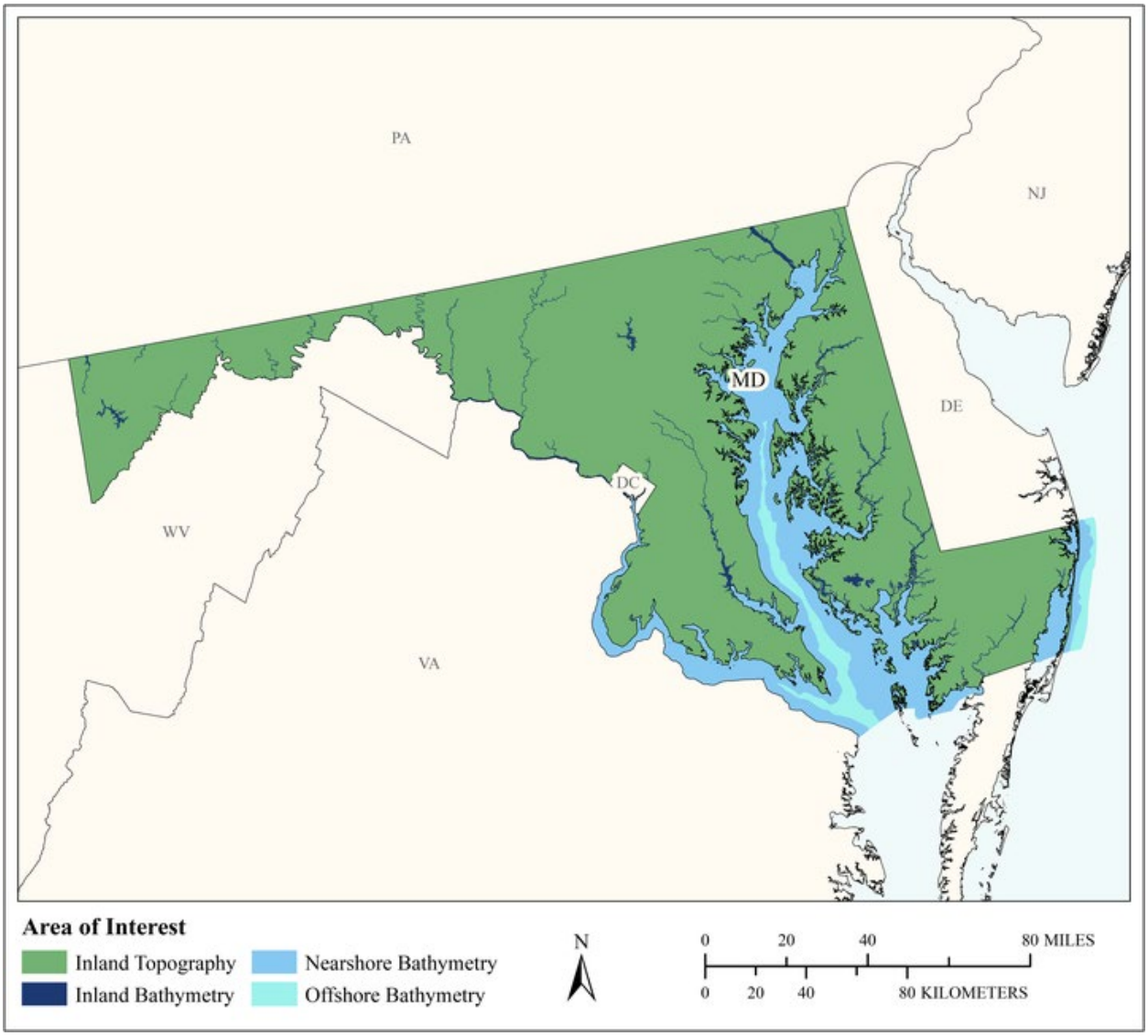
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Minor	Minor
Cost savings/cost reduction	Major	Minor	Minor	Minor
Cost avoidance	Moderate	Moderate	Moderate	Moderate
Increased revenues	None	None	None	None
Mission-driven performance improvements	Major	Moderate	Moderate	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	Major
Improved response or timeliness	Moderate	Major	Major	Major
Improved customer experience	Moderate	Major	Major	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	None	None
Environmental	Moderate	Moderate	Moderate	Moderate
Public safety, including life and property	Major	Moderate	Minor	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Other operational benefits	Moderate	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$462,751					Annual dollars saved/ realized	$11,088			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$80,967					Annual dollars saved/ realized	$8,217			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major			Major		
Education or outreach description	Flood Insurance Program											
Environmental	Major			Major			Major			Major		
Environmental description	Mapping of all streams within Maryland for improved water quality, wetland and near shore SAV											
Public safety, including life and property	Major			Major			Major			Major		
Public safety, including life and property description	Flood mapping/modeling for FEMA											
Other	More accurate elevation required for NHD/WBD enhancements/updates											
Other benefits	Major											
Other description	More accurate elevation required for NHD/WBD enhancements/updates											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes	Yes	
Hydrologic Flow Accumulation Grids	Yes	Yes	Yes	
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	Yes
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Hazard Modeling and Mapping



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Highly desirable	Highly desirable	Highly desirable
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Coastal hazard modeling and mapping, Riverine hazard modeling and mapping, Sea level change modeling and asset management, Hazard mitigation planning, Storm surge modeling.
MCA Title	Hazard Modeling and Mapping
MCA ID	21576
Organization Type	Academic or Not-for-Profit
Organization Name	Eastern Shore Regional GIS Cooperative at Salisbury University
Sub-Agency or Division	
Organization Mission	The Eastern Shore Regional GIS Cooperative (ESRGC) provides access to geographic information system (GIS) technology, data, technical support, and training to the local governments of Maryland's Eastern Shore.
Program Name	GIS Program
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 16 - Sea Level Rise and Subsidence
Tertiary Business Use	BU 03 - Coastal Zone Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Buildings, other feature extraction

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B	QL2B	Order 3
Update Frequency	2-3 years	2-3 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	Up to 5 meters	Up to 5 meters	Greater than 20 meters
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 40 cm	Up to 10 meters
How far onshore needed			To MHW	
How far down the beach profile needed	To MLLW		Below MLLW	
Tide correction requirement			MSL	MSL
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable	Nice to have		Highly desirable	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Nice to have		Highly desirable	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Nice to have		Highly desirable	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Nice to have	Nice to have	Nice to have
DTM	Not required	Nice to have	Nice to have	Nice to have
DEM	Highly desirable	Highly desirable	Nice to have	Nice to have
Raw point cloud data	Required	Required	Highly desirable	Highly desirable
Classified point cloud	Required	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Nice to have
Ground control/ground truthing	Nice to have	Nice to have	Nice to have	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	Nice to have
Nautical and/or navigation charts			Nice to have	Nice to have
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Not required	Nice to have	Nice to have	Nice to have
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Not required	Not required	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Nice to have	Nice to have
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Nice to have	
Land use/land cover	Not required	Nice to have	Nice to have	Nice to have
Wetlands	Nice to have	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Nice to have	Nice to have
Inland surface water features	Highly desirable	Highly desirable	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Not required	Not required	Nice to have	
Cultural resources	Not required	Not required	Nice to have	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	2011 FEMA LiDAR: Coastal Worcester County, MD - QL2 2011 NRCS LiDAR: Pocomoke and Atlantic Coastal Watersheds, MD - QL2 2012 NRCS LiDAR: Somerset and Wicomico Counties, MD - QL2 2014 USGS Hurricane Sandy Supplemental, MD - QL2 2015 Sandy Supplemental LiDAR, MD - QL2 2013 Queen Anne's County, MD - QL3 2014 Cecil County, MD - QL2 2013 Harford County, MD - QL3 2014 Baltimore County, MD - QL2 2016-2017 Anne Arundel County, MD - QL1 2017 Calvert County, MD - QL1 2014 USGS Hurricane Sandy Supplemental LiDAR, National Capital Region (NCR) - QL2 2013 Montgomery-Prince Georges LiDAR - QL2 2011 Howard County, MD - QL3 2012 FEMA Frederick County, MD - QL2 2012 FEMA Washington County, MD - QL2 2012 FEMA Allegany County, MD - QL3 2015 Garrett County, MD - QL2	Currently our projects do not require bathymetric datasets for model inputs. The services provided are dependent upon the clients desired level of analysis; bathymetry could be an essential dataset with future project proposals.	Currently not using these data; potential for usage in future projects would lead to NOAA Digital Coast for data availability.	Currently not using these data; potential for usage in future projects would lead to NOAA Digital Coast for data availability.

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast		Yes	Yes	Yes
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Maryland - Department of Information Technology			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	I don't know	I don't know	I don't know
Cost savings/cost reduction	Major	I don't know	I don't know	I don't know
Cost avoidance	Major	I don't know	I don't know	I don't know
Increased revenues	Major	I don't know	Minor	Minor
Mission-driven performance improvements	Major	I don't know	Minor	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	I don't know	Minor	Minor
Improved response or timeliness	Major	I don't know	I don't know	I don't know
Improved customer experience	Major	I don't know	I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	I don't know	Minor	Minor
Environmental	Minor	I don't know	Minor	Minor
Public safety, including life and property	Major	I don't know	Minor	Minor

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other Current Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other	Major			
Other description	Our projects are not site specific in nature; thus the availability of topographic data is a requirement for our work. Otherwise these projects would likely not exist.			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$6,030	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Time savings description	Higher accuracy data would definitely help with model inputs and success rates. Hydro-enforcement is greatly desirable to remove 'damming' effects in the dataset that would otherwise need to be addressed manually. Our project entirely depends on topographic data for modeling. Having a standard on specification across our entire geographic area would help limit processing hours for model inputs; particularly with resampling to common resolution. Our projects typically do not include field work inspections. In-office project planning may see marginal benefits with "better" data. Having topographic data is required for these projects so this is only assuming the comparison between existing datasets and potentially improved datasets in the future. Our project entirely depends on topographic data for modeling. Having hydro-enforced data would benefit us in reducing the hours spent on data preparation for model inputs.			Potential for bathymetric inclusion in our MCA; however at this time we are not utilizing these datasets. Bathymetric data would allow for higher detailed analysis.			Potential for bathymetric inclusion in our MCA; however at this time we are not utilizing these datasets. Bathymetric data would allow for higher detailed analysis.					
Cost savings/cost reduction	None			Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction description	Not applicable. We currently obtain data through the state repository or directly from the client/county/vendor. Cost savings would not affect us directly.			Data is acquired through state entities or municipalities. Data costs are typically not an issue with our MCA as we use pre-existing datasets through the Maryland Open Data Policy. Potential for bathymetric inclusion in our MCA; however at this time we are not utilizing these datasets. Bathymetric data would allow for higher detailed analysis.			Data is currently obtained through existing public applications. Costs savings are unknown at this time.					
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide	
Cost avoidance description	Data errors could potentially decrease from higher quality datasets. Unable to determine exact amount compared to existing data. Main projects include asset management regarding sea level change and flooding. These datasets assist in determining model outputs and preparation actions. Full classified point clouds would be highly desirable, along with higher level of hydrotreatment. Hydroenforced datasets would allow us to spend less time on manual data preparation for model inputs.			Unfamiliar with data processing of bathymetric data for flood input models. Potential for cost savings; more information required based on the project. Potential for bathymetric inclusion in our MCA; however at this time we are not utilizing these datasets. Bathymetric data would allow for higher detailed analysis.			Potential for bathymetric inclusion in our MCA; however at this time we are not utilizing these datasets. Bathymetric data would allow for higher detailed analysis.					
Increased revenues	None			None			Minor	Unable to provide		I don't know	Unable to provide	
Increased revenues description							Potential for new services or applications based on updated model outputs.					
Mission-driven performance improvements	Major	Annual percent improvement	100%	Moderate	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements description	Without these topographic datasets, our mission would likely not be possible. These datasets are required to perform the necessary analyses and provide the desired services sought out by our clients.			Potential for bathymetric inclusion in our MCA; however at this time we are not utilizing these datasets. Bathymetric data would allow for higher detailed analysis.			Potential for bathymetric inclusion in our MCA; however at this time we are not utilizing these datasets. Bathymetric data would allow for higher detailed analysis.					

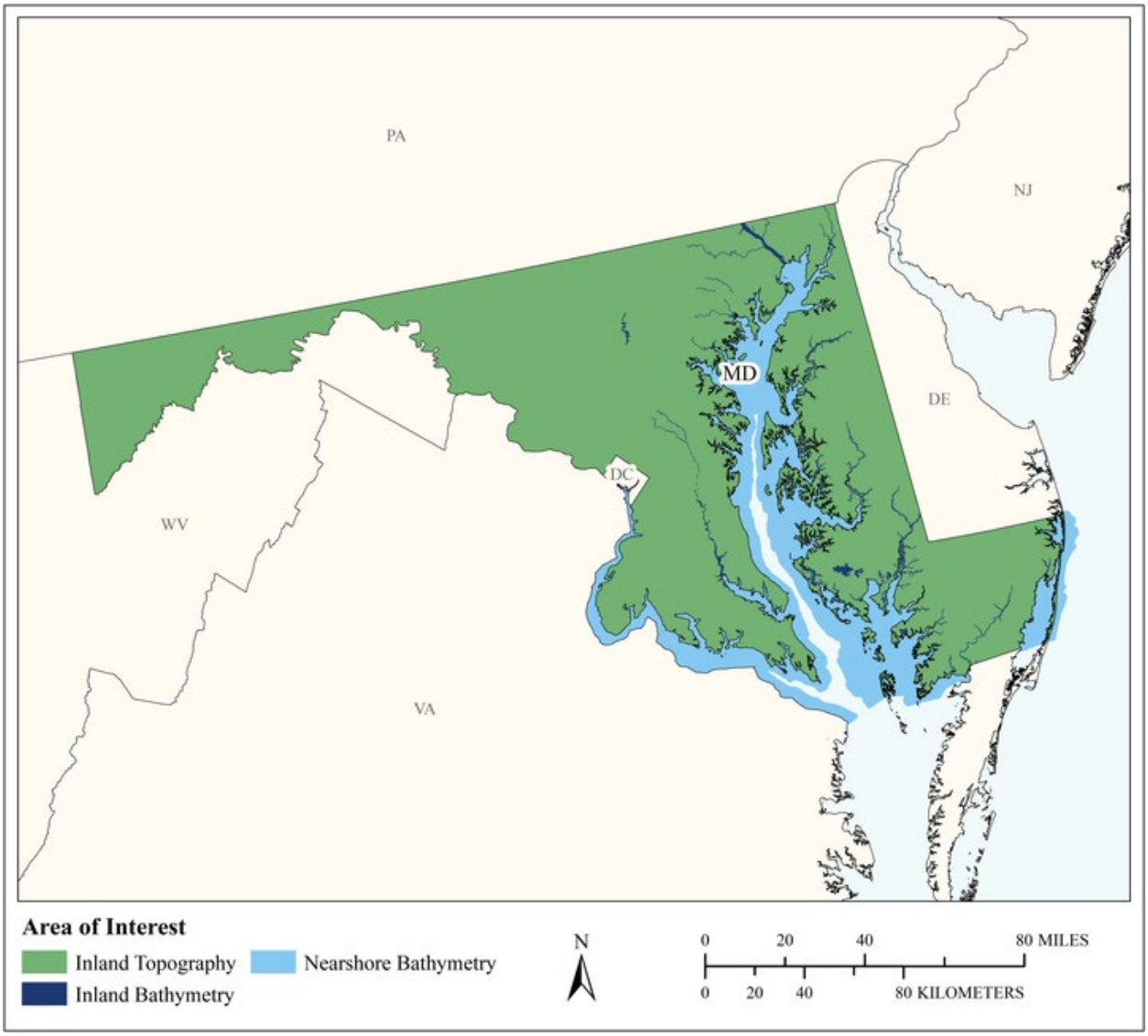
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future annual operational benefits added during validation		Annual dollars saved/ realized	$456,845					Annual dollars saved/ realized	$11,088			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide	
Value added to products or services description	Property preservation is possible based on the initial results from model outputs. Newer and improved topographic datasets allow us to update hazard models and maps. Proper flood preparations are dependent upon quality data and analysis. Temporal datasets are necessary to monitor changes in the environment.			Improved datasets lead to improved maps and services. Inclusion of Bathymetric data has potential to improve upon existing and future services and applications.			Potential for bathymetric inclusion in our MCA; however at this time we are not utilizing these datasets. Bathymetric data would allow for higher detailed analysis.					
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness description	Potential data visualizations with temporal datasets and high quality collections. Higher quality datasets will allow for higher quality maps and services. Temporal datasets, especially post disaster, can help with prevention and mitigation of future events. Improved data model inputs may provide insight into potentially hazardous flood areas that were not considered before with lower quality data. Hazard Mitigation Planning is dependent upon the input model datasets.			Potential for wave action inclusion in flood modeling and mitigation plans. Potential for additional services and maps rendered from updated model outputs.			Potential for bathymetric inclusion in our MCA; however at this time we are not utilizing these datasets. Bathymetric data would allow for higher detailed analysis.					
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Improved customer experience description	Perceived customer confidence is difficult to measure. Assumption that high quality temporal data will provide answers to some questions, and lead to new questions as well. Potential to build out services and web maps/apps based on model outputs. Particularly with higher temporally available datasets. Higher quality data typically means larger in size as well... This may actually lead to slower downloads; however the availability of temporal datasets on a statewide scale can lead to comprehensive repositories that streamline data acquisition for users.			Potential for additional services and maps rendered from updated model outputs. Additional model outputs provides options for client visualization. More data means more storage and longer load times with higher resolution products. Considerations for hardware upgrades based on the availability of data.			Potential for new apps and services for the client to share publicly. Potentially larger data requirements for updated/improved data model inputs.					
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$80,967					Annual dollars saved/ realized	$8,217			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			I don't know			Minor			I don't know		
Education or outreach description	Educating users on what data IS and what data is NOT... Higher availability of data leads to more questions being asked about data and how to properly use it. Education and outreach will ultimately expand as temporal datasets become more widely available.						Potential for training and outreach based on new model outputs					
Environmental	None			I don't know			I don't know			I don't know		
Public safety, including life and property	Major			Moderate			Minor			I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Public safety, including life and property description	Projects primarily focus on asset management/inventory based on flood modeling outputs and sea level change predictions.	Potential for bathymetric inclusion in our MCA; however at this time we are not utilizing these datasets. Bathymetric data would allow for higher detailed analysis.	Potential for bathymetric inclusion in our MCA; however at this time we are not utilizing these datasets. Bathymetric data would allow for higher detailed analysis.	

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				
Other (please specify)	Yes	Yes	Yes	Yes
Other description	Will generate our own from LAS files			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Statewide Emergency Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements		Coastal Counties of Maryland		

MCA Description	Response
Mission Critical Activity	Coastal Hazard Mitigation, Inundation Modeling, Flood Studies, Watershed Studies
MCA Title	Statewide Emergency Management
MCA ID	22422
Organization Type	State or U.S. Territorial government
Organization Name	Maryland Emergency Management
Sub-Agency or Division	
Organization Mission	To ensure that Maryland families, communities, and key stakeholders are provided the tools they need to prepare for, mitigate against, respond to, and recover from the consequences of emergency and disaster events.
Program Name	Hazard Mitigation, Operations, Recovery, Planning
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Could be used for damage assessments to structures and infrastructure

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL1B	
Update Frequency	4-5 years	4-5 years	Event driven only – Data need to coincide with a specific event.	
Event type(s)			Natural or man-made disaster	
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	
Acceptable Vertical Error	Up to 10 cm	Up to 20 cm	Up to 20 cm	
How far onshore needed			To Mean Lower Low Water (MLLW)	
How far down the beach profile needed	To MHHW		To MLLW	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Nice to have	Nice to have		Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Nice to have		Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Required	Nice to have	Nice to have		Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	
DTM	Highly desirable	Highly desirable	Highly desirable	
DEM	Required	Highly desirable	Highly desirable	
Raw point cloud data	Nice to have	Not required	Nice to have	
Classified point cloud	Nice to have	Nice to have	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	
Ground control/ground truthing	Highly desirable	Nice to have	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Highly desirable		
Land use/land cover	Required	Highly desirable		
Wetlands	Highly desirable	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Highly desirable		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	https://imap.maryland.gov/Pages/lidar.aspx	Best available	Best available	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI			Yes	
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	https://imap.maryland.gov/Pages/lidar.aspx			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know	I don't know	I don't know	
Cost savings/cost reduction	I don't know	I don't know	I don't know	
Cost avoidance	I don't know	I don't know	I don't know	
Increased revenues	I don't know	I don't know	I don't know	
Mission-driven performance improvements	I don't know	I don't know	I don't know	

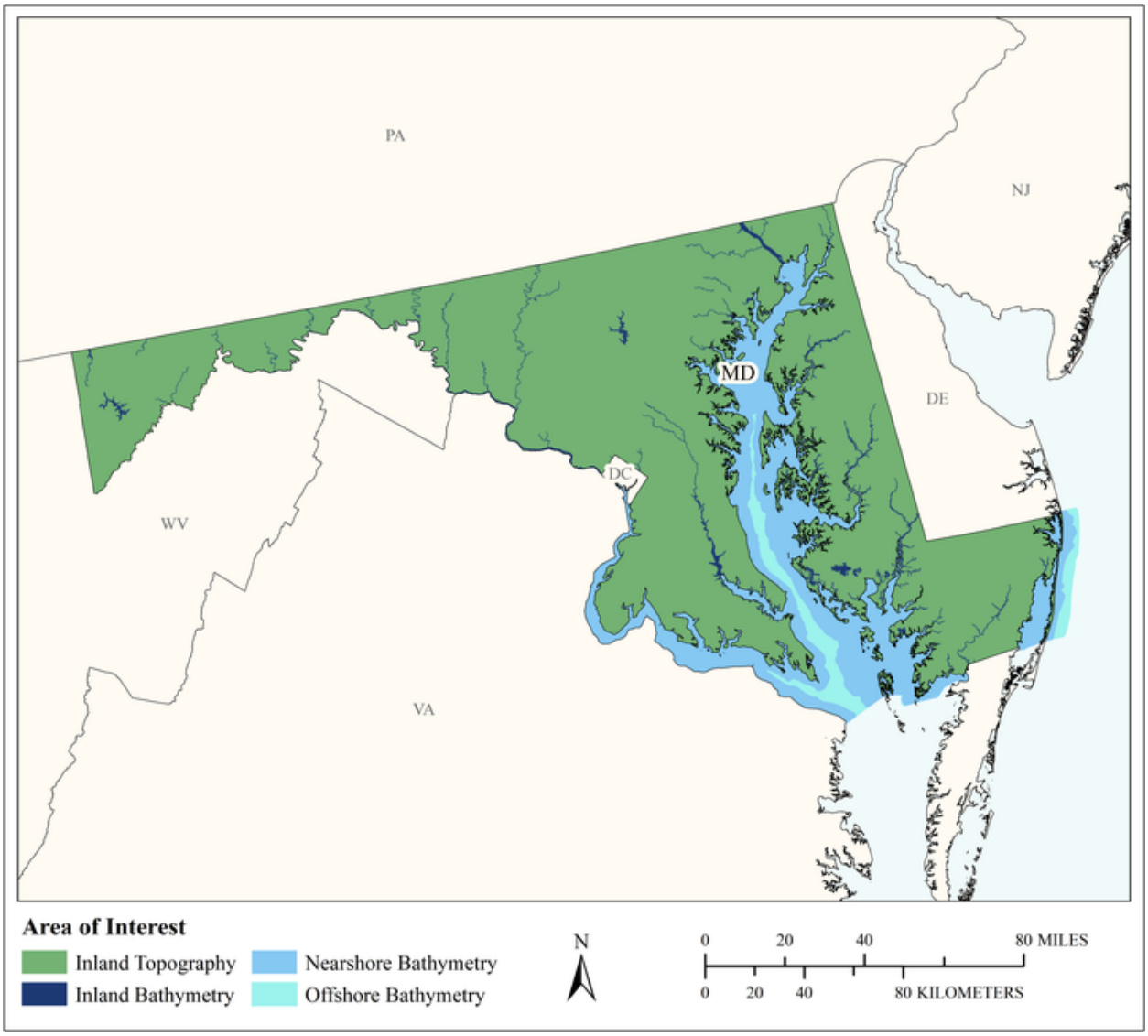
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know	I don't know	I don't know	
Improved response or timeliness	I don't know	I don't know	I don't know	
Improved customer experience	I don't know	I don't know	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	I don't know	I don't know	
Environmental	I don't know	I don't know	I don't know	
Public safety, including life and property	I don't know	I don't know	I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$462,751					Annual dollars saved/ realized	$11,088			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$80,967					Annual dollars saved/ realized	$8,217			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know			I don't know					
Environmental	I don't know			I don't know			I don't know					
Public safety, including life and property	I don't know			I don't know			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Multi-Modal Transportation Asset Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Area split by varying quality level or update frequency
Sub Area Requirements				Maryland

MCA Description	Response
Mission Critical Activity	Coastal hazard mitigation, facility/assets/roads vulnerability with sea level change, line of site analysis, storm water network modeling. Harbor dredging and dredging for the Chesapeake Bay, Ocean City, Salisbury, etc. Also sediment analysis.
MCA Title	Multi-Modal Transportation Asset Management
MCA ID	21676
Organization Type	State or U.S. Territorial government
Organization Name	Maryland DOT State Highway Administration
Sub-Agency or Division	
Organization Mission	The Maryland Department of Transportation is a customer-driven leader that delivers safe, sustainable, intelligent, and exceptional transportation solutions in order to connect our customers to life's opportunities
Program Name	NPDES (National Pollutant Discharge Elimination System), Climate Change Vulnerability Analysis
Total Annual Program Budget	
Primary Business Use	BU 16 - Sea Level Rise and Subsidence
Secondary Business Use	BU 23 - Urban and Regional Planning
Tertiary Business Use	BU 22 - Infrastructure and Construction Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Utility infrastructure (storm drains, outfalls), bottom surface, underwater archaeological features

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Other	Required
Other description	Maryland Port Administration (MPA) dredging channels

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL1B	QL1B	(a) Order 1a (b) Order 1
Update Frequency	2-3 years	2-3 years	2-3 years	(a) 6 months (b) 2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI	Coastal areas need more accuracy than higher elevation areas of state, but QL1 data will help with predictive modelling of increased "flashy" type of storm events in non-coastal areas			Every 6 months for port dredging, others 2-3 years
Acceptable Horizontal Error	Less than 20 cm	Less than 50 cm	Less than 50 cm	Up to 5 meters
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm	Less than 10 cm	Less than 1 meter
How far onshore needed			To MHW	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MHW	MHW
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Required	Required	Required	Required	Required
Entire AOI under same environmental conditions	Required	Required	Required	Required	Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Required	Required	Nice to have
DTM	Required	Required	Required	Nice to have
DEM	Required	Required	Required	Nice to have
Raw point cloud data	Nice to have	Nice to have	Nice to have	Nice to have
Classified point cloud	Required	Nice to have	Nice to have	
Edited/cube XYZ		Not required	Not required	Not required
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Not required	Not required	Not required
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Required	Nice to have	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Highly desirable	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Nice to have	Nice to have
Submerged features			Nice to have	Nice to have
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Required	Required	Not required	Not required
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Nice to have	Nice to have
Tide/wave heights			Required	Required
Sea ice conditions			Nice to have	Not required
Habitat distribution and classification			Required	Required
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Not required
Offshore cadastral			Not required	Not required
Lease areas			Not required	Not required
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Required	Required	Nice to have	Nice to have
Wetlands	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Required	Required	Nice to have	
Cultural resources	Required	Required	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	USGS QL-2 for all of Maryland	NOAA 2010 data and older data derived by the Maryland Geologic Survey 2000.	NOAA 2010 - 3 meter and 6 meter. Maryland Geologic Survey data from 2000?? Otherwise, a little of this and a little of that. Whatever we can get our hands on.	NOAA 2010 - 3 meter and 6 meter. Maryland Geologic Survey data from 2000?? Otherwise, a little of this and a little of that. Whatever we can get our hands on.
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast		Yes	Yes	Yes
NCEI		Yes	Yes	Yes
Open Topography				
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts		Yes	Yes	Yes
USGS Inland Waters server		Yes		
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes	Yes	Yes	
State repositories used	Maryland Dept of IT/GIS has a statewide data server which includes Lidar data.	Maryland Dept of IT/DOIT has a statewide data server which includes Lidar/Elevation data	Maryland Dept of IT/DOIT has a statewide data server which includes Lidar/elevation data	
Data that meet my needs are not available				

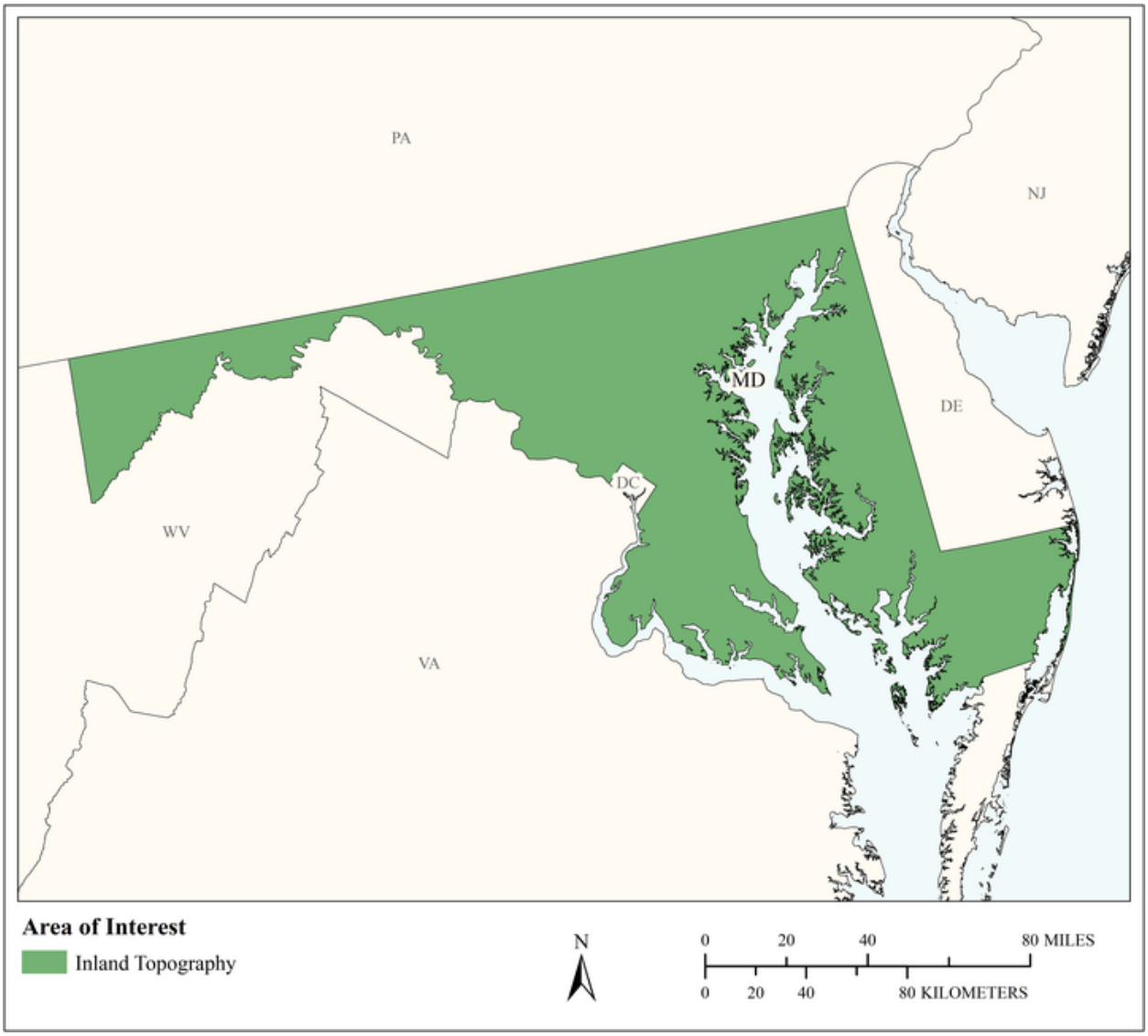
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Minor	Minor
Cost savings/cost reduction	Major	Minor	Minor	Minor
Cost avoidance	Moderate	Moderate	Moderate	Moderate
Increased revenues	None	None	None	None
Mission-driven performance improvements	Major	Moderate	Moderate	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	Major
Improved response or timeliness	Moderate	Major	Major	Major
Improved customer experience	Moderate	Major	Major	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	None	None
Environmental	Moderate	Moderate	Moderate	Moderate
Public safety, including life and property	Major	Moderate	Minor	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Other operational benefits	Moderate	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$291,681		Annual dollars saved/ realized	$82,144						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Other customer service benefits	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$5,155		Annual dollars saved/ realized	$5,240						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major			Major		
Education or outreach description	Flood Insurance Program						Flood Insurance Program					
Environmental	Major			Major			Major			Major		
Environmental description	Mapping of all streams within Maryland for improved water quality, wetland and near shore SAV						Mapping of all streams within Maryland for improved water quality, wetland and near shore SAV					
Public safety, including life and property	Major			Major			Major			Major		
Public safety, including life and property description	Flood mapping/modeling for FEMA						Flood mapping/modeling for FEMA					
Other												
Other benefits	Major						Major					
Other description	More accurate elevation required for NHD/WBD enhancements/updates						More accurate elevation required for NHD/WBD enhancements/updates					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes	Yes	
Hydrologic Flow Accumulation Grids	Yes	Yes	Yes	
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	Yes
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	1
Update frequency	3

MCA Title: Wildfire Management, Planning, and Response



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of forest fuel and fire susceptibility. Fire behavior modeling to support wildfire suppression activities. Wildland/urban interface building identification. Post fire analysis to determine landslide prone areas.
MCA Title	Wildfire Management, Planning, and Response
MCA ID	60218
Organization Type	State or U.S. Territorial government
Organization Name	State of Maryland
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 17 - Wildfire Management, Planning, and Response
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

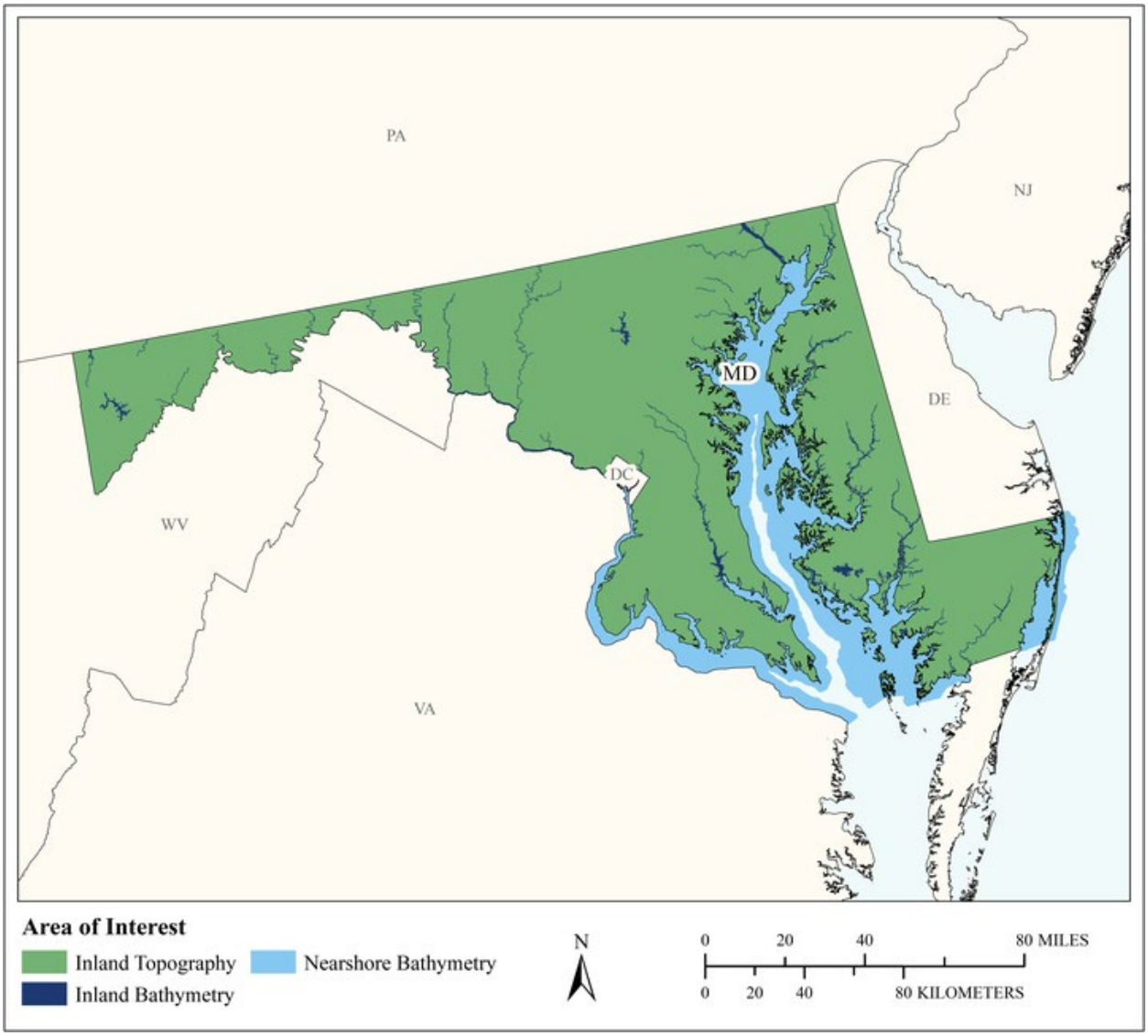
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$53,123									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Statewide Geospatial Services



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	The Maryland Department of Information Technology, Geographic Information Office provides a centralized enterprise GIS platform to store and serve GIS data. Additionally, we have initiatives that include the collection and dissemination of core framework layers such as LiDAR and Imagery. We provide services for the majority of the BUs listed.
MCA Title	Statewide Geospatial Services
MCA ID	11478
Organization Type	State or U.S. Territorial government
Organization Name	Maryland Department of Information Technology
Sub-Agency or Division	
Organization Mission	1) Improve the quality and lower the cost of government services, through collective investment in and effective application of geospatial data and systems and 2) Reach beyond government by making data freely and publicly available to the fullest extent possible in consideration of privacy and security. To succeed in this mission, the GIO Office administers and monitors a number of initiatives. These include, but are not limited to: Maintenance and support of the State's Enterprise GIS, making maps, apps and services available to GIS end users. Management of the State's GIS Software Master Contract, providing software, training and technical support to employees of eligible State agencies. Communication of statewide GIS pursuits and interests through this website, as well as, other social media outlets and GIS partners, including MSGIC and TUgis. The GIO Office strives to support existing and future efforts to improve the quality of GIS in Maryland through coordination and collaboration with the larger GIS community.
Program Name	The Maryland Department of Information Technology, Geographic Information Office provides direct support to the Maryland Emergency Management Agency (MEMA) for the State Emergency Operations Center. Our office provides the OSPREY Platform for Situational Awareness
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Required
Tops of vegetation	Not required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)

General Geographic Area and Size	
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	In the case of Emergency Management, we are likely looking at buildings and roads

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL1B	
Update Frequency	2-3 years	2-3 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed			To the fall line	
How far down the beach profile needed	To MHW		To MLLW	
Tide correction requirement			No requirement for tide correction	
Cross sections and/or transects meet needs	Partial	Partial	Partial	
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Nice to have		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Highly desirable	
DTM	Highly desirable	Highly desirable	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Required	Required	Required	
Classified point cloud	Highly desirable	Required	Required	
Edited/cube XYZ		Not required	Not required	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Not required	Not required	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Not required	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)			Not required	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Not required	Not required	Not required	
Ground control/ground truthing	Not required	Not required	Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required	Required	Highly desirable	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Not required	
Submerged features			Not required	
Subbottom characteristics			Not required	
Geologic and seismic data	Not required	Not required	Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Not required	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	
Estuaries			Nice to have	
Inland surface water features	Highly desirable	Highly desirable	Highly desirable	
Bridges/culverts	Nice to have	Not required		
Landmark features	Not required	Not required	Not required	
Cultural resources	Not required	Not required	Not required	
Coastal and riverine structures	Nice to have	Not required	Not required	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy

Current dataset used	COUNTY DATE COLLECTION NAME POINT SPACING DEM RESOLUTION VERTICAL ACCURACY (RMSE) PROJECT PARTNERS FULL METADATA Allegany 2012 FEMA Region 3 FY12 LiDAR: Allegany, Frederick and Washington 0.5 m 1m 3.2ft 13.0 cm Funded by NRCS and FEMA Contracted through USGS Link Anne Arundel 2011 Anne Arundel County LiDAR 1.4 m 0.9m 3ft 15.0 cm Anne Arundel County Link Baltimore City 2015 MD / PA Sandy Supplemental LiDAR 0.7 m 0.7m 2.3ft 15.6 cm USGS Link Baltimore 2015 Baltimore County LiDAR 0.7 m 0.7m 2.3ft 6.79 cm Baltimore County Link Calvert 2011 Calvert County LiDAR 1.4 m 2m 6.6ft 18.5 cm Calvert County Link Caroline 2013 Hurricane Sandy Supplemental LiDAR: Caroline, Dorchester 0.7 m 1m 3.2ft 16.2 cm USGS Link Carroll 2015 MD / PA Sandy Supplemental LiDAR 0.7 m 0.7m 2.3ft 15.6 cm USGS Link Cecil 2013 Cecil County HD	We are currently not using inland bathymetry	No bathymetric data currently being used.	

	LiDAR 0.46m 0.6m 2ft 12.5 cm Cecil County, USGS Link Charles 2014 Hurricane Sandy Supplemental LiDAR: Charles, Prince George's and St. Mary's 0.7 m 0.9m 3ft 11.5 cm USGS Link Dorchester 2013 Hurricane Sandy Supplemental LiDAR: Caroline, Dorchester 0.7 m 0.9m 3ft 16.2 cm USGS Link Frederick 2012 FEMA Region 3 FY12 LiDAR: Allegany, Frederick and Washington 0.5 m 1m 3.2ft 10.0 cm Funded by NRCS and FEMA Contracted through USGS Link Garrett 2015 Garrett County LiDAR 0.7 m 1m 3.2ft 7.2 cm Garrett County, USGS Link Harford 2013 Harford County LiDAR 1.2 m 1.5m 4.9ft 6.8 cm Harford County Link Howard 2011 Howard County LiDAR 1.4 m 2m 6.6ft 18.5 cm Howard County Link Kent 2015 MD / PA Sandy Supplemental LiDAR 0.7 m 0.7m 2.3ft 15.6 cm USGS Link Montgomery 2013 Montgomery County LiDAR 0.9 m 1.2m 3.9ft 5.24 cm Montgomery County Link Prince George's 2014 Hurricane			

	Sandy Supplemental LiDAR: Charles, Prince George's and St. Mary's 0.7 m 0.9m 3ft 11.5 cm USGS Link Queen Anne's 2013 Queen Anne's County HD LiDAR 0.46 m 0.6m 2ft 12.5 cm Queen Anne's County Link Somerset (Riverine) 2011 Pocomoke and Atlantic Coastal Watersheds in Maryland 0.7 m 1m 3.2ft 9.25 cm Funded by NRCS Contracted through USGS Link Somerset (Western) 2012 NRCS Maryland LiDAR: Somerset and Wicomico 0.7 m 1m 3.2ft 8.0 cm Funded by NRCS Contracted through USGS Link St. Mary's 2014 Hurricane Sandy Supplemental LiDAR: Charles, Prince George's and St. Mary's 0.7 m 0.9m 3ft 11.5 cm USGS Link Talbot 2015 MD / PA Sandy Supplemental LiDAR 0.7 m 0.7m 2.3ft 15.6 cm USGS Link Washington 2012 FEMA Region 3 FY12 LiDAR: Allegany, Frederick and Washington 0.5 m 1m 3.2ft 10.0 cm Funded by NRCS and FEMA Contracted through USGS Link Washington, D.C. 2014 Hurricane Sandy			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
	Supplemental LiDAR 0.7 m 1m 3.2ft 11.5 cm USGS Link Wicomico (Riverine) 2011 Pocomoke and Atlantic Coastal Watersheds in Maryland 0.7 m 1m 3.2ft 9.25 cm Funded by NRCS Contracted through USGS Link Wicomico (Western) 2012 NRCS Maryland LiDAR: Somerset and Wicomico 0.7 m 1m 3.2ft 8.0 cm Funded by NRCS Contracted through USGS Link Worcester (Coastal) 2011 VA FEMA LiDAR: Coastal Worcester 0.5 m 1m 3.2ft 9.25 cm Funded by NRCS Contracted through USGS Link Worcester (Riverine) 2011 Pocomoke and Atlantic Coastal Watersheds in Maryland 0.7 m 1m 3.2ft 9.25 cm Funded by NRCS Contracted through USGS Link			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast		Yes	Yes	
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				

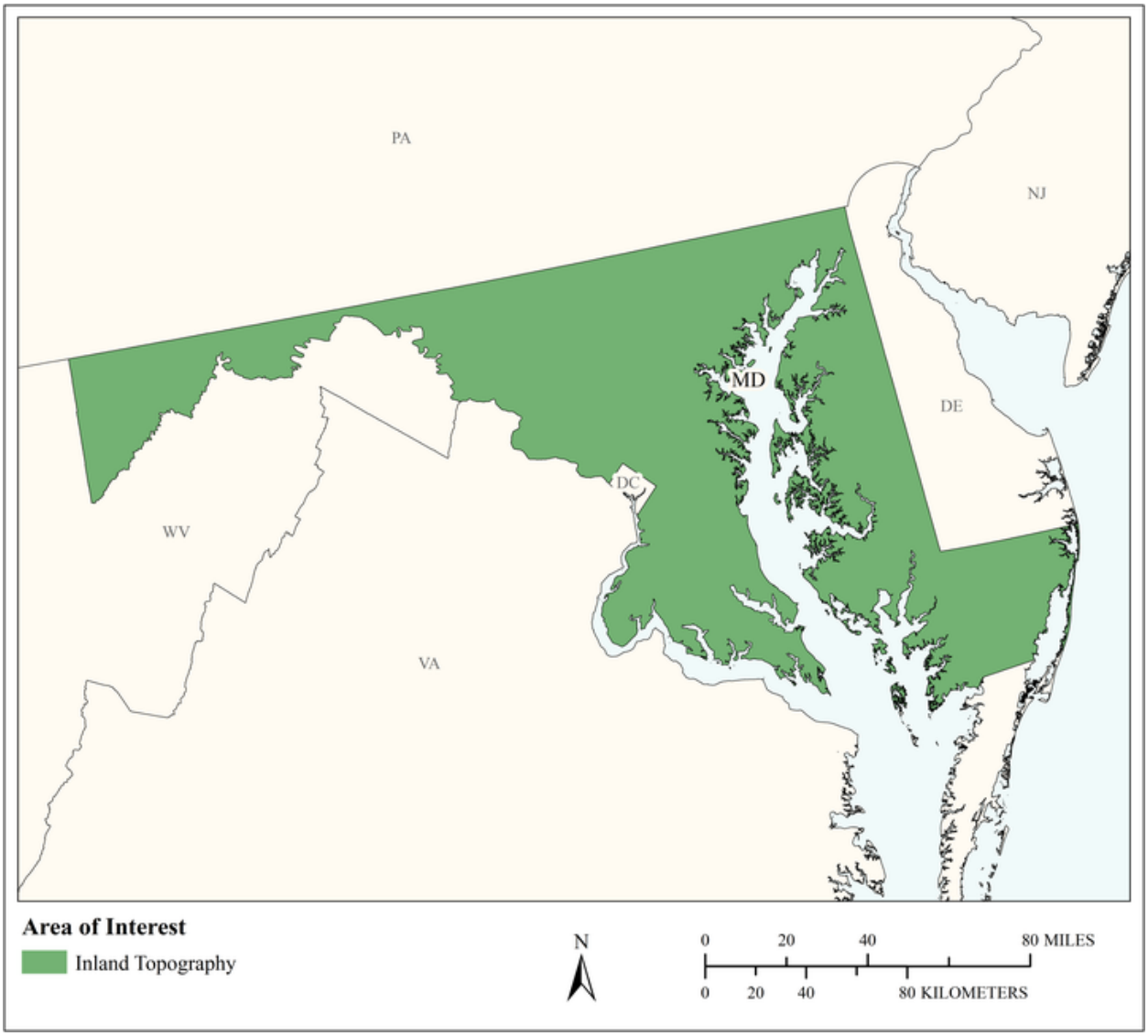
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Marine Minerals Program GIS				
State Repositories	Yes	Yes	Yes	
State repositories used	MD iMAP Topography Server (https://lidar.geodata.md.gov/imap/rest/services)	MD iMAP LiDAR Services	MD iMAP LiDAR Services	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Inland bathy data not available	Moderate	
Cost savings/cost reduction	Moderate	Inland bathy data not available	Major	
Cost avoidance	Moderate	Inland bathy data not available	Major	
Increased revenues	None	Inland bathy data not available	None	
Mission-driven performance improvements	Moderate	Inland bathy data not available	Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available	Major	
Improved response or timeliness	Major	Inland bathy data not available	Moderate	
Improved customer experience	Major	Inland bathy data not available	Moderate	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Inland bathy data not available	Moderate	
Environmental	Moderate	Inland bathy data not available	Major	
Public safety, including life and property	Moderate	Inland bathy data not available	Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Time savings description	Agencies such as the Maryland Department of Environment perform these tasks. Avoids contractual work to correct data. Collection at same QL level and resolution will save time trying to normalize data.											
Cost savings/cost reduction	Major	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost avoidance description	Contractor costs saved.											
Increased revenues	I don't know	Unable to provide		None			None					
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			Moderate					
Environmental	Moderate			Major			Major					
Public safety, including life and property	Major			Major			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes	Yes	
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Land Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Road and railroad route selection and maintenance. Slope analysis for autonomous cars. GPS navigation visualization.
MCA Title	Land Navigation and Safety
MCA ID	60219
Organization Type	State or U.S. Territorial government
Organization Name	State of Maryland
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 19 - Land Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

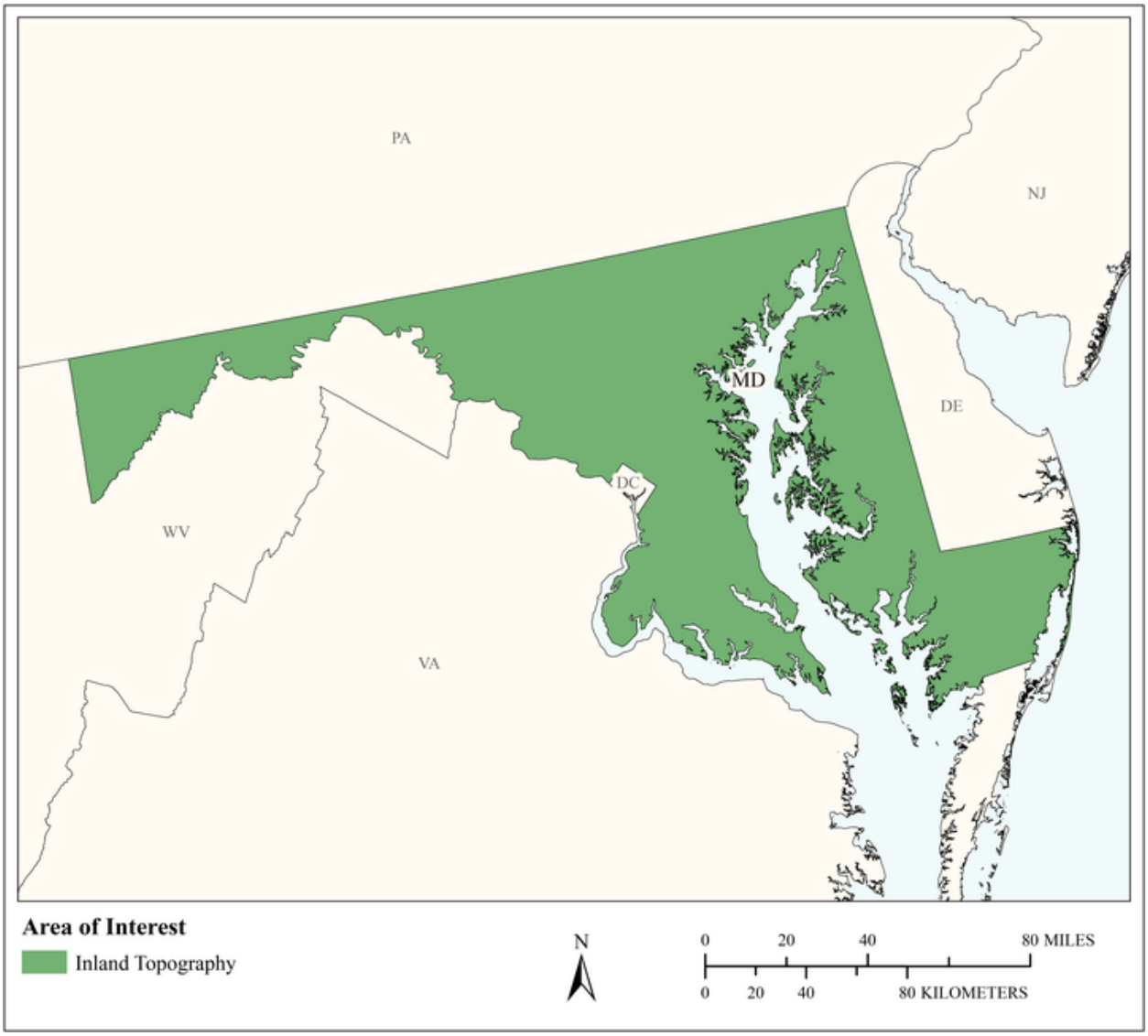
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Moderate			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Moderate	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$128,085									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$10,343									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Aviation Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of in-flight hazards and path obstructions. Aeronautical charting. Runway construction and repair.
MCA Title	Aviation Navigation and Safety
MCA ID	60220
Organization Type	State or U.S. Territorial government
Organization Name	State of Maryland
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 21 - Aviation Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes			
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Major			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

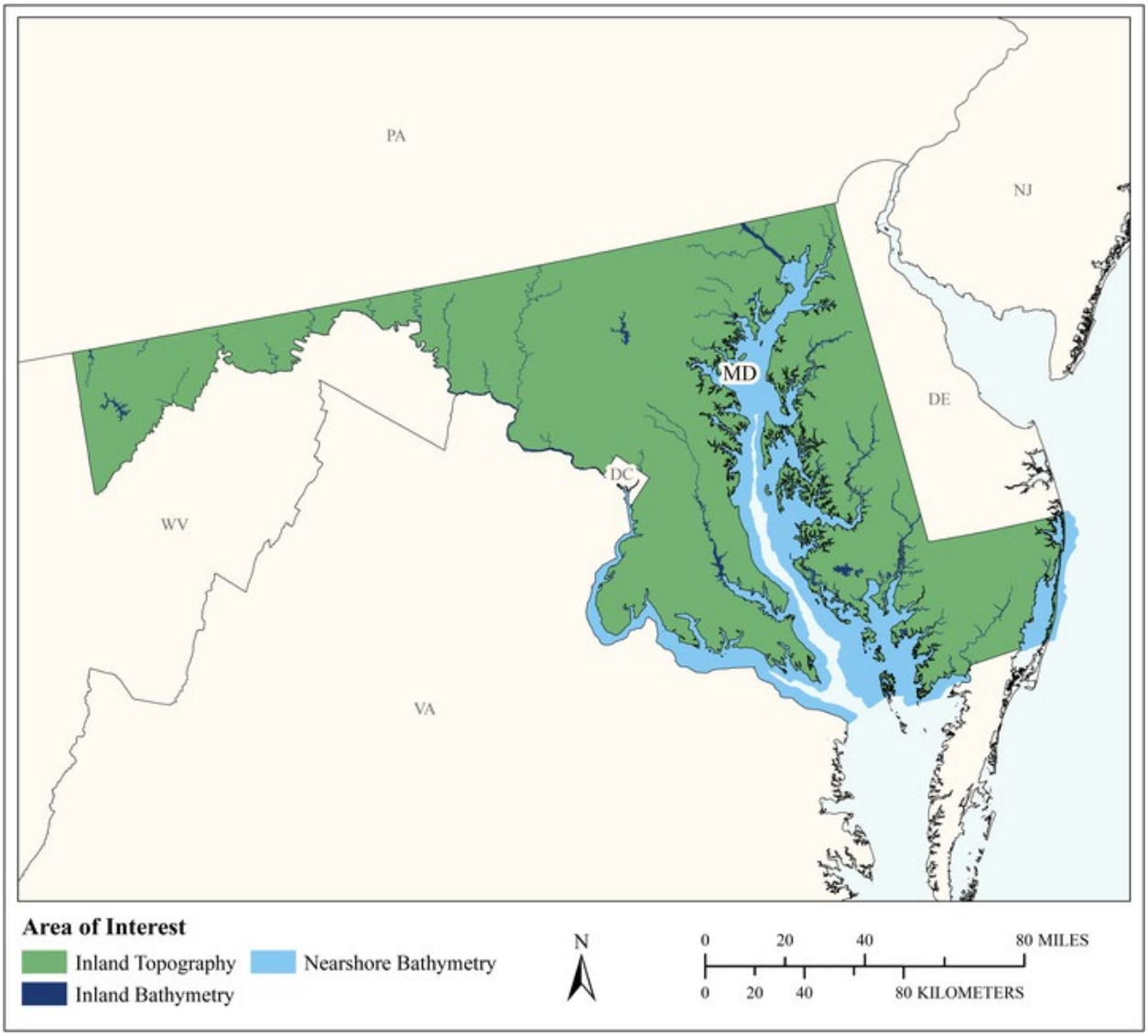
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$33,424									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$41,629									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Moderate											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Infrastructure and Construction Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Marine construction. Bridge design and construction. Engineering and construction of dams, levees, dikes, reservoirs, and coastal structures. Shipyard and port construction. Water, sewer, or power line planning and vegetation analysis. Pump, drain, and well placement. Stormwater modeling. Cut and fill analysis for earth-moving. Building site analysis. Road infrastructure. Infrastructure hardening or mitigation for climate change effects, e.g. sea level change.
MCA Title	Infrastructure and Construction Management
MCA ID	60221
Organization Type	State or U.S. Territorial government
Organization Name	State of Maryland
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B	QL1B	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Highly desirable	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Nice to have	Nice to have	
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	
Ground control/ground truthing	Required	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Highly desirable	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Nice to have	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Highly desirable	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Required	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	
Cost savings/cost reduction	Major	Major	Minor	
Cost avoidance	Major	Moderate	Minor	
Increased revenues	Minor	None	None	
Mission-driven performance improvements	Moderate	Moderate	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate	Minor	

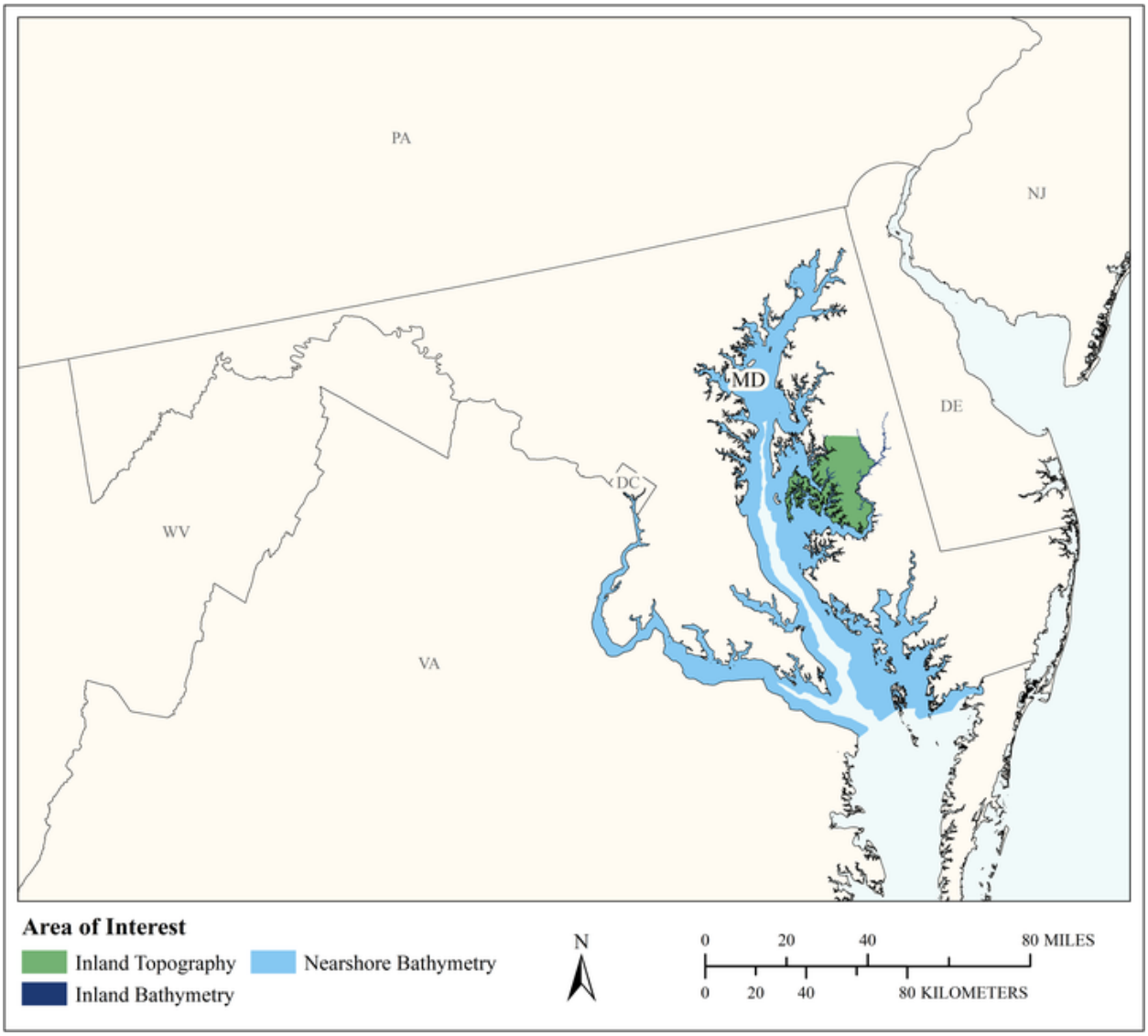
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major	Minor	
Improved customer experience	Moderate	Minor	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	Minor	
Environmental	Moderate	Minor	Minor	
Public safety, including life and property	Moderate	Moderate	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Increased revenues	None			None			Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$444,339		Annual dollars saved/ realized	$149,705		Annual dollars saved/ realized	$3,671			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,307,601		Annual dollars saved/ realized	$15,545		Annual dollars saved/ realized	$504			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			Minor					
Environmental	Moderate			Moderate			Moderate					
Public safety, including life and property	Major			Moderate			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Talbot County Government



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	Custom description	Custom description	
Sub Area Requirements	Talbot County, MD	Miles River, Choptank River, Chesapeake Bay, Tred Avon River, Harris Creek, Tuchahoe River, and Wye River	Bay waters of Maryland	

MCA Description	Response
Mission Critical Activity	The GIS staff in Talbot County Maryland actively supports all county departments including Emergency Services, Planning and Zoning, Permits and Inspections, Public Works, Parks and Recreation. We also provide GIS support to the municipalities, residential and business communities. Our primary engagement with issues regarding the need for high resolution elevation data include floodplain management, stormwater management, sea level rise, permitting in coastal communities, hazardous mitigation project, environmental planning and protection, tracking impervious surfaces, road maintenance, development review, damage assessment (tidal flooding), water and sewer service, water and sewer service extension planning, well head protection, emergency shelter evaluation, evacuation routes, boat ramp and landings maintenance, etc.
MCA Title	Talbot County Government
MCA ID	1113
Organization Type	Regional, County, City, or other local government
Organization Name	Talbot County Public Works
Sub-Agency or Division	
Organization Mission	The Talbot County government is committed to providing the best possible service to the citizens who have given us their public trust. The County strives to preserve the rural and agricultural character of the area, while promoting economic development and protecting the environment and natural resources so that the special quality of life we enjoy remains intact.
Program Name	The development of the Talbot County Comprehensive Plan is the primary critical activity that established the goals and future activity.
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 22 - Infrastructure and Construction Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Road side ditches, drainage features through vegetated areas, sheds, barns, berms,

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Not required
5.1 – 10 acres	Not required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B	QL2B	
Update Frequency	6-10 years	6-10 years	>10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	Up to 1 meter	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 40 cm	
How far onshore needed			To Mean Higher High Water (MHHW)	
How far down the beach profile needed	To MLLW		Below MLLW	
Tide correction requirement			Any tide correction is acceptable, as long as it is defined	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Not required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required	Not required		Not required	Not required
Entire AOI under same environmental conditions	Required	Highly desirable	Not required		Not required	Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Not required	Highly desirable		Not required	Not required
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Not required	Not required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Not required	Not required	
DTM	Not required	Not required	Not required	
DEM	Required	Required	Required	
Raw point cloud data	Not required	Not required	Not required	
Classified point cloud	Not required	Nice to have	Not required	
Edited/cube XYZ		Not required	Not required	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Not required	Not required	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Not required	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Nice to have	Not required	Highly desirable	
Ground control/ground truthing	Highly desirable	Nice to have	Highly desirable	
Other			Required	
Other description			Metadata	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Not required	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required	Not required	Not required	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Not required	
Submerged features			Highly desirable	
Subbottom characteristics			Not required	
Geologic and seismic data	Not required	Not required	Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Highly desirable	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Not required	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Required	Highly desirable	Highly desirable	
Land use/land cover	Not required	Nice to have	Nice to have	
Wetlands	Not required	Nice to have	Nice to have	
Estuaries			Not required	
Inland surface water features	Highly desirable	Highly desirable	Nice to have	
Bridges/culverts	Highly desirable	Nice to have		
Landmark features	Not required	Not required	Nice to have	
Cultural resources	Not required	Not required	Not required	
Coastal and riverine structures	Highly desirable	Nice to have	Nice to have	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	December 2015 LiDAR Sandy Supplemental DEM	NOAA National Ocean Service Bathymetry of the Chesapeake Bay and Tributaries (coarse) Approx 1998 plus or minus	NOAA NOS Chesapeake Bay and Tributaries (?10 meter?) DEM approx 1998	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other	Yes	Yes	Yes	
Other description	USGS / Local Files	NOAA NOS / Local files	NOAA NOS download from 1998ish	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	None	
Cost savings/cost reduction	Major	Minor	None	
Cost avoidance	Major	Minor	None	
Increased revenues	I don't know	None	None	
Mission-driven performance improvements	Major	Minor	None	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Minor	
Improved response or timeliness	Major	Minor	None	
Improved customer experience	Major	Minor	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor	None	
Environmental	Major	Minor	None	
Public safety, including life and property	Major	Minor	None	

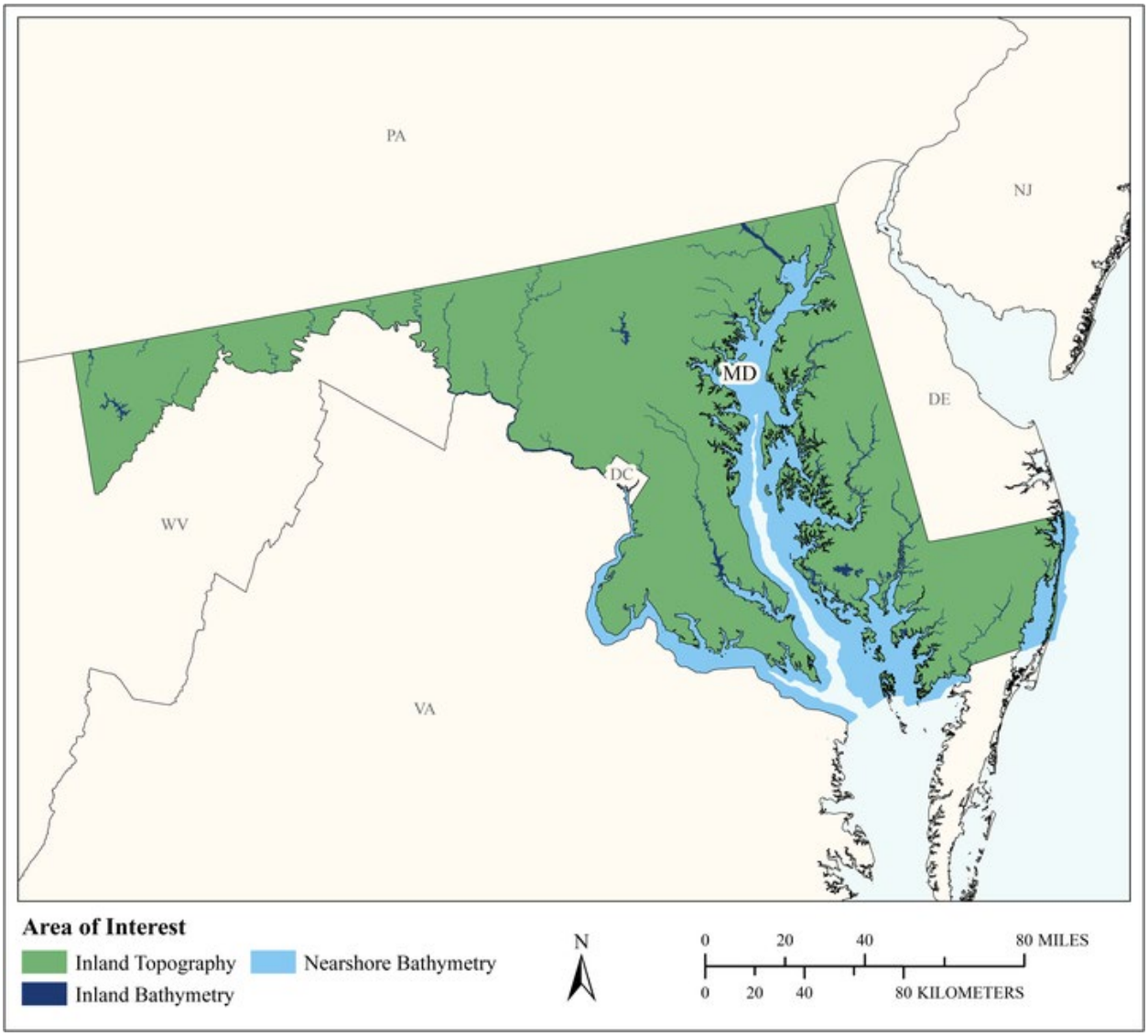
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$93,465	Minor	Annual dollars saved/realized	$1,357	Minor	Annual dollars saved/realized	$1,357			
Time savings description	Digital distribution avoids staff effort and improves customer service. Staff can better prepare and follow up with accurate information. Better information results in better design and decision making. Digital data can be displayed via web mapping and save valuable time. Answer here overlaps with hours saved in answers above. Improves site evaluation accuracy and reliability, better visuals.			2 hrs @ 15 trips / 2. 2hrs @ 30 trips / 2.			2hrs @ 30 trips / 2. 2 hrs @ 15 trips / 2.					
Cost savings/cost reduction	Moderate	Annual dollars saved/realized	$200	Minor	Annual dollars saved/realized	$625	Minor	Annual dollars saved/realized	$625			
Cost savings/cost reduction description	Saved staff time on LiDAR collection and project management.			$50 @ 200 hrs / 8 yrs assuming 8 yr data collection cycle / 2.			$50 @ 200 hrs / 8 yrs assuming 8 yr data collection cycle / 2.					
Cost avoidance	Major	Annual dollars saved/realized	$1,050	Minor	Annual dollars saved/realized	$625	Minor	Annual dollars saved/realized	$625			
Cost avoidance description	People will make a decision with or without the best data available. A problem avoided. Staff time saved. Derived products and added value analysis would save staff time. Improved decision making for hazardous mitigation projects.			$50 @ 200 hrs / 8 yrs / 2.			$50 @ 200 hrs / 8 yrs /2.					
Increased revenues	None			Moderate	Annual dollars saved/realized	$13,500	Moderate	Annual dollars saved/realized	$13,500			
Increased revenues description				Oyster bar restoration and water quality improvement / HTML benefits. Increased ability to identify habitat and environmental threats.			Oyster bar restoration and water quality improvement / HTML benefits. Increased ability to identify habitat and environmental threats.					
Mission-driven performance improvements	Moderate	Annual percent improvement	40%	Major	Annual percent improvement	10%	Major	Annual percent improvement	10%			
Mission-driven performance improvements description				80% / 8 yrs Environmental / water quality projects / maritime industry and tourism. 80% / 8 yrs.			80% / 8 yrs Environmental / water quality projects / maritime industry and tourism. 80% / 8 yrs.					
Other operational benefits	Major	Annual dollars saved/realized	$301,500	Moderate	Annual dollars saved/realized	$376,875	Moderate	Annual dollars saved/realized	$376,875			
Other operational benefits description	The general public still does not read or frequently use elevation data. Elevevation is largest untapped potential.			Improved SLOSH Models. Improvement in velocity wave action, wave height, and LIMWA designations.			Improved SLOSH Models. Improvement in velocity wave action, wave height, and LIMWA designations.					
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Annual dollars saved/realized	$650,000	Minor	Annual dollars saved/realized	$401,875	Minor	Annual dollars saved/realized	$401,875			
Value added to products or services description	Tidal flooding mitigation and improved floodplain policy. Public outreach maps with high value information easy to read.			Hazard identification relates to maritime safety / Flood hazard mitigation. Improved navigation products relates to more maritime related tourism.			Hazard identification relates to maritime safety / Flood hazard mitigation. Improved navigation products relates to more maritime related tourism.					
Improved response or timeliness	Moderate	Annual dollars saved/realized	$13,568	Minor	Annual dollars saved/realized	$9,250	Minor	Annual dollars saved/realized	$9,250			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Improved response or timeliness description	Information resources become available for developers / buyers to protect their assets. Added value to be able to generate quick custom flood inundation maps. Better information results in better decisions both public and privately. Digital web products help. Both parties can reference the same high quality information. Better information system tools don't necessarily relate to faster approvals. Low probability but high impact. Better decision when allocating recovery resources.			Public outreach through interactive maps. Related to improved prediction of road closure. Hazardous mitigation decision making improved and implemented. Staff time savings. Improved product reliability and decision making resources.			Public outreach through interactive maps. Related to improved prediction of road closure. Hazardous mitigation decision making improved and implemented. Staff time savings. Improved product reliability and decision making resources.					
Improved customer experience	Moderate	Annual dollars saved/realized	$48,240	Moderate	Annual dollars saved/realized	$3,000	Moderate	Annual dollars saved/realized	$3,000			
Improved customer experience description	Unknown future products will be helpful. Both staff and customers have access to the same high quality information. Easily searchable high quality GIS data for download is very valuable.			New data products for public outreach. Reliable authoritative source / easy to use and interpret. Better data equals better decision making.			New data products for public outreach. Reliable authoritative source / easy to use and interpret. Better data equals better decision making.					
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate					
Education or outreach description	What if scenarios and easy to understand visuals will help educators			Improved data equals better tools for scientific and environmental impact analysis.			Improved data equals better tools for scientific and environmental impact analysis.					
Environmental	Moderate			Moderate			Moderate					
Environmental description	Analysis and decisions are made easy by open source high quality elevation data			Ability to measure and quantify with precision and adjust scientific methods			Ability to measure and quantify with precision and adjust scientific methods					
Public safety, including life and property	Moderate			Moderate			Moderate					
Public safety, including life and property description	Good and easy to understand visual tools will save lives			Hazard identification and improved navigation tools / emergency response improves			Hazard identification and improved navigation tools / emergency response improves					
Other	Better land use decisions											
Other benefits	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Land Use Planning and Analysis



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Land use analysis (includes residential growth and density analyses; land use/land cover mapping; analyses regarding the status, vulnerability, threat and stability of rural resource lands; and development capacity analyses)
MCA Title	Land Use Planning and Analysis
MCA ID	1263
Organization Type	State or U.S. Territorial government
Organization Name	Maryland Department of Planning
Sub-Agency or Division	
Organization Mission	The Maryland Department of Planning collaborates with state agencies, local governments and the private sector, providing assistance and data so that each community can shape their future in a way that reflects local values, honors its heritage and presents opportunities for Maryland to flourish. Planning facilitates the coordination of planning efforts statewide. Planning provides essential planning data, information and analysis for the state of Maryland. Planning plays an important role in preserving Maryland's heritage and conserving its natural resources
Program Name	Planning Services Division
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 06 - Natural Resources Conservation
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Building footprints, agricultural fields, and site development constraints such as steep slopes, wooded areas, and wetlands/waterways. We generally compile data at the individual property scale to complete analyses at larger scales (e.g. to generate larger generalized landscapes, or complete land use analysis at the zip code, town, or county scale).

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required

Inland Bathy Feature Size Requirements	Response
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B	QL2B	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter	Up to 1 meter	
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 40 cm	
How far onshore needed			To MHW	
How far down the beach profile needed	To MHW		To MLLW	
Tide correction requirement			MHW	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Not required
Hydro-conditioning	Highly desirable
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	
DTM	Nice to have	Nice to have	Nice to have	
DEM	Required	Required	Required	
Raw point cloud data	Not required	Not required	Not required	
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Not required	Not required	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Not required	Not required	
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Not required	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Not required	Not required	Not required	
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Not required	
Geologic and seismic data	Not required	Not required	Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Required	
Routes			Highly desirable	
Offshore cadastral			Required	
Lease areas			Highly desirable	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Required	Required	Required	
Wetlands	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Nice to have	Nice to have	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Lidar data for Maryland counties collected between 2011 and 2015. Point cloud and DEMs downloadable from MD iMap at http://imap.maryland.gov/Pages/lidar-download.aspx (Can Download Aspect, Shaded Relief, DEM, Hillshade, Slope and Point Cloud data) Point spacing varies by county (~0.46 to 1.4 meters). DEM Resolution ranges from ~0.6 m to 2m (http://imap.maryland.gov/Pages/lidar-metadata.aspx)	Lidar data for Maryland counties collected between 2011 and 2015. Point cloud and DEMs downloadable from MD iMap at http://imap.maryland.gov/Pages/lidar-download.aspx (Can Download Aspect, Shaded Relief, DEM, Hillshade, Slope and Point Cloud data) Point spacing varies by county (~0.46 to 1.4 meters). DEM Resolution ranges from ~0.6 m to 2m (http://imap.maryland.gov/Pages/lidar-metadata.aspx)	Not currently using nearshore bathymetric data	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	Lidar data are available through MdImap, a central GIS data portal for the State of Maryland: http://imap.maryland.gov/Pages/lidar-download.aspx Users can view the data interactively or download it.	Lidar data are available through MdImap, a central GIS data portal for the State of Maryland: http://imap.maryland.gov/Pages/lidar-download.aspx Users can view the data interactively or download it.		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know	I don't know	None	
Cost savings/cost reduction	None	None	None	
Cost avoidance	None	None	None	
Increased revenues	None	None	None	
Mission-driven performance improvements	Moderate	Moderate	None	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate	None	
Improved response or timeliness	None	None	None	
Improved customer experience	Moderate	Moderate	None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	None	None	
Environmental	Moderate	Moderate	None	
Public safety, including life and property	I don't know	I don't know	None	

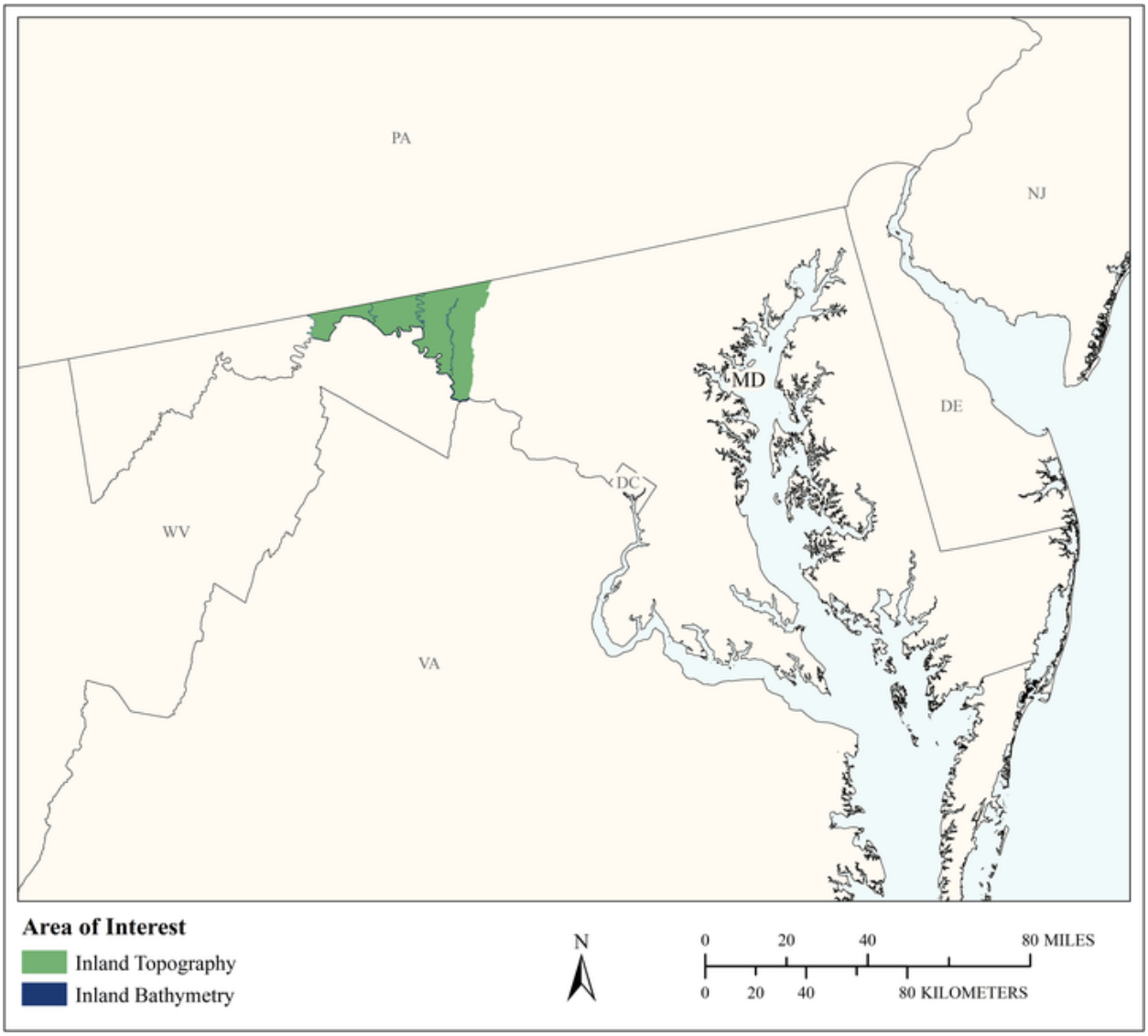
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Time savings description	Seamless integration of 3D data and derivatives would reduce the need to collect data from external sources for mapping purposes. Seamless integration of 3D data and derivatives would reduce the need to collect and align data from multiple sources.			Seamless integration of 3D data and derivatives would reduce the need to collect data from external sources for mapping purposes. Seamless integration of 3D data and derivatives would reduce the need to collect and align data from multiple sources.			Seamless integration of 3D data and derivatives would reduce the need to collect and align data from multiple sources. Seamless integration of 3D data and derivatives would reduce the need to collect data from external sources for mapping purposes.					
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide				
Cost avoidance description	High resolution land cover data (and derivatives) would improve the quality of site development constraint analyses.			High resolution land cover data (and derivatives) would improve the quality of site development constraint analyses.								
Increased revenues	None			None			None					
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Mission-driven performance improvements description	Improved 3D data would enhance land use analyses and related data products, comprehensive plan reviews, and technical assistance projects that may contribute to planning decisions. Additionally, it would enable visualization projects (e.g. flyovers for transit oriented development areas, site selection analyses, etc.). More accurate base data for land use analysis would contribute to the organization's mission to provide essential planning data, information and analysis for Maryland.			Improved 3D data would enhance land use analyses and related data products, comprehensive plan reviews, and technical assistance projects that may contribute to planning decisions. Additionally, it would enable visualization projects (e.g. flyovers for transit oriented development areas, site selection analyses, etc.). More accurate base data for land use analysis would contribute to the organization's mission to provide essential planning data, information and analysis for Maryland. Improved land use analyses based on improved land use / land cover data would facilitate planning decisions across the state.			Improved 3D data would enhance land use analyses and related data products, comprehensive plan reviews, and technical assistance projects that may contribute to planning decisions. Additionally, it would enable visualization projects (e.g. flyovers for transit oriented development areas, site selection analyses, etc.). More accurate base data for land use analysis would contribute to the organization's mission to provide essential planning data, information and analysis for Maryland.					
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,660,327									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Value added to products or services description	High resolution land cover data (and derivatives) would improve the quality of site development constraint analyses.			Many of our products (analyses) rely on an accurate land use/land cover dataset.			High resolution land cover data (and derivatives) would improve the quality of site development constraint analyses.					
Improved response or timeliness	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide				
Improved customer experience description	Many of our products (analyses) rely on an accurate land use/land cover dataset.			Many of our products are analyses that rely on an accurate land use/land cover dataset.								
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$307,136									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know			I don't know					

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Environmental	I don't know	I don't know	I don't know	
Environmental description	Improved land use / land cover mapping may support natural resource conservation efforts	Improved land use / land cover mapping may support natural resource conservation efforts	Improved land use / land cover mapping may support natural resource conservation efforts.	
Public safety, including life and property	I don't know	I don't know	I don't know	

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	
Hillshades				
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes	Yes	Yes	
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes	Yes	Yes	
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement	Yes	Yes	Yes	
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Mapping and GIS Support of Elevation Dependent County Government Activities



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements	Washington County, MD	Washington County, MD		

MCA Description	Response
Mission Critical Activity	The Washington County GIS Office is the enterprise GIS hub for Washington County government. It supports all the other departments that have their own GIS staff and those smaller ones without any GIS staff. It establishes the Mission – Vision – Goals – and Objectives for the GIS on the county level. It also sets priorities and direction, sets an example of data stewardship and manages expectations. It coordinates policy, and assures quality through setting standards.
MCA Title	Mapping and GIS Support of Elevation Dependent County Government Activities
MCA ID	11480
Organization Type	Regional, County, City, or other local government
Organization Name	Washington County Maryland Government
Sub-Agency or Division	
Organization Mission	The Washington County GIS Office is the enterprise GIS hub for Washington County government. It supports all the other departments that have their own GIS staff and those smaller ones without any GIS staff. It establishes the Mission – Vision – Goals – and Objectives for the GIS on the county level. It also sets priorities and direction, sets an example of data stewardship and manages expectations. It coordinates policy, and assures quality through setting standards.
Program Name	NextGen 9-1-1
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Tertiary Business Use	BU 27 - Recreation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Groups of trees, house, building, roads

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	Cross sections and/or transects meet needs		
Update Frequency	6-10 years	Event driven only – Data need to coincide with a specific event.		
Event type(s)		Major flood event.		
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 60 cm	Up to 1 meter		
Acceptable Vertical Error	Up to 20 cm	Up to 60 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs		Yes		
Cross section/transect requirement		Every 100'; 1' accuracy		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Required			Required	
Entire AOI under same environmental conditions	Required	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Required	Required		
Edited/cube XYZ		Highly desirable		
Full waveform	Highly desirable	Highly desirable		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Required		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Highly desirable	Not required		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	LAS 1.2 files: Dewberry collected LiDAR for Washington County, MD. The acquisition was performed by Geodigital. The nominal pulse spacing for this project is 1.6 ft (0.5 meters). This project was collected with a sensor which collects intensity values for each discrete pulse extracted from the waveform. GPS Week Time, Intensity, Flightline and echo number attributes were provided for each LiDAR point. Dewberry used proprietary procedures to classify the LAS according to contract specifications: 1-Unclassified, 2-Ground, 7-Noise, 9-Water, 10-Ignored Ground due to breakline proximity, and 11-Withheld.	None		

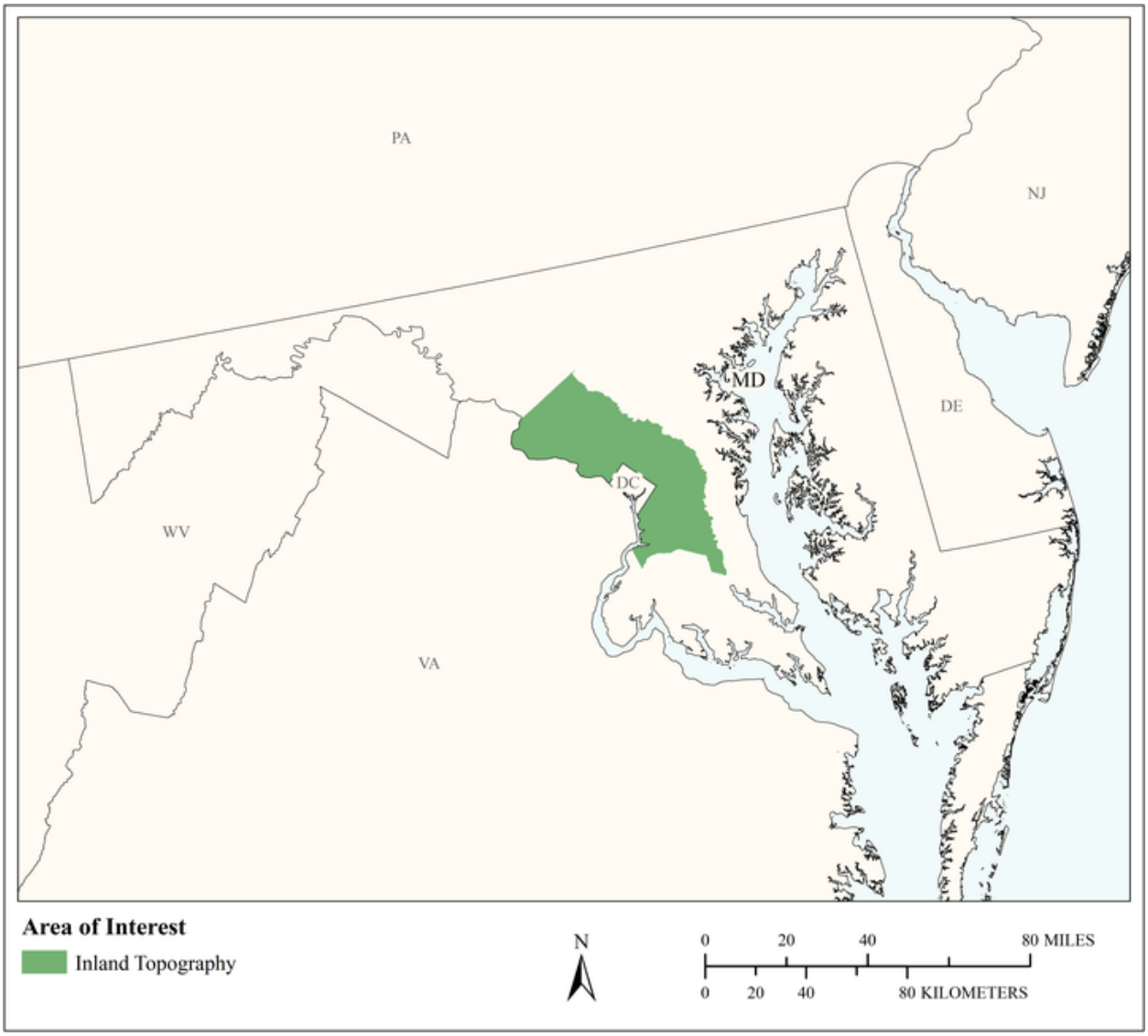
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	MDimap	MDimap		
Other	Yes			
Other description	In-house			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	None		
Cost savings/cost reduction	Major	None		
Cost avoidance	Major	None		
Increased revenues	Major	None		
Mission-driven performance improvements	Major	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None		
Improved response or timeliness	Major	None		
Improved customer experience	Major	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	None		
Environmental	Major	None		
Public safety, including life and property	Major	None		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Major	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Other customer service benefits				Major	Unable to provide							
Other customer service benefits description												
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Major			Major								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Development Review, Floodplain Management, Property Mapping, and Parks Planning and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements	Montgomery and Prince George's Counties, MD			

MCA Description	Response
Mission Critical Activity	We are responsible for development review, floodplain management, property mapping, and parks planning and management. All require accurate elevation information.
MCA Title	Development Review, Floodplain Management, Property Mapping, and Parks Planning and Management
MCA ID	21525
Organization Type	Regional, County, City, or other local government
Organization Name	Maryland National Capital Planning Commission (MNCPPC)
Sub-Agency or Division	
Organization Mission	Regional Planning Parks and Recreation Management
Program Name	All Park and Planning programs.
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 27 - Recreation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Buildings

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Locally acquired lidar			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	Local acquisition			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	Minor			
Mission-driven performance improvements	Major			

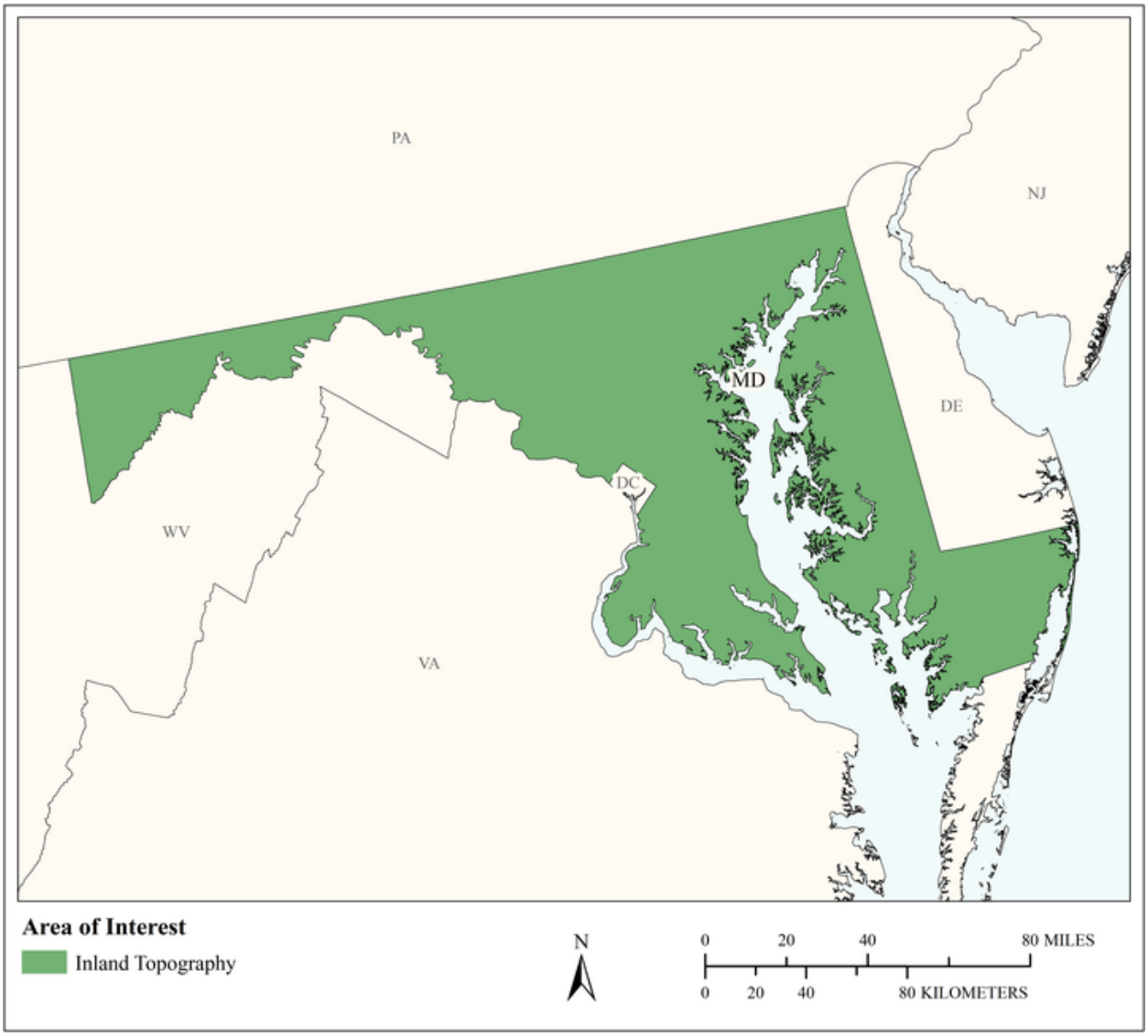
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Moderate			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide										
Cost savings/cost reduction	I don't know	Unable to provide										
Cost avoidance	I don't know	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	I don't know	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide										
Improved response or timeliness	I don't know	Unable to provide										
Improved customer experience	I don't know	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Real Estate, Banking, Mortgage, and Insurance



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Assessment of risk for natural hazards (e.g., sinkholes, flooding) to inform insurance policy rates and the determination of mandatory insurance. Building permit compliance.
MCA Title	Real Estate, Banking, Mortgage, and Insurance
MCA ID	60222
Organization Type	State or U.S. Territorial government
Organization Name	State of Maryland
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 25 - Real Estate, Banking, Mortgage, and Insurance
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

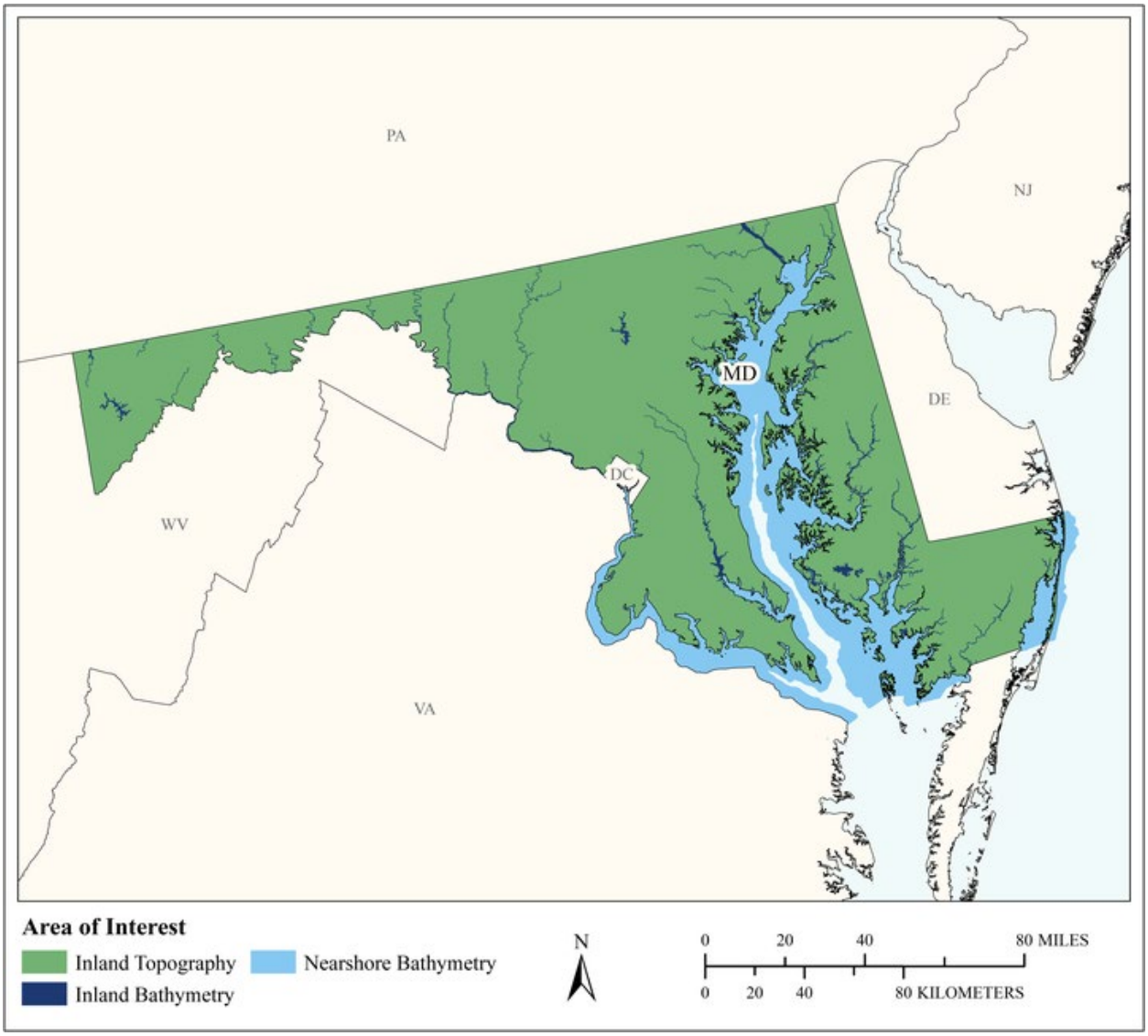
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Moderate			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$343,543									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Education K12 and Beyond, Basic Research



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Development of 3-D visualizations to help students understand the Earth they live on. Understanding of continental-scale climate change impacts. Ocean science. Ocean education. Scientific research. Data dissemination. Development of training simulators.
MCA Title	Education K12 and Beyond, Basic Research
MCA ID	60223
Organization Type	State or U.S. Territorial government
Organization Name	State of Maryland
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 26 - Education K12 and Beyond, Basic Research
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL1B	QL2B	
Update Frequency	2-3 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Nice to have		Highly desirable	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Required	Nice to have		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required		Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Required	
DTM	Required	Highly desirable	Required	
DEM	Required	Required	Required	
Raw point cloud data	Required	Required	Required	
Classified point cloud	Required	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Nice to have	
Ground control/ground truthing	Highly desirable	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Highly desirable	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Required	Highly desirable	Highly desirable	
Wetlands	Required	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Nice to have	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Major	
Cost savings/cost reduction	Major	Minor	Moderate	
Cost avoidance	Major	Minor	Major	
Increased revenues	Minor	None	Minor	
Mission-driven performance improvements	Major	Moderate	Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Major	

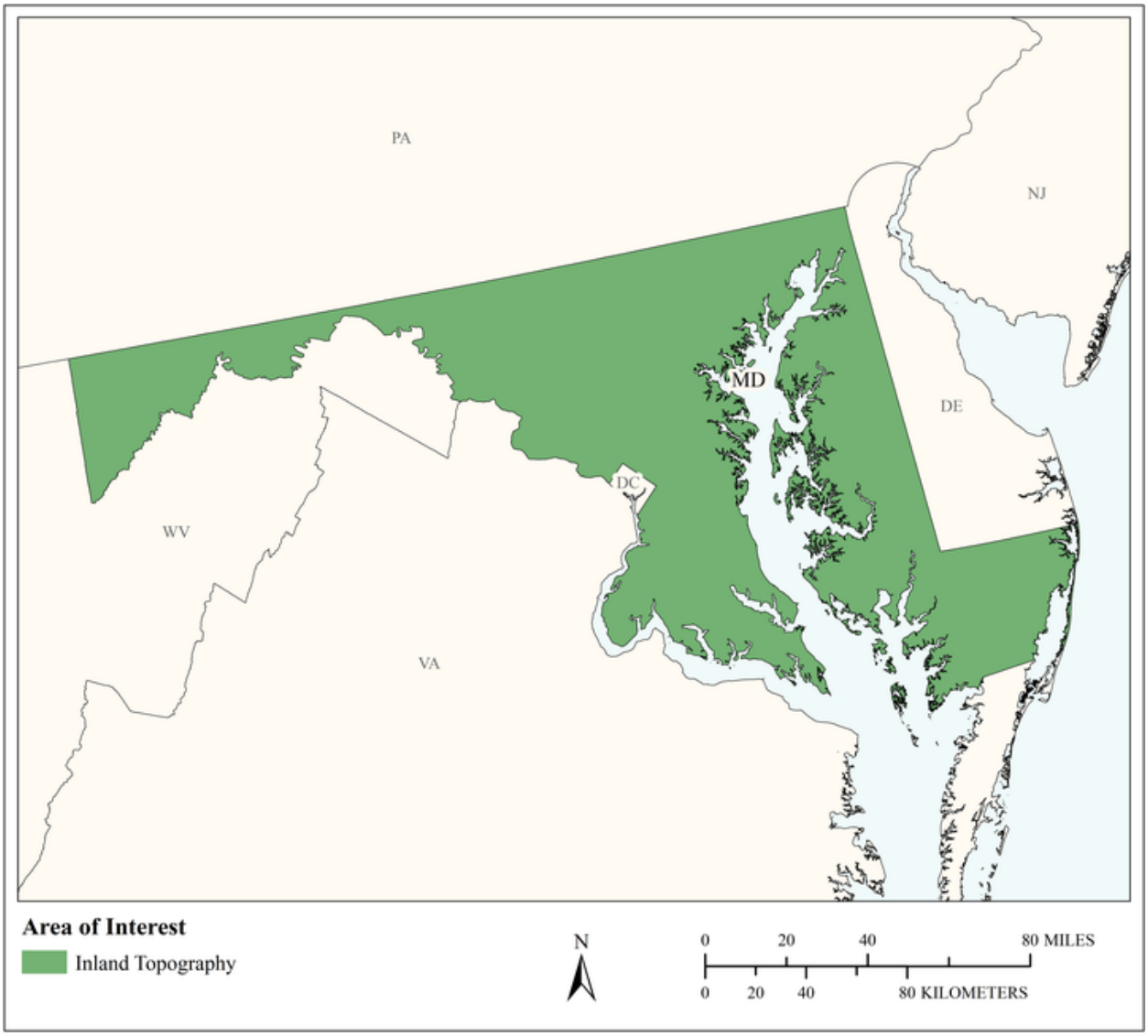
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	Minor	
Improved customer experience	Major	Minor	Moderate	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major	Major	
Environmental	Major	Minor	Minor	
Public safety, including life and property	Major	Moderate	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$51,959		Annual dollars saved/ realized	$13,588		Annual dollars saved/ realized	$1,152			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$124,198					Annual dollars saved/ realized	$45			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major					
Environmental	Major			Major			Major					
Public safety, including life and property	Major			Major			Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes		Yes	
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes		Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Telecommunications



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Telecommunication tower site selection. Design of radio and radar systems. Interference analysis. Path profiles. Undersea telecommunication route selection and deployment.
MCA Title	Telecommunications
MCA ID	60224
Organization Type	State or U.S. Territorial government
Organization Name	State of Maryland
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 28 - Telecommunications
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Highly desirable			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

Massachusetts

Current status of elevation data for Massachusetts

The Commonwealth of Massachusetts currently has a 3DEP-compliant coverage of about 35% (figure 1) for its' approximately 8,100 square mile land area. According to the US Census Bureau, Massachusetts has a population density of about 840 people per square mile, making it the fifth most densely populated state and thus one where flooding is impacting more and more people, especially as the climate changes. The state is also heavily forested, especially in the Western 1/3 of the state. As a coastal state, marine resources are a significant contributor to Massachusetts' economy, whether from fishing by fleets based in famous harbors such as Gloucester to the North or New Bedford to the south, or from the millions who visit the state's beaches or coastal communities or who enjoy recreational boating. Thus, high quality topographic and bathymetric mapping are important for:

- Assessing the vulnerability of transportation infrastructure - roadways, mass transit, airports, bridges, tunnels, and culverts. Existing infrastructure design was based on historic weather patterns and relied on now-outdated elevation mapping. High quality elevation mapping supports updated hydrological and hydraulic modeling of riverine and coastal storm surge flooding. These models identify infrastructure and residential areas vulnerable to flooding, help establish infrastructure replacement priorities, and inform design and siting requirements for new and replacement infrastructure as part of mitigation planning.
- Assessing the impact of sea level rise on coastal wetlands; these wetlands are nurseries for economically valuable fisheries and are buffers against storm surges.
- Seafloor and habitat mapping; the depth and characteristics of the seabed define the habitat for benthic organisms and are fundamental parameters of marine ecosystems that are an important part of Massachusetts economy.
- Mapping shoreline change, a significant issue on parts of Massachusetts' coast.
- Planning for and managing increasingly dense use of near-coastal waters for wind turbine placement, coastal navigation, and cables and pipelines on the seabed.
- Supporting municipal vulnerability assessments and planning to make storm water infrastructure, as well as sewage and water treatment, drinking water supplies, and other assets more resilient.
- Characterizing vegetative cover as part of mapping natural communities and habitats and developing strategies for adaptation in the state's four broad ecosystem types: forested, aquatic, coastal, and wetland.

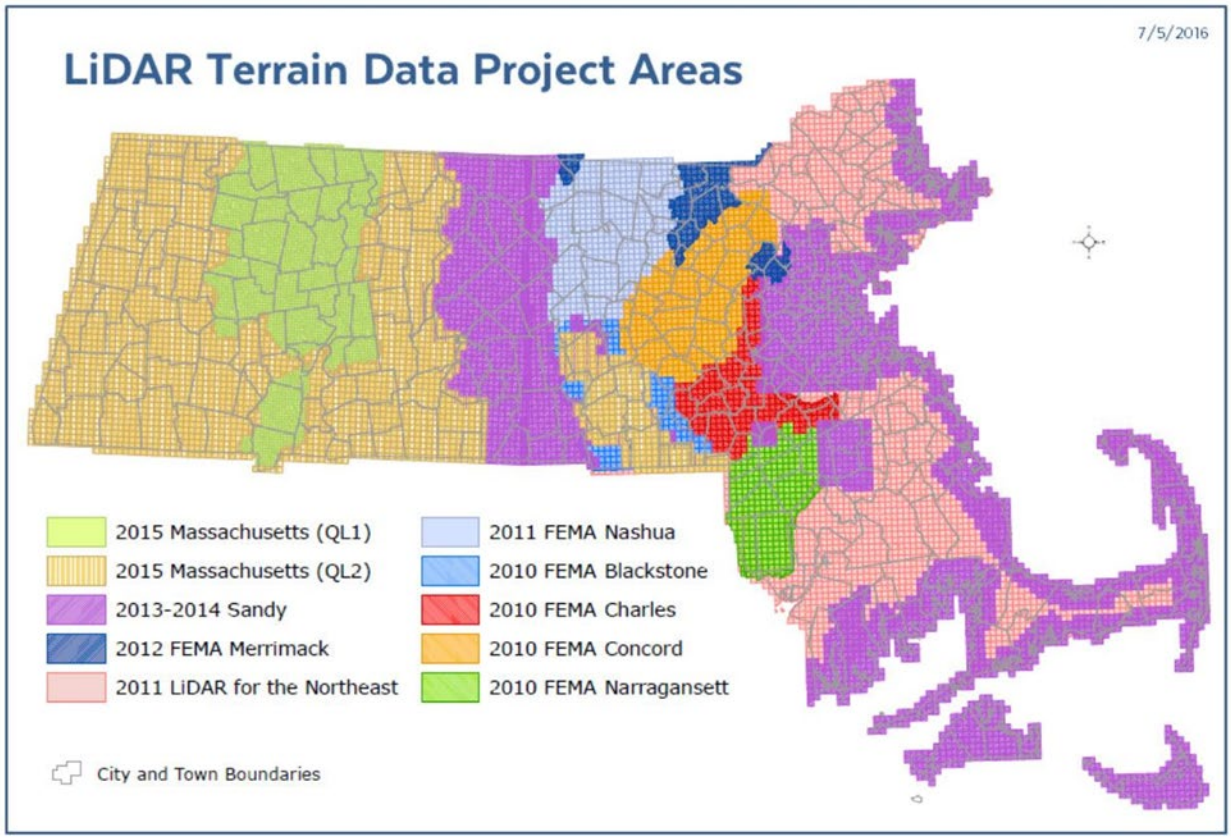


Figure 1. Lidar Terrain Data Project Areas

Massachusetts was an early adopter of acquiring lidar to produce elevation products and services starting with a 2002 project covering most of the towns in the greater Boston area. Since that time data have been collected through a series of opportunistic cost sharing opportunities with local entities, federal agencies and more recently the 3DEP program.

This opportunistic approach resulted in a patchwork quilt of data with updates for some older datasets in fast growing areas as well as new Quality Level 1 (QL1) data for areas without coverage but of high priority for federal programs. This leaves areas of slower growth and lower priority to federal programs without 3DEP compliant data. Datasets that were collected just prior to 3DEP like the Lidar for the Northeast project are now eligible for 3DEP funding because the datasets are older than 8 years and do not meet QL2 specifications. Large areas of FEMA data in the region are also eligible for 3DEP funding.

MassGIS is the lead agency in the Commonwealth of Massachusetts for high-resolution elevation coordination. MassGIS also takes on the hard work of coordinating and managing framework data including hydrography and orthoimagery within state government. MassGIS also coordinates data acquisition with towns, cities, and regional government. A parallel effort led by the Massachusetts Office of Coastal Zone Management (CZM) is coordinating the development of nearshore, and offshore bathymetry. Along with its counterpart agencies in New Hampshire and Maine, and in partnership with NOAA, CZM is also currently in the process of creating the first geoform map of the Gulf of Maine. CZM is also engaged in a long-term project to map benthic habit using the national standard (Coastal and Marine Ecological Classification Standard).

The Massachusetts Division of Fisheries and Wildlife (MassWildlife), with support from the Department of Environmental Protection, has mapped bathymetry (measures of water depth) at a scale of 1:10,000 for

some inland water lakes and ponds in Massachusetts. The data were gathered on boats by a GPS/depth sounder. The data samples were then extrapolated to form contour lines.

High-level summary of elevation data requirements

Topographic and bathymetric data requirements vary across the commonwealth by terrain and program. Massachusetts terrain (figure 2) features a low coastal plain in the east, the New England Uplands, and then the Connecticut River, also known as the Pioneer, Valley. Further west rises a range of rolling, bucolic mountains known as the Berkshires. Near the New York border, the Taconic and Hoosac Ranges cross into Massachusetts; however, in general, the area West of the Pioneer Valley is known as The Berkshires.

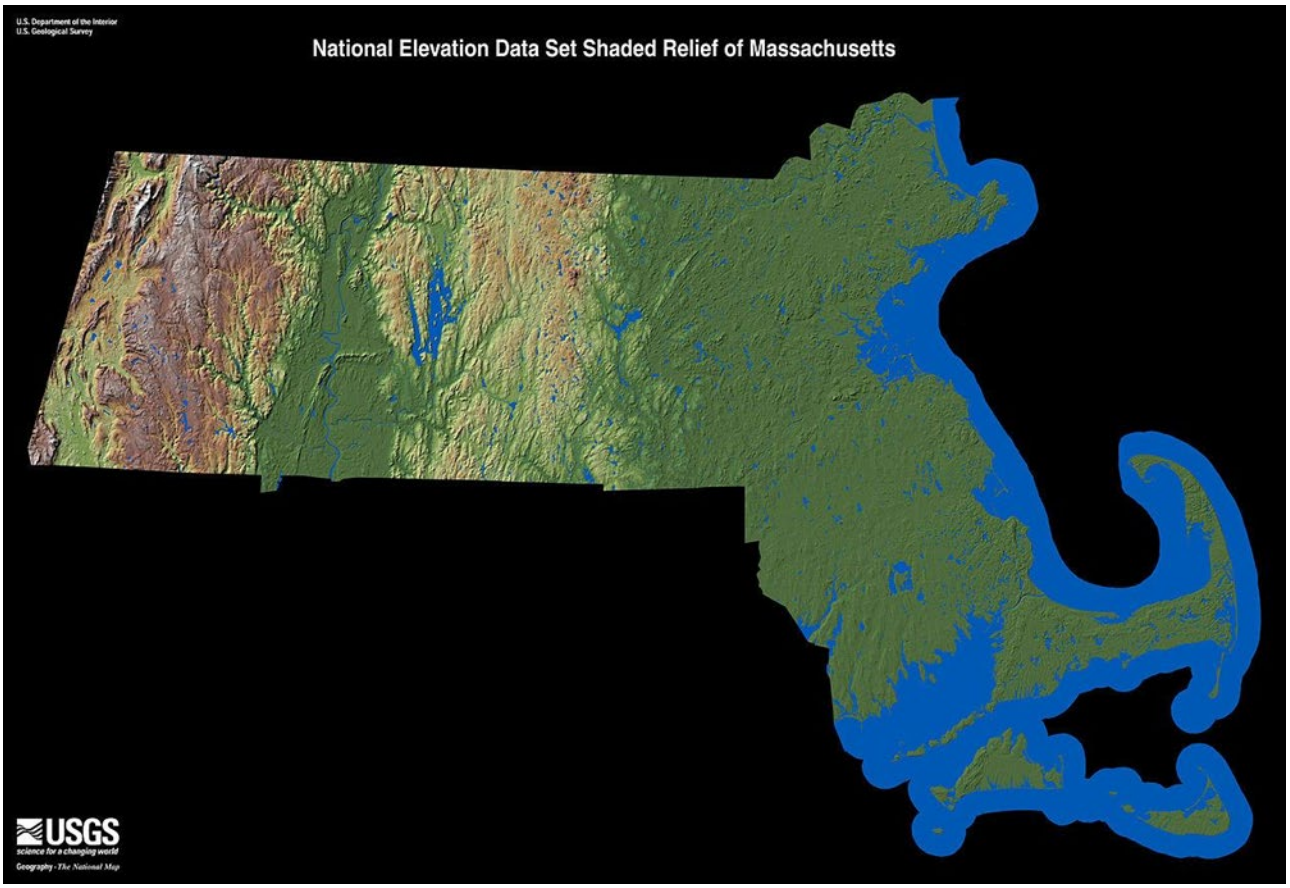


Figure 2. USGS shaded relief map of Massachusetts

Specific data requirements will vary by physiographic region. Inland topographic needs are driven primarily by traditional applications including geology, transportation planning, forest and wildlife management, local planning, and floodplain management. Some of the more challenging requirements are for areas along the Massachusetts coast. Nearshore bathymetry is required along most coastal portions of the commonwealth, owing to the rapid development and vulnerability of coastal communities addressing the combined threats of ocean warming, strong storm surge, and rising sea levels. The maintenance and expansion of Massachusetts' ports (e.g., Boston Harbor and New Bedford.) depends upon the accurate mapping of bathymetry and the frequent influx of sediment and redeposition. Offshore bathymetry supports shipping channels and monitoring the health of the ocean, which serves the commercial fishing and recreational economy.

Specific need for bathymetric high-quality mapping include:

- 99.9% of hydrodynamic oceanographic and coastal modeling requires bathy. Bathymetry is the foundation of hydrography which measures the physical features including not only bathymetry but also the shape and features of the shoreline the characteristics of des, currents, and waves; and the physical and chemical properties of the water itself.
- Related, bathymetry allows us to identify geoforms (the physical structures of the underwater marine environment, i.e. underwater topography, living (biogenic) structures that create their own physical environment, or man-made features such as shipwrecks, breakwaters, and dredge areas). CZM, New Hampshire, Maine, and NOAA are currently in the process of creating the first geoform map of the Gulf of Maine.
- The Hard and Complex Boom SSU (Special, Sensitive, and Unique), a protected area in the Massachusetts Ocean Plan, is calculated using bathy. Put another way, we need bathy for marine spatial planning.
- Vital for creating Sea Level Rise risk maps and other coastal resiliency products.
- Bathymetry is a key element of biological oceanography: Depth and characteristics of the seabed define the habitat for benthic organisms and are fundamental parameters of marine ecosystems. CZM is engaged in a long-term project to map benthic habit using the national standard (Coastal and Marine Ecological Classification Standard).
- Identification of underwater archeological resources such as wrecks and paleosols.

Further survey and information are needed to understand the requirements at the county-city-regional-and Boston-area metropolitan planning agency levels to ensure that multiple stakeholder needs can be met through a coordinated program and funding mechanism.

The Commonwealth of Massachusetts has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

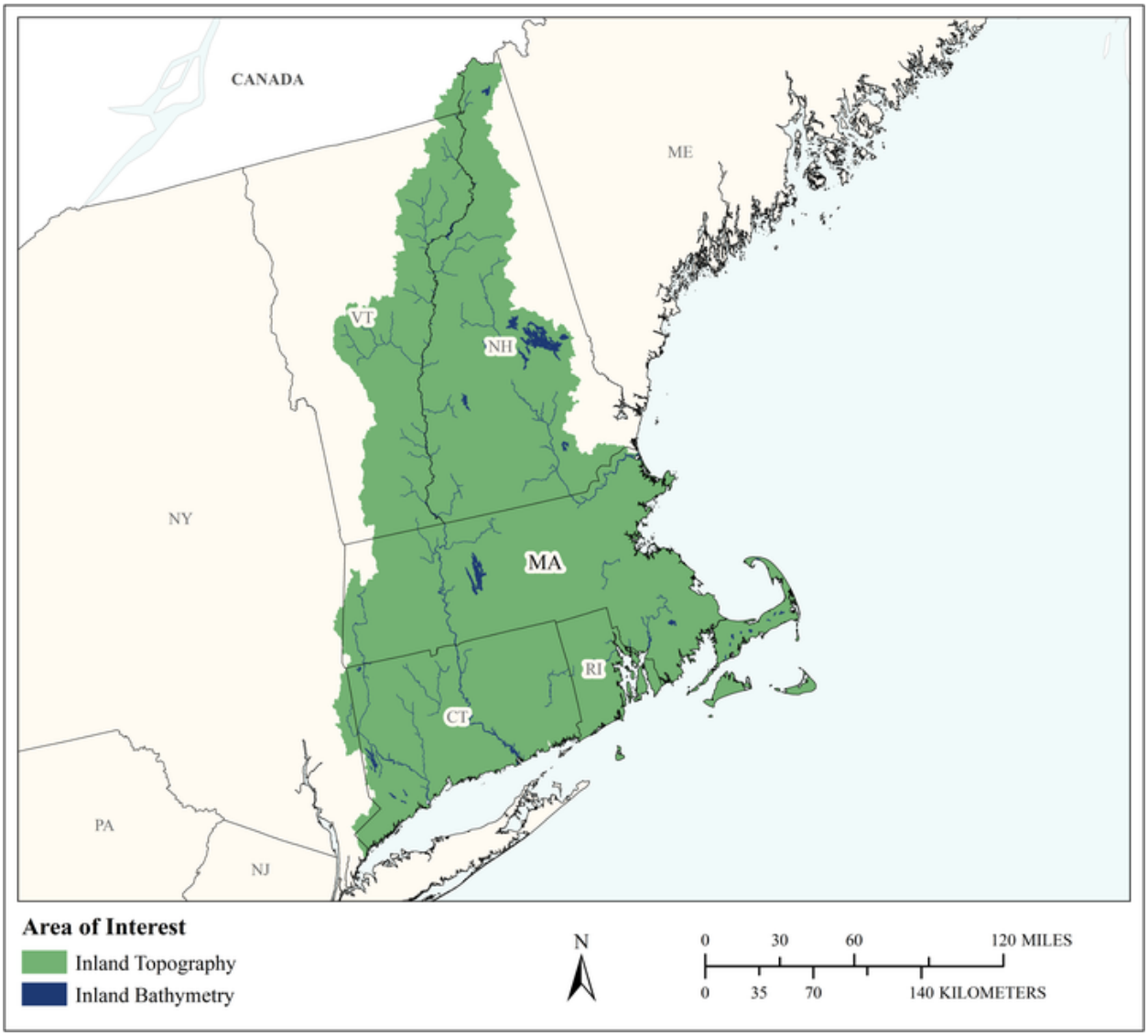
Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	Massachusetts Dept. of Conservation & Recreation, Division of Water Supply Protection	1102	Water Quality/Quantity Monitoring, Analyses and Management	Inland Topo	QL0	4-5 years	$8,743	Unable to quantify	None	Moderate	Minor
				Inland Bathy	QL1B	6-10 years	Unable to quantify	Unable to quantify	I don't know	Minor	Minor
BU 02 – Riverine Ecosystem Management	Commonwealth of Massachusetts	60225	Riverine Ecosystem Management	Inland Topo	QL1 HD	6-10 years	$12,413	$1,239	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$6,607	$465	Major	Major	Major
				Nearshore Bathy	QL0B	2-3 years	$116,450	$88,986	Moderate	Moderate	Moderate
				Offshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 03 – Coastal Zone Management	Woods Hole Sea Grant and Cape Cod Cooperative Extension	1197	Coastal Hazard Mitigation	Inland Topo	QL0	4-5 years	$213,618	$4,824	Major	Major	Major
				Nearshore Bathy	QL1B	4-5 years	$103,015	$5,427	Major	Major	Major
BU 03 – Coastal Zone Management	Massachusetts Coastal Zone Management	1466	Coastal Hazards Storm Smart Coasts Program	Inland Topo	QL1	4-5 years	$418,110	$73,094	Major	Major	Major
				Nearshore Bathy	QL0B	4-5 years	$260,761	$441,109	Minor	Moderate	Moderate
BU 06 – Natural Resource Management	MA Dept. of Fish and Game - Div. of Ecological Restoration	22368	Ecological Restoration	Inland Topo	QL0	2-3 years	$107,236	Unable to quantify	Moderate	Major	Minor
				Inland Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	Minor	Major	I don't know
				Nearshore Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	Minor	Major	Moderate
BU 07 – Wildlife and Habitat Management	Massachusetts Division Fisheries and Wildlife	21498	Wildlife and Habitat Management	Inland Bathy	QL3B	2-3 years	$57,285	$27,135	I don't know	I don't know	Moderate
				Nearshore Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
BU 09 – Fisheries Management and Aquaculture	Massachusetts Division of Marine Fisheries	21750	Fisheries Management and Aquaculture	Nearshore Bathy	QL0B	6-10 years	Unable to quantify	$14,472	Moderate	Major	Minor
				Offshore Bathy	Order 1	6-10 years	Unable to quantify	Unable to quantify	Moderate	Major	Minor
BU 10 – Geologic Assessment	MA Geological Survey	22125	Geologic Mapping	Inland Topo	QL0	2-3 years	$1,711,893	$30,052	Moderate	Major	Major
				Inland Bathy	QL0B	4-5 years	$22,660	$24,900	Moderate	Moderate	Major
				Nearshore Bathy	QL0B	2-3 years	$89,795	$144,477	Minor	Moderate	Major
				Offshore Bathy	Order 1b	4-5 years	$2,061,927	Unable to quantify	None	None	None

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 12 – Renewable Energy Resources	Commonwealth of Massachusetts	60226	Renewable Energy Resources	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	None
				Nearshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Offshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 15 – Flood Risk Management	Commonwealth of Massachusetts	60227	Flood Risk Management	Inland Topo	QL2	4-5 years	$1,138,661	$199,230	Major	Moderate	Major
				Inland Bathy	QL1B	4-5 years	$79,099	$88,808	Moderate	Moderate	Major
				Nearshore Bathy	QL2B	4-5 years	$220,429	$163,369	Major	Moderate	Major
BU 16 – Sea Level Rise and Subsidence	Cape Cod Commission	21571	Coastal Hazard Mitigation and Coastal Resilience Planning	Inland Topo	QL0	4-5 years	$854,270	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	Minor	Moderate	Minor
				Nearshore Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	Minor	Major	Minor
BU 19 – Land Navigation	Commonwealth of Massachusetts	60228	Land Navigation and Safety	Inland Topo	QL0	2-3 years	$105,057	$8,483	Minor	Major	Major
BU 20 – Marine and Riverine Navigation	Commonwealth of Massachusetts	60229	Marine and Riverine Navigation and Safety	Nearshore Bathy	QL0B	2-3 years	$892,458	$30,216	Minor	Major	Major
				Offshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 21 – Aviation Navigation	Commonwealth of Massachusetts	60230	Aviation Navigation and Safety	Inland Topo	QL1 HD	Annually	$27,415	$34,145	Minor	Moderate	Moderate
BU 22 – Infrastructure Management	Commonwealth of Massachusetts: Department of Conservation and Recreation, Office of Dam Safety	1099	Dam Safety	Inland Topo	QL0 HD	Annually	$427,738	$677,682	Minor	Major	Major
				Inland Bathy	Cross sections and/or transects meet needs	2-3 years	$543,717	$36,180	None	Major	Major
				Nearshore Bathy	QL1B	4-5 years	$22,893	$3,147	Minor	Moderate	Major
BU 22 – Infrastructure Management	Massachusetts Water Resources Authority	1120	Drinking Water Supply and Management	Inland Topo	QL0	2-3 years	$131,817	$387,913	I don't know	I don't know	I don't know
				Inland Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	Minor	Moderate	Moderate
				Nearshore Bathy	QL1B	4-5 years	$1,435	$197	Minor	Moderate	Major
BU 23 – Urban and Regional Planning	City of Gloucester, MA	1463	Coastal Planning for Hazard Mitigation and Adaptation	Inland Topo	QL1	2-3 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
				Nearshore Bathy	Cross sections and/or transects meet needs	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 23 – Urban and Regional Planning	Commonwealth of Massachusetts	60231	Urban and Regional Planning	Inland Topo	QL1	4-5 years	$2,182,027	$251,916	Moderate	Major	Major
BU 30 – Maritime and Land Boundary Management	Commonwealth of Massachusetts	60232	Maritime and Land Boundary Management	Inland Topo	QL1	6-10 years	$9,125	$34,988	Moderate	Minor	None
				Nearshore Bathy	QL0B	2-3 years	$267,431	Unable to quantify	Moderate	Major	Moderate
				Offshore Bathy	I don't know	2-3 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate

MCA Title: Water Quality/Quantity Monitoring, Analyses and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)	One or more Hydrologic Units (HUC4s)		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Water quality/quantity monitoring, analyses and management. This is a multi-fold process that requires an accurate hydrologically connected stream/drainage network for flow modeling, proper management of forestry resources to ensure water quality, management of wildlife populations to prevent source water contamination and management of critical infrastructure throughout the watersheds.
MCA Title	Water Quality/Quantity Monitoring, Analyses and Management
MCA ID	1102
Organization Type	State or U.S. Territorial government
Organization Name	Massachusetts Dept. of Conservation & Recreation, Division of Water Supply Protection
Sub-Agency or Division	
Organization Mission	The Division of Water Supply Protection manages and protects the drinking water supply for 2.5 million residents of Massachusetts, primarily in the Greater Boston area. Our mission is to utilize and conserve water and other natural resources to protect, preserve and enhance the environment of the Commonwealth and to assure the availability of pure water for future generations.
Program Name	Division of Water Supply Protection (subset of larger MA Department of Conservation and Recreation)
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 02 - Riverine Ecosystem Management
Tertiary Business Use	BU 04 - Forest Resources Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Survey level features for inland topo. Bottom surface of reservoirs for inland bathy.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Required

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL1B		
Update Frequency	4-5 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 60 cm	The best horizontal accuracy achievable for the vertical accuracy I need		
Acceptable Vertical Error	Up to 10 cm	Up to 20 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Required			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Required			Required	
DEM for entire AOI needs to be seamless	Highly desirable	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Up to double the required TVU at the 95% confidence level			Up to double the required TVU at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable		
DTM	Required	Highly desirable		
DEM	Nice to have	Highly desirable		
Raw point cloud data	Not required	Not required		
Classified point cloud	Required	Required		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Nice to have		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Nice to have		
Landmark features	Nice to have	Not required		
Cultural resources	Nice to have	Not required		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	My AOI is covered by a conglomerate of 3D data from a variety of years. The far western portion of my AOI is covered by 2015 USGS Western MA QL2 Lidar. The middle (western) portion of my AOI is covered by 2013-2014 USGS Hurricane Sandy Supplemental for NE (QL2). The middle (northeastern) portion of my AOI is covered by 2011 FEMA RiskMap Lidar: Nashua River Watershed (QL3); while the middle (southeastern) portion of covered by both 2010 FEMA Blackstone Lidar (QL3) and 2015 USGS Western MA QL2 Lidar. The far eastern portion is covered by 2010 Concord River Lidar (QL3).	Currently, we only have bathymetric data from historic surveys that were translated into GIS-usable data collected in the early 1900's.		

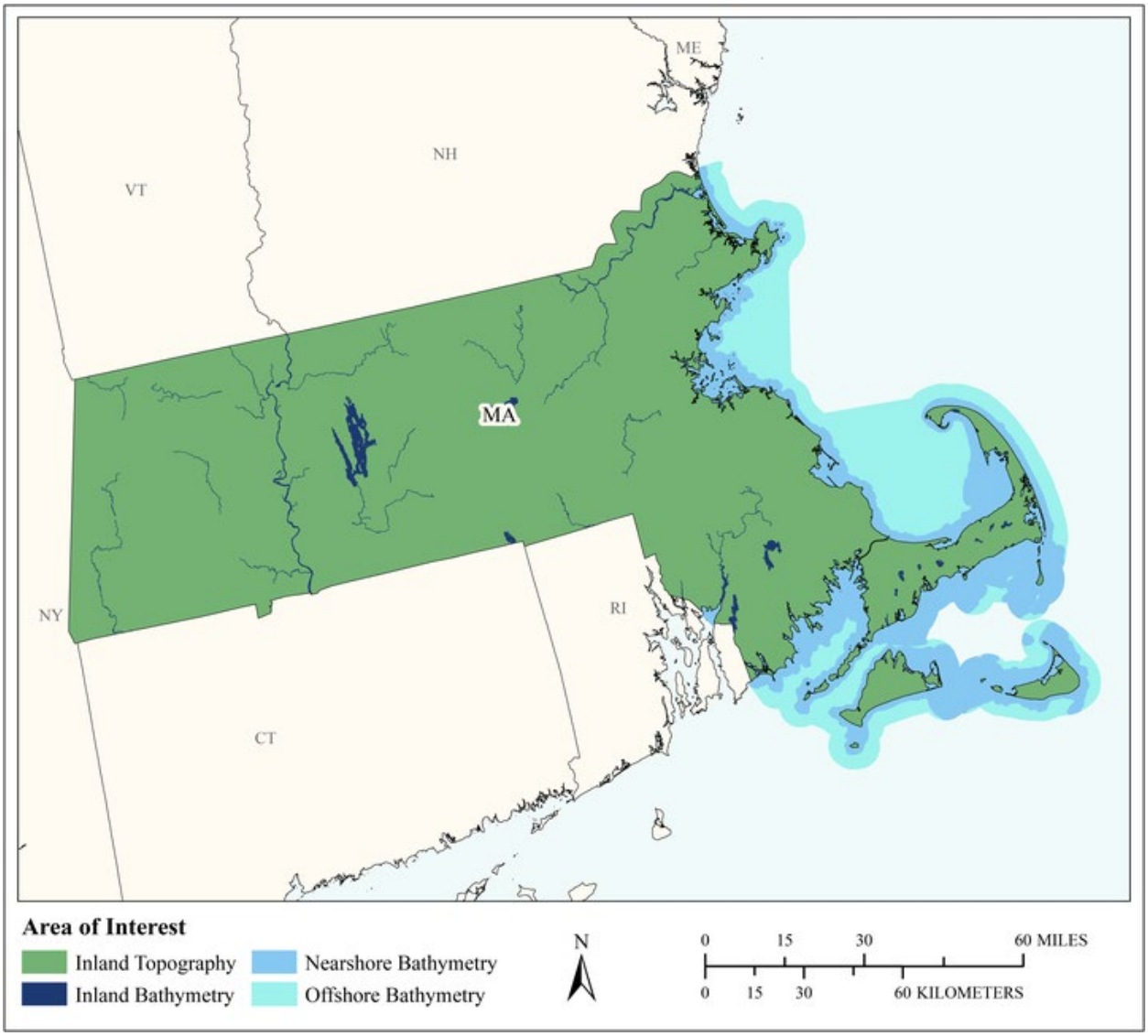
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes	Yes		
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	MassGIS			
Other		Yes		
Other description		Historic survey data from before reservoirs were filled.		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor	None		
Cost savings/cost reduction	I don't know	None		
Cost avoidance	Moderate	None		
Increased revenues	I don't know	None		
Mission-driven performance improvements	Minor	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None	None		
Improved response or timeliness	None	None		
Improved customer experience	None	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	None		
Environmental	Minor	Minor		
Public safety, including life and property	Minor	None		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$8,744	Moderate	Unable to provide							
Time savings description	Less time spent combining data from multiple data sources; changing projects of this data, etc. Fewer field visits would be required. More accurate and efficient flow modeling.											
Cost savings/cost reduction	I don't know	Unable to provide		None								
Cost avoidance	Minor	Unable to provide		Major	Unable to provide							
Increased revenues	Moderate	Unable to provide		Moderate	Unable to provide							
Increased revenues description	Improved understanding of forest health, enabling more educated timber harvest decisions.											
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements description	Improved flow modeling.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness	Moderate	Unable to provide		Minor	Unable to provide							
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			I don't know								
Environmental	Moderate			Minor								
Environmental description	Increased understanding of riverine systems and forest health for improved management.											
Public safety, including life and property	Minor			Minor								
Public safety, including life and property description	Improved dam break analysis.											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Riverine Ecosystem Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Stream channel analysis and mapping. Stream bank erosion analysis. Aquatic and terrestrial species habitat management. Environmental management.
MCA Title	Riverine Ecosystem Management
MCA ID	60225
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Massachusetts
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B	QL0B	I don't know
Update Frequency	6-10 years	4-5 years	2-3 years	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable	I don't know	Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Required	I don't know	Highly desirable	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	I don't know	Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Required	Required	I don't know	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	I don't know
DTM	Required	Highly desirable	Required	I don't know
DEM	Required	Required	Required	I don't know
Raw point cloud data	Nice to have	Nice to have	Nice to have	I don't know
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Not required	Nice to have	I don't know
Full waveform	Nice to have	Nice to have	Highly desirable	I don't know
Bathymetric Attributed Grid (BAG)		Not required	Nice to have	I don't know
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	I don't know
Tide Predictions			Not required	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			Not required	I don't know
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Nice to have	I don't know
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	I don't know
Nautical and/or navigation charts			Not required	I don't know
Acoustic imagery of the seafloor			Highly desirable	I don't know
Aerial and/or satellite imagery	Required	Highly desirable	Required	I don't know
Underwater videography			Not required	I don't know
Bottom texture			Highly desirable	I don't know
Bottom type			Required	I don't know
Submerged features			Highly desirable	I don't know
Subbottom characteristics			Highly desirable	I don't know
Geologic and seismic data	Nice to have	Nice to have	Not required	I don't know
Water column properties - Physical			Nice to have	I don't know
Water column properties - Chemical			Nice to have	I don't know
Water column properties - Biological			Nice to have	I don't know
Currents			Nice to have	I don't know
Tide/wave heights			Not required	I don't know
Sea ice conditions			Not required	I don't know
Habitat distribution and classification			Nice to have	I don't know
Boundaries			Not required	I don't know
Routes			Not required	I don't know
Offshore cadastral			Not required	I don't know
Lease areas			Not required	I don't know
Fixed obstructions			Not required	I don't know
Floating observation/navigation systems			Not required	I don't know
Shorelines – current, historic, change rates	Nice to have	Nice to have	Highly desirable	
Land use/land cover	Highly desirable	Nice to have	Required	I don't know
Wetlands	Highly desirable	Highly desirable	Required	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	I don't know
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have	Not required	
Cultural resources	Nice to have	Nice to have	Not required	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	I don't know
Cost savings/cost reduction	Moderate	Minor	Moderate	I don't know
Cost avoidance	Moderate	None	None	I don't know
Increased revenues	None	None	None	I don't know
Mission-driven performance improvements	Major	None	Minor	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Minor	I don't know

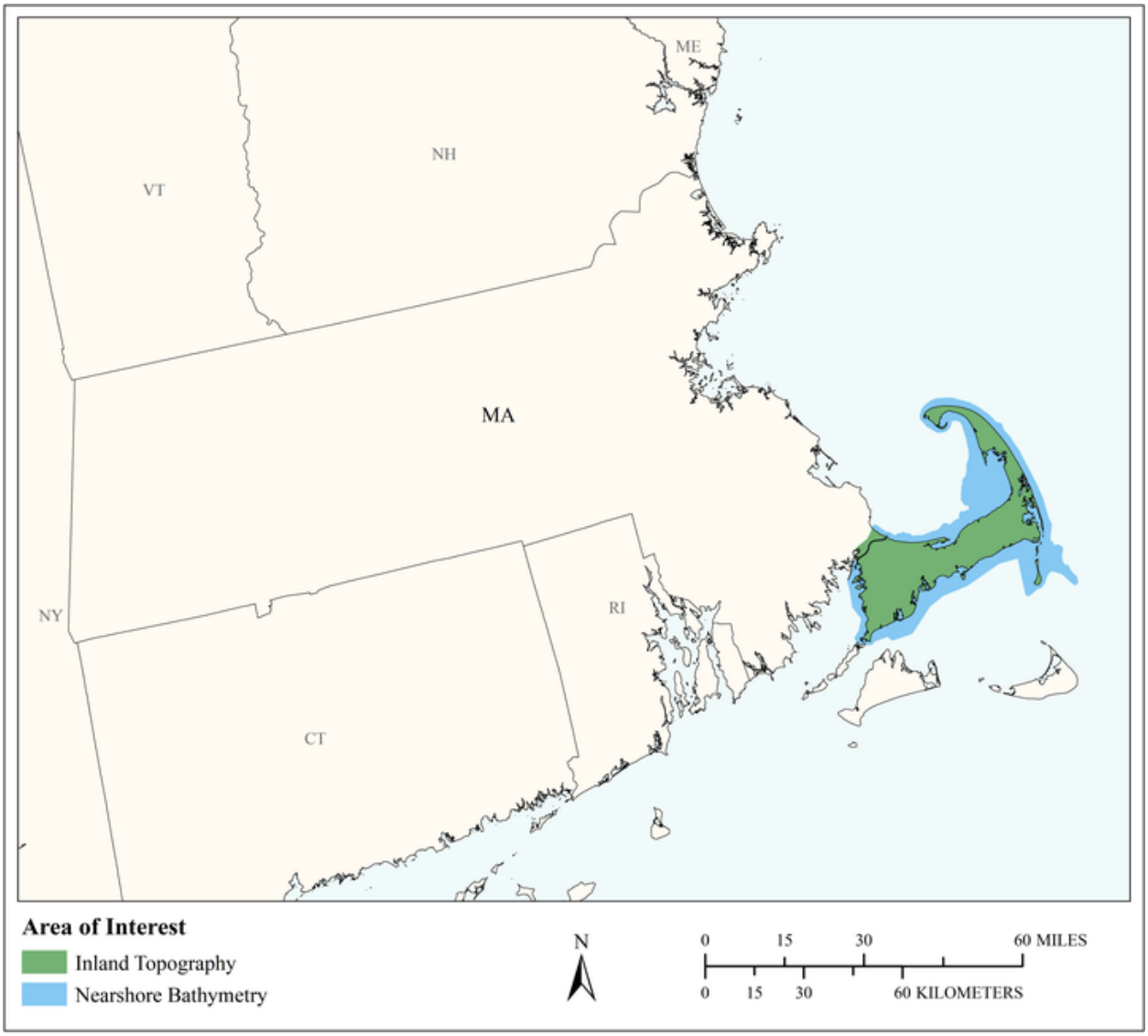
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Moderate	Minor	I don't know
Improved customer experience	Major	Minor	Minor	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Minor	I don't know
Environmental	Major	Major	Moderate	I don't know
Public safety, including life and property	Major	Moderate	Moderate	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$12,413		Annual dollars saved/ realized	$6,607		Annual dollars saved/ realized	$116,450			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,239		Annual dollars saved/ realized	$465		Annual dollars saved/ realized	$88,986			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate			I don't know		
Environmental	Major			Major			Moderate			I don't know		
Public safety, including life and property	Major			Major			Moderate			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps			Yes	
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints			Yes	
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Coastal Hazard Mitigation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements	Barnstable County, MA		Barnstable County, MA	

MCA Description	Response
Mission Critical Activity	Coastal hazard mitigation
MCA Title	Coastal Hazard Mitigation
MCA ID	1197
Organization Type	Regional, County, City, or other local government
Organization Name	Woods Hole Sea Grant and Cape Cod Cooperative Extension
Sub-Agency or Division	
Organization Mission	The mission of Barnstable County is to promote and sustain a pro-active open government that enhances the quality of life for the citizens of Barnstable County. We conserve and enhance natural and marine resources. The Woods Hole Sea Grant program, based at the Woods Hole Oceanographic Institution (WHOI), supports research, education, and extension projects that encourage environmental stewardship, long-term economic development, and responsible use of the nation's coastal and ocean resources.
Program Name	The extension program of the Woods Hole Sea Grant and Cape Cod Cooperative Extension
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 16 - Sea Level Rise and Subsidence
Tertiary Business Use	BU 15 - Flood Risk Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Dunes, seawalls

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0		QL1B	
Update Frequency	4-5 years		4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need		The best horizontal accuracy achievable for the vertical accuracy I need	
Acceptable Vertical Error	Up to 10 cm		Up to 20 cm	
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MHW	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable		Highly desirable			Highly desirable
Entire AOI under same environmental conditions	Highly desirable		Highly desirable			Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Required			Required
DEM for entire AOI needs to be seamless	Required		Required			Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable		Highly desirable	
DTM	Required		Highly desirable	
DEM	Highly desirable		Required	
Raw point cloud data	Nice to have		Nice to have	
Classified point cloud	Nice to have		Nice to have	
Edited/cube XYZ			Nice to have	
Full waveform	Nice to have		Nice to have	
Bathymetric Attributed Grid (BAG)			Nice to have	
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have		Highly desirable	
Ground control/ground truthing	Nice to have		Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required		Required	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Highly desirable		Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Required	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Required		Required	
Land use/land cover	Required		Highly desirable	
Wetlands	Required		Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required		Nice to have	
Bridges/culverts	Required			
Landmark features	Highly desirable		Nice to have	
Cultural resources	Highly desirable		Nice to have	
Coastal and riverine structures	Required		Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	LiDAR from 2011 and 2013/4 Post Sandy collection		From NOAA Digital Coast, multibeam preferred	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes		Yes	
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Major	
Cost savings/cost reduction	Major		Major	
Cost avoidance	Major		Major	
Increased revenues	Major		Minor	
Mission-driven performance improvements	Major		Major	

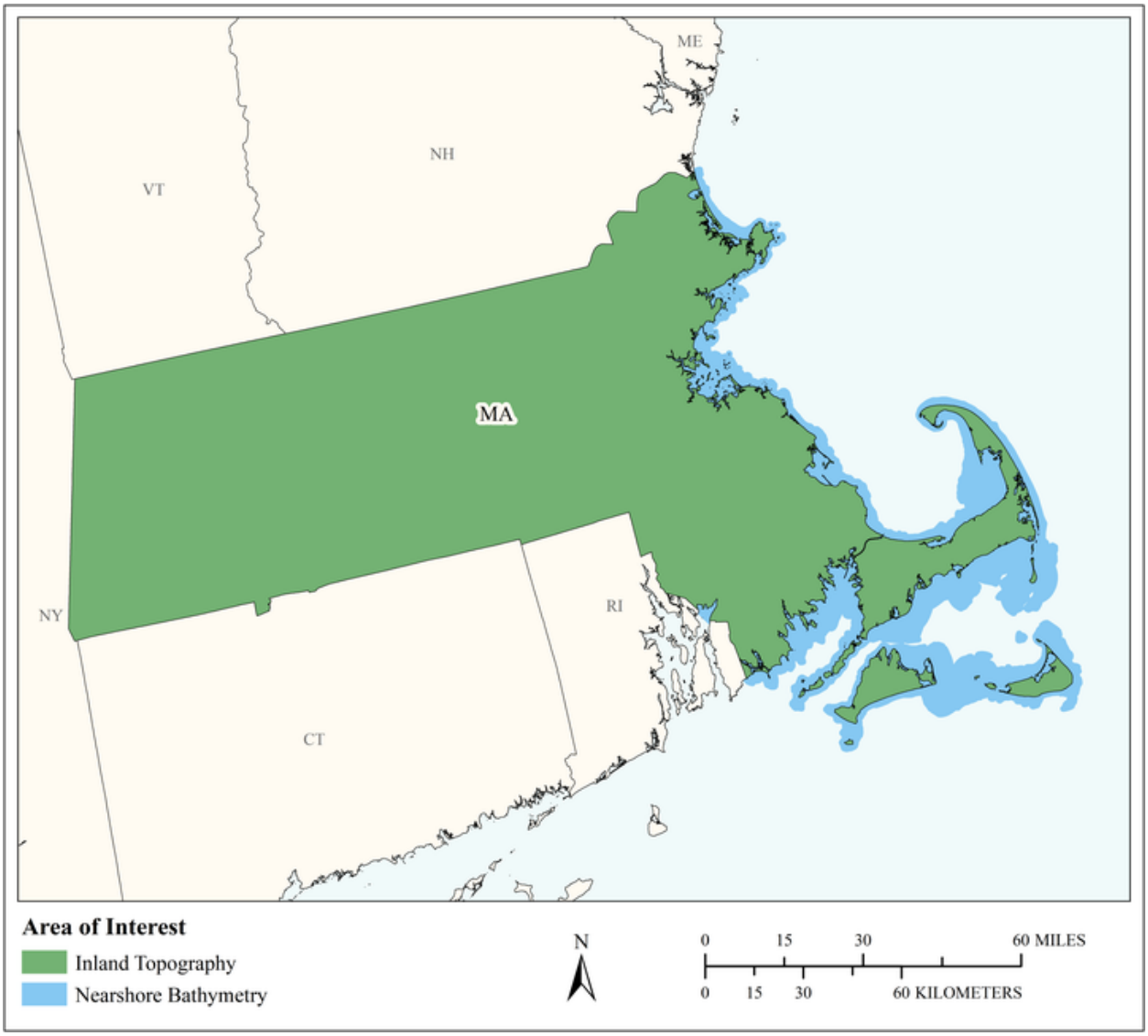
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		Major	
Improved response or timeliness	Major		Major	
Improved customer experience	Major		Moderate	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major		Major	
Environmental	Major		Major	
Public safety, including life and property	Major		Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$3,618				Major	Annual dollars saved/realized	$3,015			
Time savings description	Not having to match it myself. Can skip topographic profile collection in some areas. I'd rather have it down for me.						Couldn't do it ourselves.					
Cost savings/cost reduction	Major	Annual dollars saved/realized	$200,000				Moderate	Annual dollars saved/realized	$100,000			
Cost savings/cost reduction description	Beach/dune restoration. We couldn't afford to collect this data ourselves.						Beach/dune restoration.					
Cost avoidance	Moderate	Annual dollars saved/realized	$10,000				Major	Unable to provide				
Cost avoidance description	It's processed so we don't have to.											
Increased revenues	I don't know	Unable to provide					I don't know	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide					Major	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Annual dollars saved/realized	$1,206				Major	Annual dollars saved/realized	$3,015			
Value added to products or services description	Shoreline delineation, flood hazard maps.						Shoreline delineation, flood hazard maps.					
Improved response or timeliness	Moderate	Annual dollars saved/realized	$3,618				Moderate	Annual dollars saved/realized	$2,412			
Improved response or timeliness description	Natural hazards. Hazard maps.						Flood, erosion.					
Improved customer experience	Moderate	Unable to provide					I don't know	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major						Major					
Education or outreach description	They support our extension core mission						Extension is our core mission					
Environmental	Major						Major					
Environmental description	Our extension work with the data has environmental benefits						Our work has environmental benefits					
Public safety, including life and property	Major						Major					
Public safety, including life and property description	Our outreach helps preserve life and property						Our work protects life and property					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes		Yes	
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections	Yes		Yes	
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes		Yes	
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Coastal Hazards Storm Smart Coasts Program



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Coastal hazards. (https://www.mass.gov/stormsmart-coasts-program) Massachusetts Sea Level Rise and Coastal Flooding Viewer. Saltmarsh mapping.
MCA Title	Coastal Hazards Storm Smart Coasts Program
MCA ID	1466
Organization Type	State or U.S. Territorial government
Organization Name	Massachusetts Coastal Zone Management
Sub-Agency or Division	
Organization Mission	"CZM's mission is to balance the impact of human activities with the protection of coastal and marine resources through planning, public involvement, education, research, and sound resource management."
Program Name	There are so many but here's one example: Massachusetts Sea Level Rise and Coastal Flooding Viewer.
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 06 - Natural Resources Conservation
Tertiary Business Use	BU 16 - Sea Level Rise and Subsidence

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Any structure that meets the criteria of "critical infrastructure" which can range from a tiny harbor master's office to a sprawling hospital complex. Also detailed features of underwater habitats.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1		QL0B	
Update Frequency	4-5 years		4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Horizontal Error	Up to 1 meter		The best horizontal accuracy achievable for the vertical accuracy I need	
Acceptable Vertical Error	Up to 20 cm		Up to 20 cm	
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MLLW	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have		Nice to have			Nice to have
Entire AOI under same environmental conditions	Nice to have		Nice to have			Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have		Nice to have			Nice to have
DEM for entire AOI needs to be seamless	Nice to have		Nice to have			Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required		Not required	
DTM	Nice to have		Nice to have	
DEM	Required		Required	
Raw point cloud data	Nice to have		Nice to have	
Classified point cloud	Highly desirable		Highly desirable	
Edited/cube XYZ			Not required	
Full waveform	Not required		Nice to have	
Bathymetric Attributed Grid (BAG)			Not required	
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Not required		Highly desirable	
Ground control/ground truthing	Not required		Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required		Required	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Not required		Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Highly desirable	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Not required	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Highly desirable	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates	Required		Required	
Land use/land cover	Highly desirable		Highly desirable	
Wetlands	Highly desirable		Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Nice to have	
Inland surface water features	Nice to have		Not required	
Bridges/culverts	Nice to have			
Landmark features	Not required		Not required	
Cultural resources	Not required		Not required	
Coastal and riverine structures	Nice to have		Required	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	2013/14 Super Storm Sandy QL1/QL2 lidar		A variety of topobathy datasets published by NOAA and USACE, in addition to bathymetric data developed through the CZM-USGS Seafloor Mapping Cooperative (https://www.mass.gov/service-details/czm-seafloor-and-habitat-mapping-sediment-mapping).	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes		Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes		Yes	

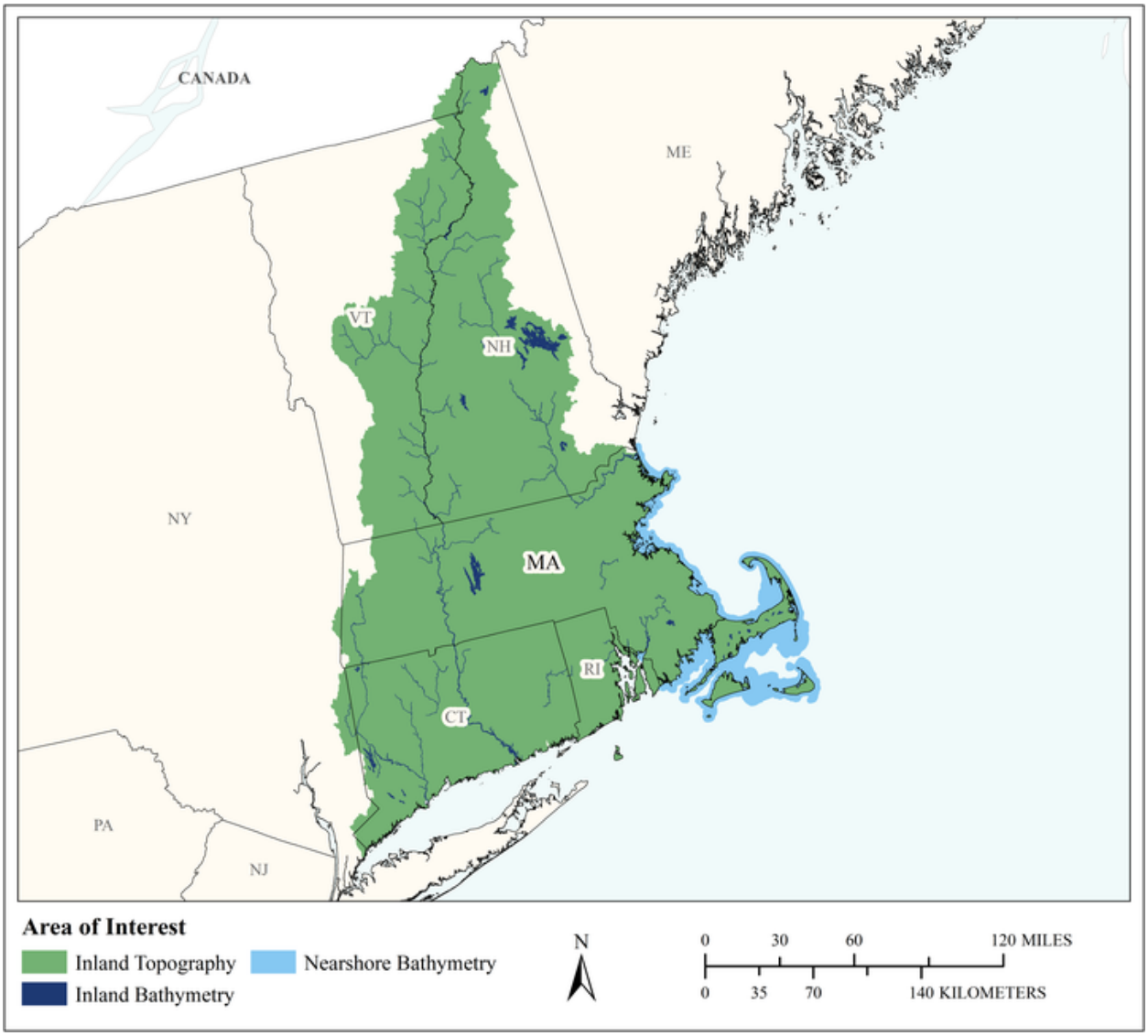
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State repositories used	MassGIS (Massachusetts Bureau of Geographic Information)		MassGIS (Massachusetts Bureau of Geographic Information), internal servers	
Other			Yes	
Other description			USGS open file reports	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Moderate	
Cost savings/cost reduction	None		Moderate	
Cost avoidance	None		I don't know	
Increased revenues	None		None	
Mission-driven performance improvements	Moderate		Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		Moderate	
Improved response or timeliness	Major		Moderate	
Improved customer experience	Major		Moderate	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major		Minor	
Environmental	Moderate		Moderate	
Public safety, including life and property	Moderate		Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide					Moderate	Unable to provide				
Cost savings/cost reduction	Minor	Unable to provide					None					
Cost avoidance	Moderate	Unable to provide					Major	Unable to provide				
Increased revenues	None						None					
Mission-driven performance improvements	Major	Unable to provide					Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$418,110					Annual dollars saved/ realized	$260,761			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide					Major	Unable to provide				
Improved customer experience	Major	Unable to provide					Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$73,094					Annual dollars saved/ realized	$441,109			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major						Minor					
Environmental	Major						Moderate					
Public safety, including life and property	Major						Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps	Yes		Yes	
Aspect maps	Yes		Yes	
Curvature maps				
Cross sections	Yes		Yes	
Height-Above-Ground maps	Yes		Yes	
Viewshed maps	Yes		Yes	
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness			Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Ecological Restoration



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)	One or more Hydrologic Units (HUC4s)	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Restoration of aquatic habitats such as Rivers, Wetlands and Watersheds.
MCA Title	Ecological Restoration
MCA ID	22368
Organization Type	State or U.S. Territorial government
Organization Name	MA Dept. of Fish and Game - Div. of Ecological Restoration
Sub-Agency or Division	
Organization Mission	DER restores and protects rivers, wetlands, and watersheds in Massachusetts for the benefit of people and the environment.
Program Name	Division of Ecological Restoration
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	BU 02 - Riverine Ecosystem Management
Tertiary Business Use	BU 03 - Coastal Zone Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	In our work, we look at footprints of structures, houses, wells, channel inverts / cross-sections, creek and riverbed channels / cross-sections

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL0B	QL0B	
Update Frequency	2-3 years	2-3 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Less than 50 cm	Less than 50 cm	
Acceptable Vertical Error	Less than 5 cm	Up to 30 cm	Less than 10 cm	
How far onshore needed			>1 kilometer inland	
How far down the beach profile needed	To MHW		To MLLW	
Tide correction requirement			MSL	
Cross sections and/or transects meet needs		Partial		
Cross section/transect requirement		Cannot answer.		

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable	Highly desirable		Highly desirable	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Highly desirable	
DTM	Highly desirable	Highly desirable	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Nice to have	Highly desirable	
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Highly desirable	
Submerged features			Nice to have	
Subbottom characteristics			Not required	
Geologic and seismic data	Nice to have	Nice to have	Not required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Required	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Required	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Required	Highly desirable	Nice to have	
Land use/land cover	Required	Required	Required	
Wetlands	Required	Required	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Nice to have	Nice to have	Required	
Cultural resources	Nice to have	Not required	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Topographic LiDAR Bathymetric LiDAR	Unknown, soundings locally. NOAA Tide Charts	Local data collection through soundings, NOAA chats	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI	Yes	Yes	Yes	
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	MassGIS NELIDAR			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	
Cost savings/cost reduction	Major	Major	Minor	
Cost avoidance	Major	Moderate	Minor	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	Moderate	I don't know	

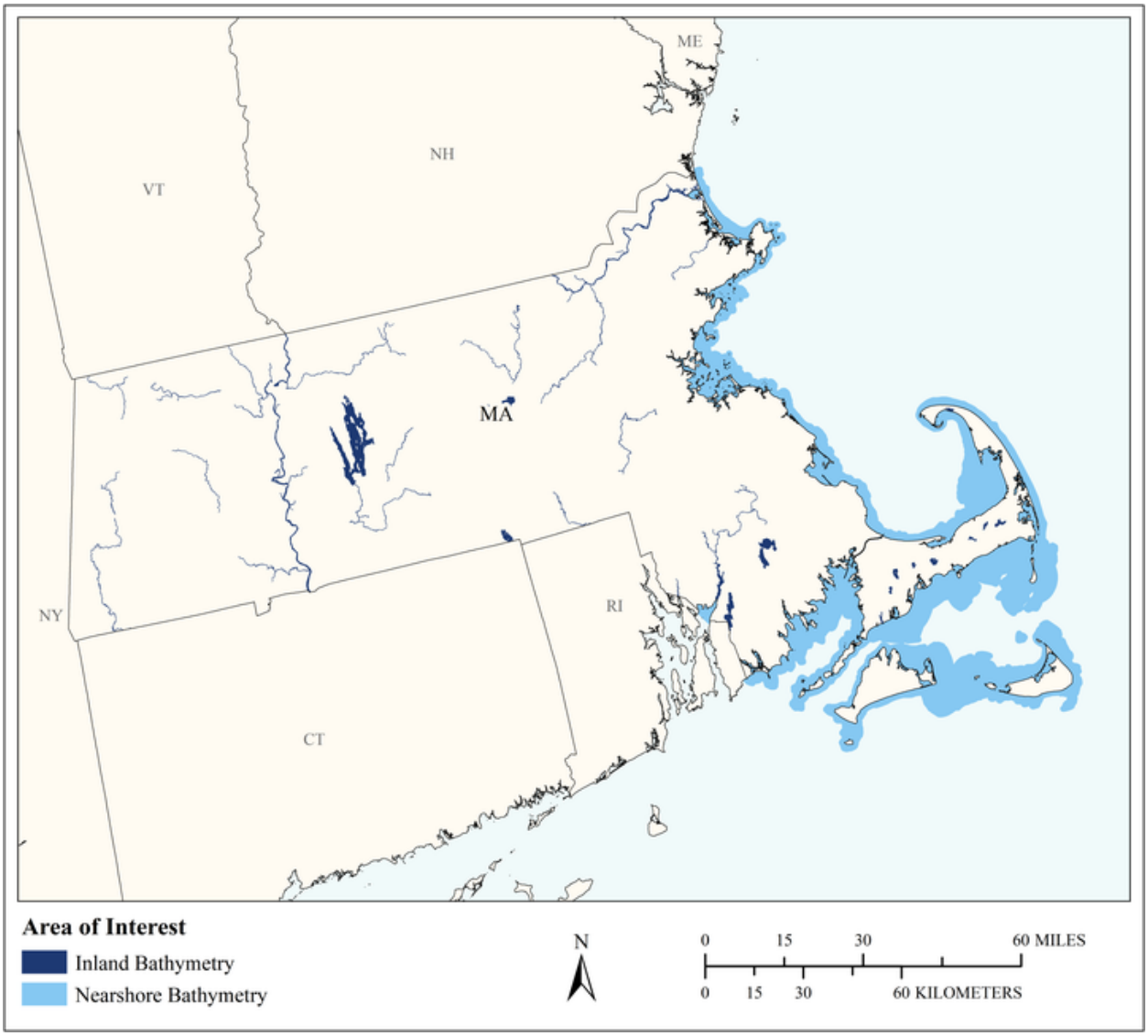
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Minor	
Improved response or timeliness	Moderate	Minor	Minor	
Improved customer experience	Moderate	Minor	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Minor	
Environmental	Major	Major	Major	
Public safety, including life and property	Major	Moderate	Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$7,236	Moderate	Unable to provide		Moderate	Unable to provide				
Time savings description	Saved hours in avoiding field visits and / or conducting desktop review before accepting project.											
Cost savings/cost reduction	Major	Annual dollars saved/realized	$100,000	Moderate	Unable to provide		Minor	Unable to provide				
Cost savings/cost reduction description	$10K's of dollars saved in sizing bridges and culverts optimally avoiding over-engineering.											
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost avoidance description	Proper structures or removal prevents future damage during hazard events.			Better data leading to better project design and dam removal, avoiding catastrophic structure failure.								
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	None			I don't know	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Minor			Minor					
Environmental	Major			Major			Major					
Environmental description	Better modeling of culvert and stream crossings, increased restoration potential.			Better restoration designs, culvert and bridge sizing, dam removal.								
Public safety, including life and property	Minor			I don't know			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes	Yes	Yes	
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes	Yes	
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Wildlife and Habitat Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type		Required	Required	
Geographic Area Requirements		One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Fisheries inventory and analysis. Location-based products and services such as maps and guides. Bathymetry is needed to analyze data on the meso-habitat scale and also turn around high quality lake and pond maps to the public. While acquiring comprehensive inland bathymetry can be very time-consuming, the benefits to our Fisheries program would be enormous; we would be able to analyze our data on the meso-habitat scale and also turn around high quality lake and pond maps to the public.
MCA Title	Wildlife and Habitat Management
MCA ID	21498
Organization Type	State or U.S. Territorial government
Organization Name	Massachusetts Division Fisheries and Wildlife
Sub-Agency or Division	
Organization Mission	To conserve and manage the flora and fauna of Massachusetts
Program Name	MADFW Fisheries Inventory and Analysis
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	BU 09 - Fisheries Management and Aquaculture
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Nice to have
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	We are interested in 3D mapping down to the scale of identifying important aquatic habitat features, like shoals, shelves, and clusters of rocks.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order		QL3B	QL0B	
Update Frequency		2-3 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error		Up to 1 meter	Less than 50 cm	
Acceptable Vertical Error		Up to 30 cm	Less than 10 cm	
How far onshore needed			1 kilometer inland	
How far down the beach profile needed			To MLLW	
Tide correction requirement			MSL	
Cross sections and/or transects meet needs		Partial		
Cross section/transect requirement		To do accurate analysis of lake/river bottoms, and provide accurate recreational maps, transects describing the deepest/shallowest parts of the water body would be important. Vertical accuracy of less than 10 cm		

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season		Required	Highly desirable			Highly desirable
Entire AOI under same environmental conditions		Required	Highly desirable			Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless		Highly desirable	Nice to have			Not required
DEM for entire AOI needs to be seamless		Highly desirable	Highly desirable			Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM		Highly desirable	Highly desirable	
DTM		Highly desirable	Highly desirable	
DEM		Required	Required	
Raw point cloud data		Nice to have	Nice to have	
Classified point cloud		Nice to have	Not required	
Edited/cube XYZ		Nice to have	Not required	
Full waveform		Nice to have	Not required	
Bathymetric Attributed Grid (BAG)		Highly desirable	Nice to have	
Breaklines required for standard hydro-flattening		Not required		
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Not required	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery		Nice to have	Nice to have	
Ground control/ground truthing		Nice to have	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery		Highly desirable	Highly desirable	
Underwater videography			Not required	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Not required	
Geologic and seismic data			Not required	
Water column properties - Physical			Highly desirable	
Water column properties - Chemical			Highly desirable	
Water column properties - Biological			Highly desirable	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates		Highly desirable	Highly desirable	
Land use/land cover		Nice to have	Highly desirable	
Wetlands		Nice to have	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features		Required	Required	
Bridges/culverts		Highly desirable		
Landmark features		Nice to have	Nice to have	
Cultural resources		Nice to have	Nice to have	
Coastal and riverine structures		Required	Highly desirable	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used		MADFW acquires our own inland bathymetry. We use a generic sonar unit, and process the data to a 1-meter resolution. The data inform sampling efforts and go into production of recreational maps.	We are currently collecting our own nearshore bathymetric data. We collect new data on an ongoing basis, and process it to a 1-meter resolution; we have not done an assessment of vertical accuracy.	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other			Yes	
Other description			MADFW	

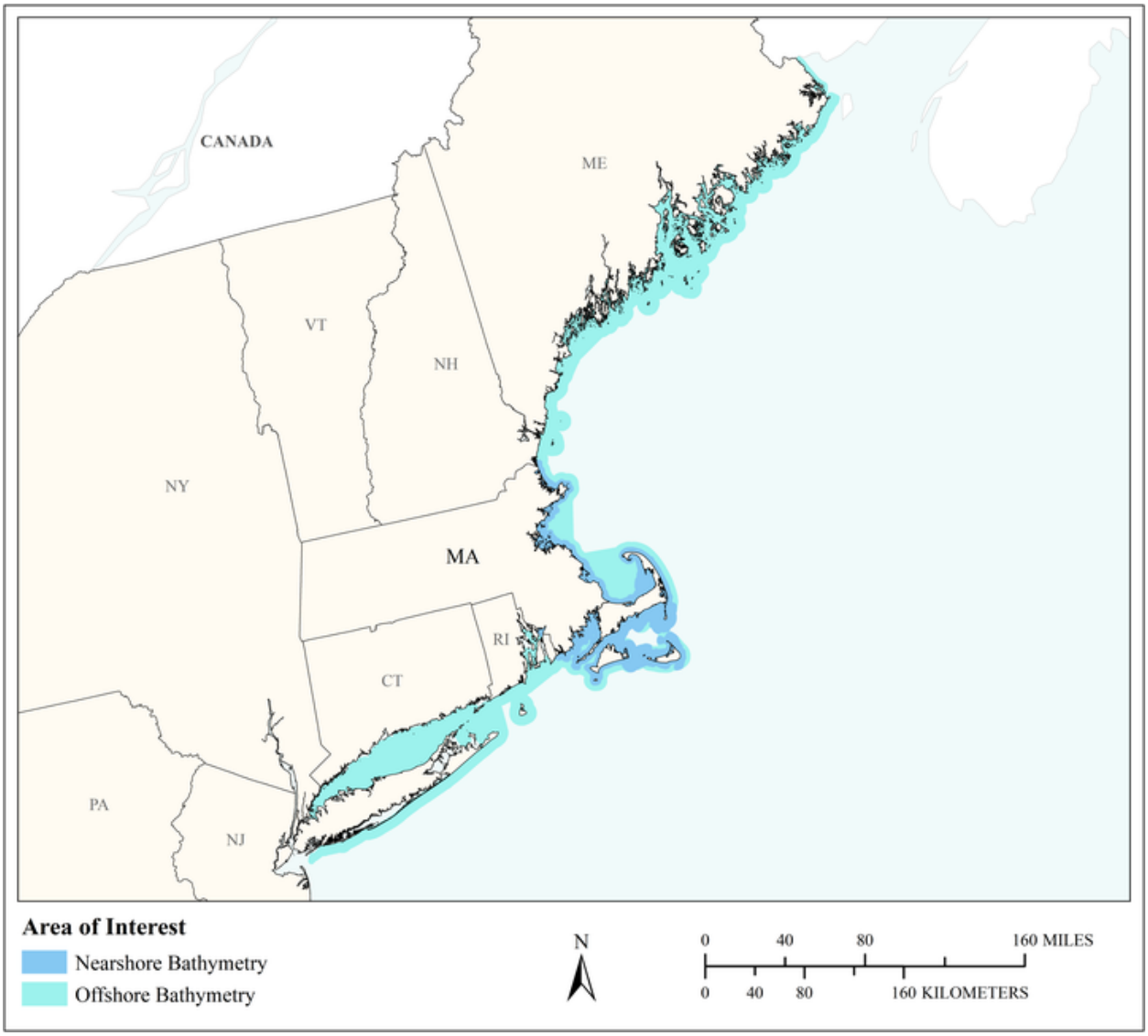
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings		Moderate	Minor	
Cost savings/cost reduction		None	Minor	
Cost avoidance		None	I don't know	
Increased revenues		None	I don't know	
Mission-driven performance improvements		Major	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services		Major	Minor	
Improved response or timeliness		None	Minor	
Improved customer experience		Major	Moderate	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach		Major	I don't know	
Environmental		Moderate	Minor	
Public safety, including life and property		Minor	I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings				Major	Annual dollars saved/realized	$57,285	Moderate	Unable to provide				
Time savings description				Won't need to collect our own data. We wouldn't have to process our own data. Reliable base elevation can go right into public map products.								
Cost savings/cost reduction				Moderate	Unable to provide		Minor	Unable to provide				
Cost avoidance				I don't know	Unable to provide		Moderate	Unable to provide				
Increased revenues				None			Moderate	Unable to provide				
Mission-driven performance improvements				Moderate	Unable to provide		Moderate	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services				Major	Annual dollars saved/realized	$3,015	Moderate	Unable to provide				
Value added to products or services description				Easily convey accuracy of maps and analysis.								
Improved response or timeliness				Major	Annual dollars saved/realized	$24,120	Moderate	Unable to provide				
Improved response or timeliness description				Can quickly provide updated map products to public.								
Improved customer experience				Moderate	Unable to provide		Moderate	Unable to provide				
Other customer service benefits				Moderate	Unable to provide							
Other customer service benefits description												
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach				I don't know			Moderate					
Environmental				I don't know			Moderate					
Public safety, including life and property				Moderate			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes	Yes	
Contours		Yes	Yes	
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Fisheries Management and Aquaculture



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type			Required	Required
Geographic Area Requirements			Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Custom description
Sub Area Requirements				Atlantic offshore from New York to Maine (generally, though sometimes further south) to the Gulf of Maine.

MCA Description	Response
Mission Critical Activity	Identification and delineation of marine fish habitats for the purpose of modeling and monitoring habitat extent and quality to more effectively manage impacts to and productivity of those habitats. Elevation data are needed to manage coastal ecosystems along that entire coast with a focus on Massachusetts. We have projects related to beach fill, winter flounder spawning habitats and dredging, eelgrass, and offshore wind.
MCA Title	Fisheries Management and Aquaculture
MCA ID	21750
Organization Type	State or U.S. Territorial government
Organization Name	Massachusetts Division of Marine Fisheries
Sub-Agency or Division	
Organization Mission	To manage the Commonwealth's living marine resources in balance with the environment resulting in sustainable fisheries and contributions to our economy, stable availability of diverse, healthy seafood and enriched opportunities that support our coastal culture.
Program Name	Division of Marine Fisheries, Fisheries Habitat Program
Total Annual Program Budget	
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	BU 06 - Natural Resources Conservation
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Not required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	The size of a VW beetle. It's often helpful to have information about ripples and sand waves, but we don't typically have that, so we're not used to working with it (e.g. high resolution indicators of energy at the seafloor).

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order			QL0B	Order 1
Update Frequency			6-10 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Horizontal Error			Up to 2 meters	Up to 2 meters
Acceptable Vertical Error			Less than 10 cm	Less than 1 meter
How far onshore needed			To Mean Higher High Water (MHHW)	
How far down the beach profile needed			Below MLLW	
Tide correction requirement			MSL	MSL
Cross sections and/or transects meet needs				Partial
Cross section/transect requirement			We need the highest quality bathymetry we can get. Full bottom coverage is necessary for the best habitat mapping.	In some areas, just better data is helpful and we'll take whatever we can get. In other areas, we want full bottom coverage. Within the state of Massachusetts, we want full bottom coverage. In offshore federal waters, full bottom coverage is more important for important fishing grounds and sensitive areas like coral and habitat closures.

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season			Nice to have	Nice to have		Nice to have
Entire AOI under same environmental conditions			Nice to have	Not required		Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless			Highly desirable	Highly desirable		Highly desirable
DEM for entire AOI needs to be seamless			Highly desirable	Highly desirable		Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM			Not required	Not required
DTM			Not required	Not required
DEM			Required	Required
Raw point cloud data			Nice to have	Nice to have
Classified point cloud			Not required	
Edited/cube XYZ			Nice to have	Nice to have
Full waveform			Not required	Not required
Bathymetric Attributed Grid (BAG)			Not required	Not required

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening				
Additional breaklines for hydro-enforcement of culverts				
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery			Required	Required
Ground control/ground truthing			Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Required	Required
Aerial and/or satellite imagery			Required	Required
Underwater videography			Required	Required
Bottom texture			Required	Required
Bottom type			Required	Required
Submerged features			Required	Required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data			Nice to have	Nice to have
Water column properties - Physical			Required	Required
Water column properties - Chemical			Required	Required
Water column properties - Biological			Required	Required
Currents			Required	Required
Tide/wave heights			Required	Nice to have
Sea ice conditions			Nice to have	Nice to have
Habitat distribution and classification			Required	Required
Boundaries			Required	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Required	Required
Floating observation/navigation systems			Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates			Required	
Land use/land cover			Nice to have	Nice to have
Wetlands			Required	Required
Estuaries			Required	Required
Inland surface water features			Not required	
Bridges/culverts				
Landmark features			Not required	
Cultural resources			Not required	
Coastal and riverine structures			Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used			USGS LIDAR data were downloaded from www.sciencebase.gov	USGS data
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				Yes
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories			Yes	
State repositories used			MassGIS, MassCZM	
Other			Yes	
Other description			USGS LIDAR data were downloaded from www.sciencebase.gov	

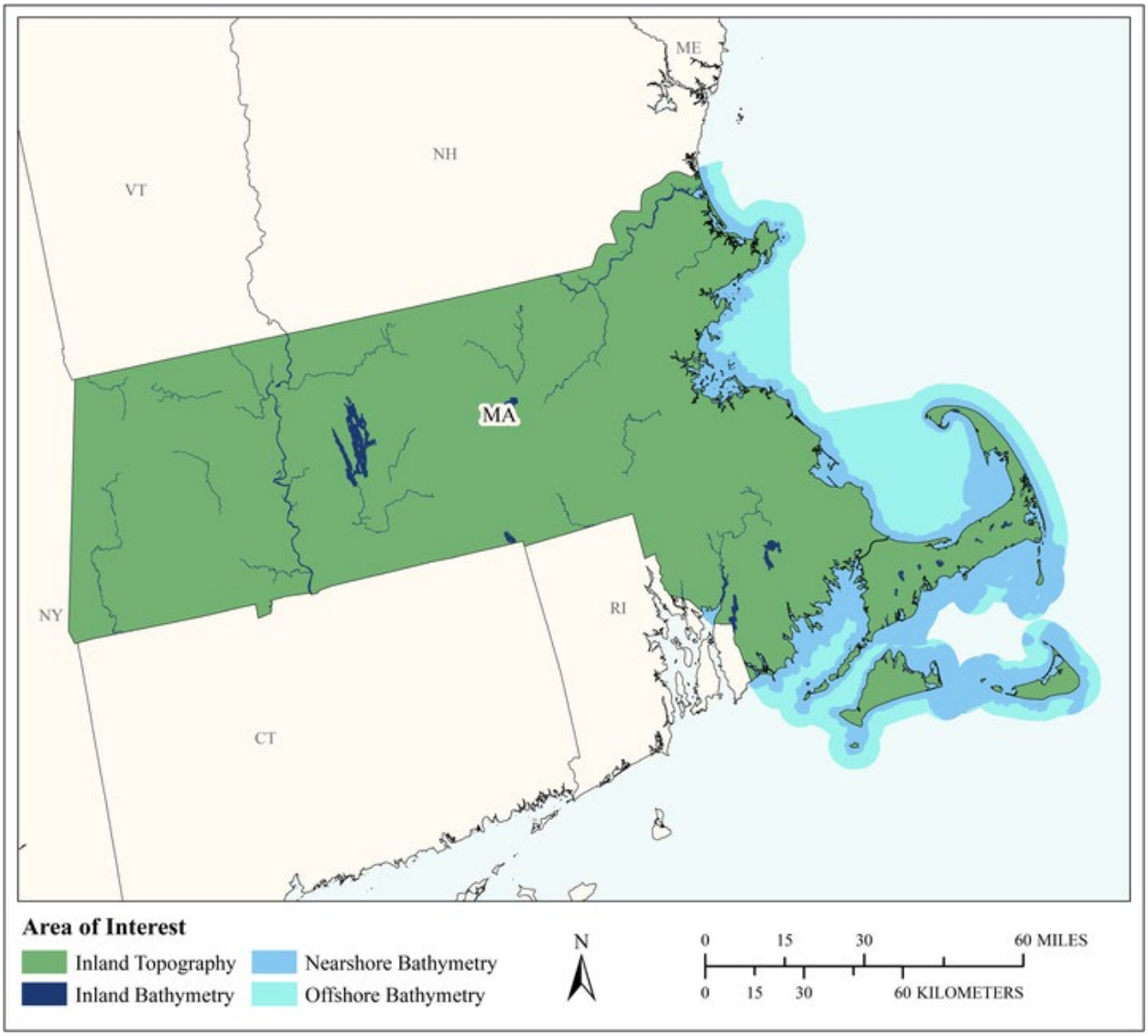
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings			Major	Moderate
Cost savings/cost reduction			Major	Moderate
Cost avoidance			Minor	Minor
Increased revenues			None	None
Mission-driven performance improvements			Moderate	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services			Minor	Moderate
Improved response or timeliness			Major	Moderate
Improved customer experience			Minor	None
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach			Moderate	Moderate
Environmental			Major	Major
Public safety, including life and property			None	None

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings							Major	Unable to provide		I don't know	Unable to provide	
Time savings description							Will help us to better model potential eelgrass restoration sites. Will help us to better understand coastal change over time (assessing vulnerability of certain shoreline locations).					
Cost savings/cost reduction							Moderate	Unable to provide		I don't know	Unable to provide	
Cost avoidance							Moderate	Unable to provide		I don't know	Unable to provide	
Increased revenues							Major	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements							Major	Annual percent improvement	7%	I don't know	Unable to provide	
Mission-driven performance improvements description							Will help us better understand vulnerable areas for cable laying and dredging.					
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services							None			I don't know	Unable to provide	
Improved response or timeliness							Major	Annual dollars saved/realized	$14,472	I don't know	Unable to provide	
Improved customer experience							Minor	Unable to provide		I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach							Moderate			Moderate		
Education or outreach description							High quality topo-bathy maps are illuminating to fishermen and outreach organizations.			High quality bathymetric maps are illuminating to fishermen and help us identify areas of concern		
Environmental							Major			Major		
Environmental description							Bathy is critical to know underlying habitats and geomorphology. For modeling, bathy is crucial in a wide variety of ways. The more accurate the bathy data, the more accurate the model and model predictions and the better we can manage.			Bathy is critical to know underlying habitats and accurately model them.		
Public safety, including life and property							Minor			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours			Yes	Yes
Hillshades			Yes	Yes
Slope maps			Yes	Yes
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness			Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic Mapping



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Geologic Mapping Natural Hazard Identification and Mitigation Sand Resource Assessment Water Resources. Availability of QL2 Lidar has revolutionized geologic mapping by providing detailed terrain information in the office and with widespread detail that would be prohibitively time-intensive and expensive to acquire via field work. There are well documented ROIs on availability of complete geologic mapping, whether on land or under water.
MCA Title	Geologic Mapping
MCA ID	22125
Organization Type	State or U.S. Territorial government
Organization Name	MA Geological Survey
Sub-Agency or Division	
Organization Mission	The state geologist shall perform research on the land, mineral, and water resources of the state; coordinate and facilitate research and communication among various agencies, researchers and stakeholders; collect, compile, analyze and preserve data pertaining to the geologic environment; disseminate the findings of such research to the public through maps, reports, and other publications; and, direct the Massachusetts geological survey. The state geologist shall advise all other branches of state and local government, concerning the geologic character of the state and its implications for both economic and scientific needs in conjunction with all existing and future environmental factors relating to the geology of the state. The state geologist shall maintain liaison with federal and other state geological surveys, and academic institutions.
Program Name	Geologic Mapping
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 11 - Geologic Resource Mining and Extraction
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Not required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Highest resolution bare earth model and bathymetry
Description of smallest 3D features	Interested in being able to see individual bedrock outcrops on a bare earth image, stone walls, dirt roads, rocks and boulders in rivers and bedforms up to 1 meter in height and a meter in wavelength.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL0B	QL0B	Order 1b
Update Frequency	2-3 years	4-5 years	2-3 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter	Up to 2 meters	Up to 10 meters
Acceptable Vertical Error	Less than 5 cm	Up to 20 cm	Up to 20 cm	Up to 2 meters
How far onshore needed			To cover the beach slope	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			NAVD88	NAVD88
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Required	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable	Highly desirable	Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Not required	Not required	Not required
DTM	Required	Required	Not required	Required
DEM	Not required	Required	Required	Not required
Raw point cloud data	Not required	Not required	Not required	Not required
Classified point cloud	Not required	Not required	Not required	
Edited/cube XYZ		Not required	Not required	Not required
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Not required	Not required	Not required
Breaklines required for standard hydro-flattening	Not required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Not required	Required	Required	Highly desirable
Ground control/ground truthing	Nice to have	Nice to have	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Nice to have	Nice to have
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Not required	Highly desirable
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Nice to have
Bottom type			Highly desirable	Nice to have
Submerged features			Highly desirable	Nice to have
Subbottom characteristics			Highly desirable	Nice to have
Geologic and seismic data	Highly desirable	Required	Required	Required
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Nice to have	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Not required
Offshore cadastral			Nice to have	Nice to have
Lease areas			Not required	Nice to have
Fixed obstructions			Not required	Nice to have
Floating observation/navigation systems			Not required	Not required
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Nice to have	
Land use/land cover	Highly desirable	Nice to have	Not required	Nice to have
Wetlands	Highly desirable	Highly desirable	Nice to have	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Nice to have	Not required
Inland surface water features	Highly desirable	Highly desirable	Nice to have	
Bridges/culverts	Nice to have	Not required		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Nice to have	Nice to have	Nice to have	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	LiDAR terrain data, QL1 and QL2	None	3 m bathy from private contractor, 10 m bathy from USGS	U.S. Geological Survey other information not known
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes		Yes	
State repositories used	MassGIS		MA Coastal Zone Management	
Other				Yes
Other description				USGS
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know	I don't know	None	None
Cost savings/cost reduction	I don't know	I don't know	None	None
Cost avoidance	I don't know	I don't know	None	None

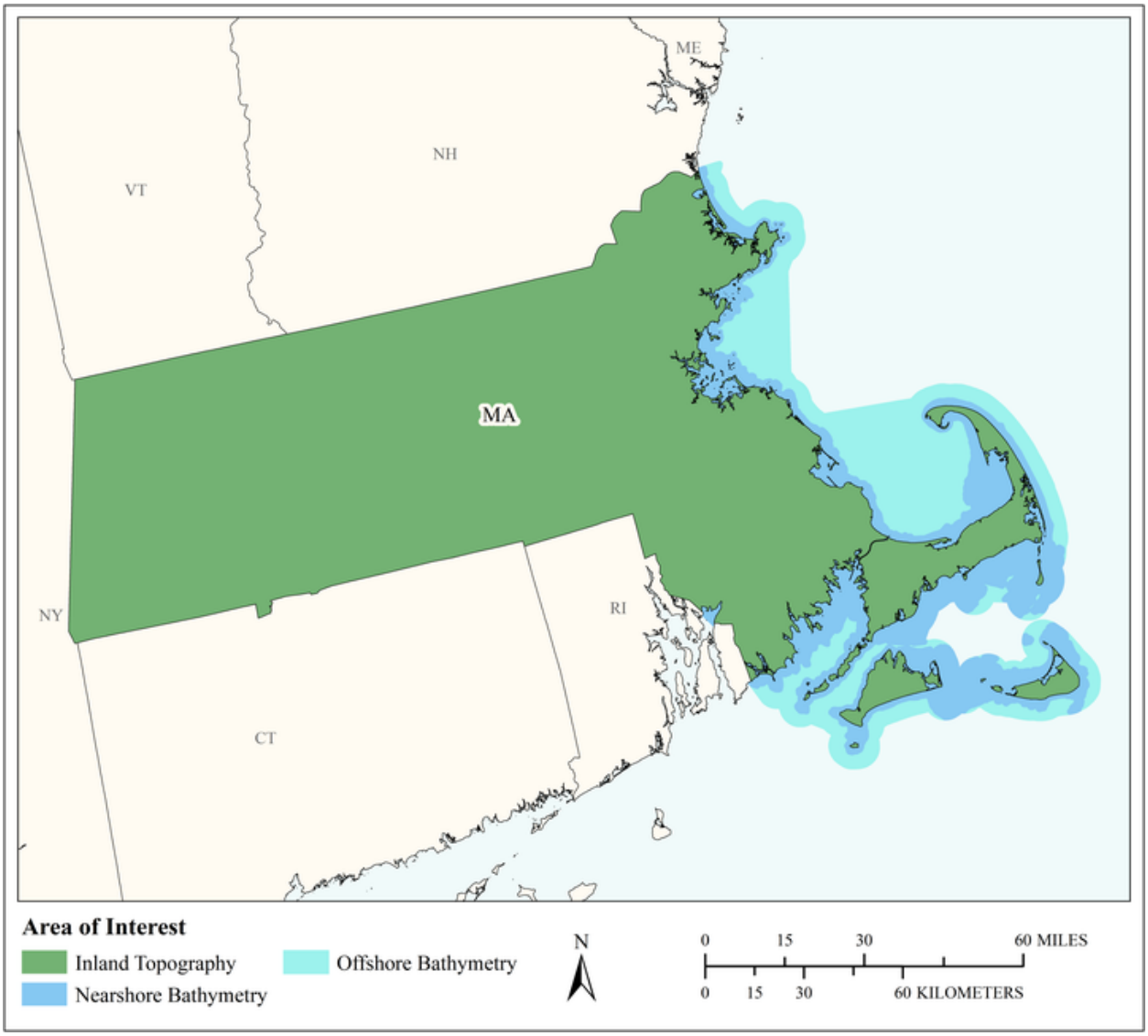
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Increased revenues	None	I don't know	None	None
Mission-driven performance improvements	Moderate	I don't know	None	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Moderate	Moderate
Improved response or timeliness	Minor	I don't know	Minor	Minor
Improved customer experience	Major	Moderate	Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	Minor	Minor
Environmental	Major	Moderate	Moderate	Moderate
Public safety, including life and property	Major	Moderate	Major	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Minor	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	None			None			None			None		
Cost avoidance	I don't know	Unable to provide		None			None			None		
Increased revenues	None			None			Moderate	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,711,893		Annual dollars saved/ realized	$22,660		Annual dollars saved/ realized	$89,795		Annual dollars saved/ realized	$2,061,927
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Value added to products or services description	Availability of QL2 Lidar has revolutionized geologic mapping by providing detailed terrain information in the office and with widespread detail that would be prohibitively time-intensive and expensive to acquire via field work.											
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$30,052		Annual dollars saved/ realized	$24,900		Annual dollars saved/ realized	$144,477			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Minor			None		
Environmental	Major			Moderate			Moderate			None		
Environmental description	Greater accuracy in mapping recharge areas to fractured rock aquifers						Better sediment transport modeling					
Public safety, including life and property	Major			Major			Major			None		
Public safety, including life and property description	Better flood, fluvial erosion and landslide hazard identification			Better understanding of flooding and fluvial erosion hazard			Coastal storm and erosion hazard mapping					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes		Yes	Yes
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes		Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Renewable Energy Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	Required
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Alternate energy development – solar, tidal, wind, wave, and ocean current. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Low head power potential for hydropower.
MCA Title	Renewable Energy Resources
MCA ID	60226
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Massachusetts
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2		I don't know	I don't know
Update Frequency	6-10 years		I don't know	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter		I don't know	I don't know
Acceptable Vertical Error	Up to 20 cm		I don't know	I don't know
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable		I don't know	I don't know		I don't know
Entire AOI under same environmental conditions	Highly desirable		I don't know	I don't know		I don't know
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable		I don't know	I don't know		I don't know
DEM for entire AOI needs to be seamless	Highly desirable		I don't know	I don't know		I don't know
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		I don't know	I don't know		I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required		I don't know	I don't know
DTM	Required		I don't know	I don't know
DEM	Required		I don't know	I don't know
Raw point cloud data	Highly desirable		I don't know	I don't know
Classified point cloud	Highly desirable		I don't know	
Edited/cube XYZ			I don't know	I don't know
Full waveform	Nice to have		I don't know	I don't know
Bathymetric Attributed Grid (BAG)			I don't know	I don't know
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			I don't know	I don't know
Tide Predictions			I don't know	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			I don't know	I don't know
Intensity imagery/sidescan imagery	Not required		I don't know	I don't know
Ground control/ground truthing	Highly desirable		I don't know	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			I don't know	I don't know
Nautical and/or navigation charts			I don't know	I don't know
Acoustic imagery of the seafloor			I don't know	I don't know
Aerial and/or satellite imagery	Highly desirable		I don't know	I don't know
Underwater videography			I don't know	I don't know
Bottom texture			I don't know	I don't know
Bottom type			I don't know	I don't know
Submerged features			I don't know	I don't know
Subbottom characteristics			I don't know	I don't know
Geologic and seismic data	Not required		I don't know	I don't know
Water column properties - Physical			I don't know	I don't know
Water column properties - Chemical			I don't know	I don't know
Water column properties - Biological			I don't know	I don't know
Currents			I don't know	I don't know
Tide/wave heights			I don't know	I don't know
Sea ice conditions			I don't know	I don't know
Habitat distribution and classification			I don't know	I don't know
Boundaries			I don't know	I don't know
Routes			I don't know	I don't know
Offshore cadastral			I don't know	I don't know
Lease areas			I don't know	I don't know
Fixed obstructions			I don't know	I don't know
Floating observation/navigation systems			I don't know	I don't know
Shorelines – current, historic, change rates	Nice to have		I don't know	
Land use/land cover	Highly desirable		I don't know	I don't know
Wetlands	Nice to have		I don't know	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			I don't know	I don't know
Inland surface water features	Nice to have		I don't know	
Bridges/culverts	Nice to have			
Landmark features	Nice to have		I don't know	
Cultural resources	Not required		I don't know	
Coastal and riverine structures	Nice to have		I don't know	
Overhead structures			I don't know	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate		I don't know	I don't know
Cost savings/cost reduction	Moderate		I don't know	I don't know
Cost avoidance	Moderate		I don't know	I don't know
Increased revenues	None		I don't know	I don't know
Mission-driven performance improvements	Minor		I don't know	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor		I don't know	I don't know

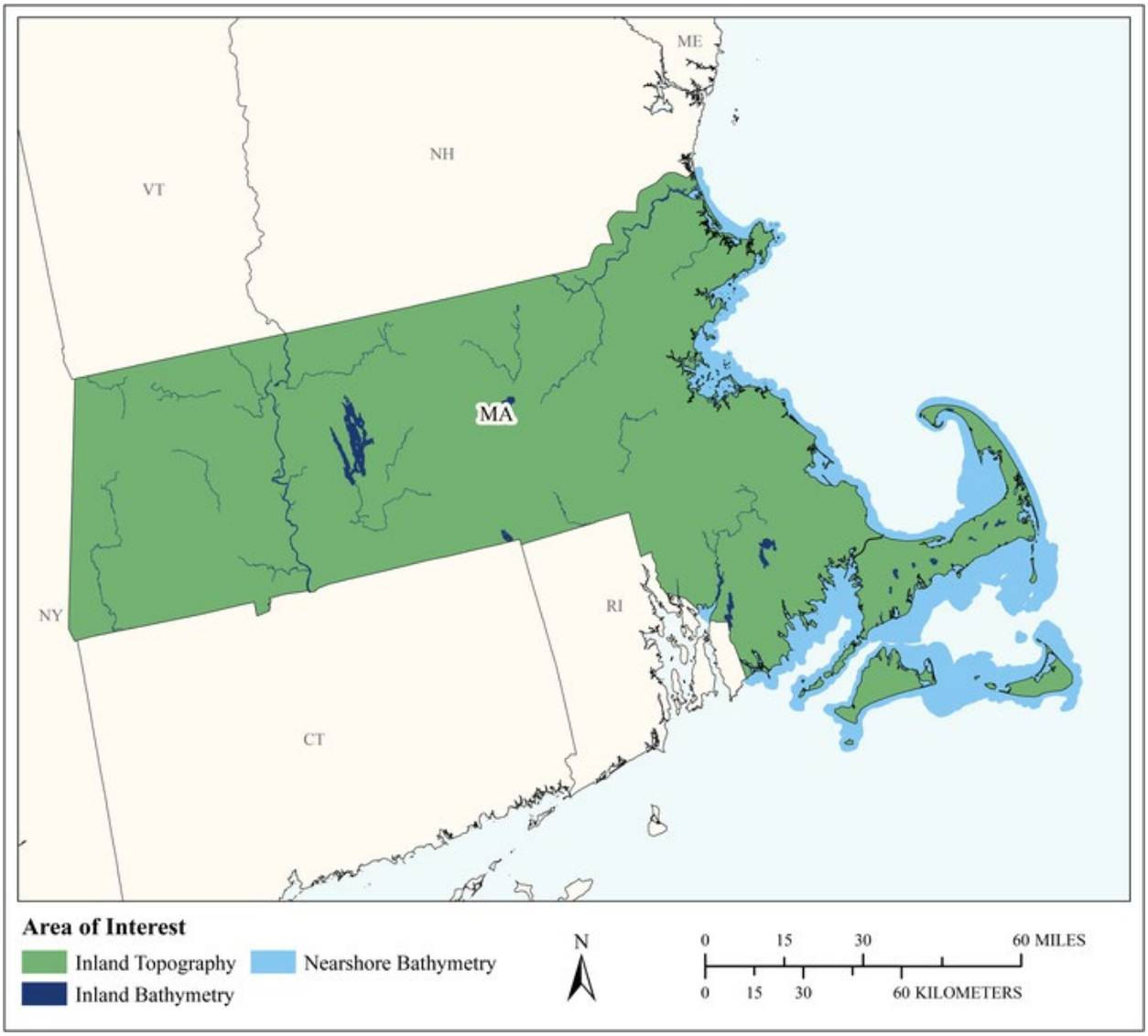
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor		I don't know	I don't know
Improved customer experience	Minor		I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor		I don't know	I don't know
Environmental	Minor		I don't know	I don't know
Public safety, including life and property	Minor		I don't know	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues	Moderate	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Minor	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor						I don't know			I don't know		
Environmental	Minor						I don't know			I don't know		
Public safety, including life and property	None						I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Flood Risk Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Flood risk modeling and mapping of riverine and coastal areas. Dam/dike/levee safety analysis. Emergency management. Flood forecasts.
MCA Title	Flood Risk Management
MCA ID	60227
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Massachusetts
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL2B	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Highly desirable	
DTM	Required	Required	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	
Classified point cloud	Required	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Not required	
Geologic and seismic data	Nice to have	Nice to have	Not required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Highly desirable	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Not required	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Minor	
Cost savings/cost reduction	Major	Minor	Minor	
Cost avoidance	Major	Moderate	Minor	
Increased revenues	Minor	Minor	None	
Mission-driven performance improvements	Major	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Minor	

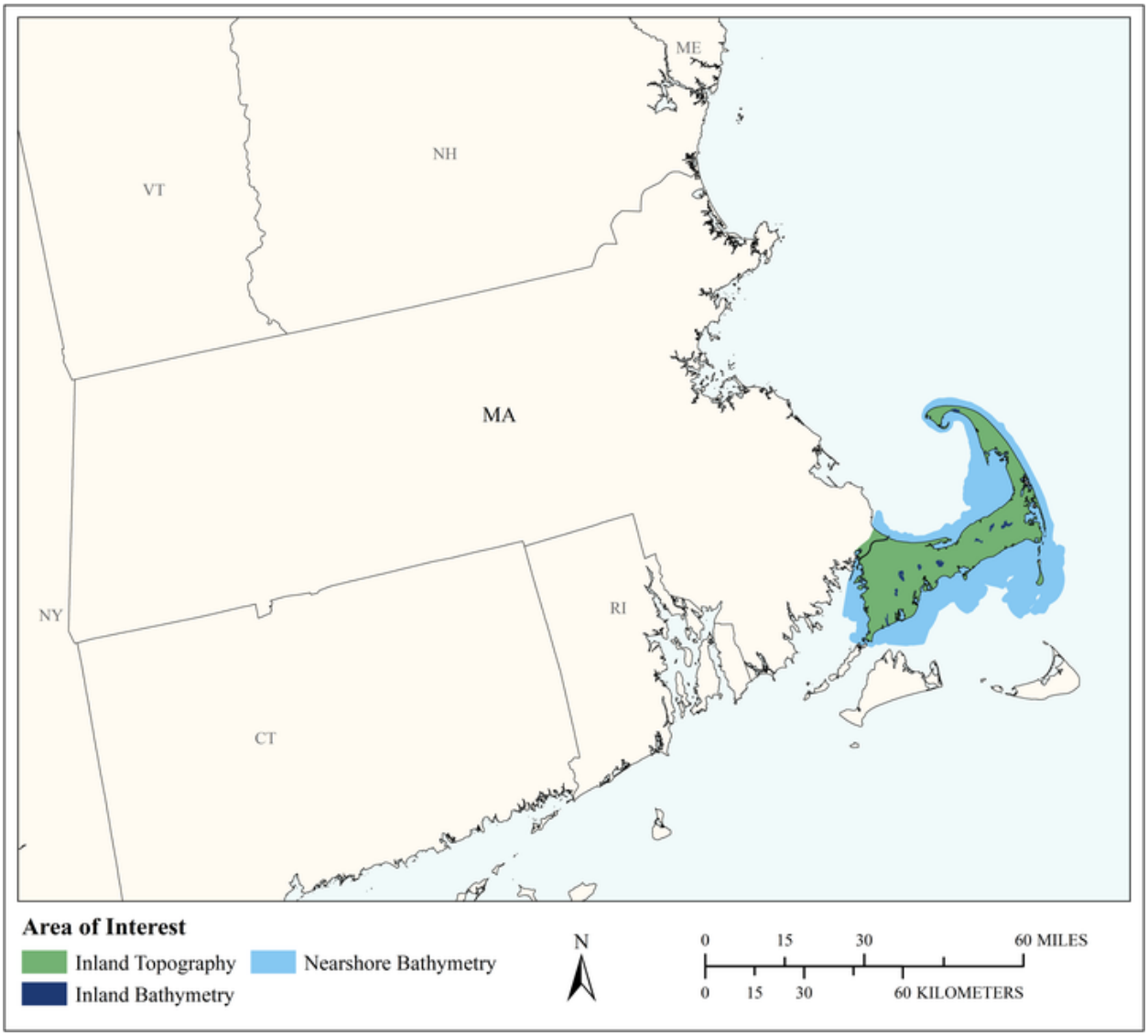
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	Minor	
Improved customer experience	Major	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor	Minor	
Environmental	Major	Moderate	Moderate	
Public safety, including life and property	Major	Moderate	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	Minor	Unable to provide		None			Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,138,661		Annual dollars saved/ realized	$79,099		Annual dollars saved/ realized	$220,429			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$199,230		Annual dollars saved/ realized	$88,808		Annual dollars saved/ realized	$163,369			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate			Major					
Environmental	Moderate			Moderate			Moderate					
Public safety, including life and property	Major			Major			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Coastal Hazard Mitigation and Coastal Resilience Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements	Barnstable County, MA	Barnstable County, MA	Barnstable County, MA	

MCA Description	Response
Mission Critical Activity	Coastal Hazard Mitigation; Coastal Resilience Planning; Virtual City Creation; Inland bathymetry is needed for Cape Cod's kettle ponds; these are windows into the Cape's groundwater resource. Having inland bathy data helps understand the groundwater resource.
MCA Title	Coastal Hazard Mitigation and Coastal Resilience Planning
MCA ID	21571
Organization Type	Regional, County, City, or other local government
Organization Name	Cape Cod Commission
Sub-Agency or Division	
Organization Mission	Keeping a special place special
Program Name	GIS Program; Transportation Program; Planning Program; Water Resources Program
Total Annual Program Budget	
Primary Business Use	BU 16 - Sea Level Rise and Subsidence
Secondary Business Use	BU 23 - Urban and Regional Planning
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Curbs and edge of roads; underwater objects as small as a sunken jetty.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required

Inland Bathy Feature Size Requirements	Response
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL2B	QL2B	
Update Frequency	4-5 years	2-3 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI	Some shorelines may require annual updates The mid- and outer-Cape change from daily water activity AND major changes can occur due to specific events. The boundary of the Cape on the Cape Cod Bay side only changes due to specific storm events.			
Acceptable Horizontal Error	Up to 30 cm	Up to 1 meter	Up to 2 meters	
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed			To Mean Higher High Water (MHHW)	
How far down the beach profile needed	Below MLLW		To MLLW	
Tide correction requirement			MHW	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Not required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Required
Entire AOI under same environmental conditions	Highly desirable	Required	Required		Required	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Highly desirable		Highly desirable	Required
DEM for entire AOI needs to be seamless	Required	Highly desirable	Required		Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level		Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	
DTM	Required	Highly desirable	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Highly desirable	Required	
Classified point cloud	Required	Highly desirable	Required	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Highly desirable	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	
Ground control/ground truthing	Highly desirable	Highly desirable	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Not required	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Highly desirable	
Water column properties - Physical			Highly desirable	
Water column properties - Chemical			Highly desirable	
Water column properties - Biological			Highly desirable	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Highly desirable	
Routes			Highly desirable	
Offshore cadastral			Highly desirable	
Lease areas			Highly desirable	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Required	Required	Required	
Wetlands	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Topographic Lidar, Bathymetric Lidar, Topo bathy shoreline Lidar	USACE navigation charts	NOAA Hydrographic Surveys	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes	Yes	Yes	
NCEI	Yes			
Open Topography				
NOAA nautical charts				
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	MassGIS			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor	Moderate	Moderate	
Cost savings/cost reduction	Major	Major	Major	
Cost avoidance	Moderate	Major	Major	
Increased revenues	Minor	Minor	Minor	

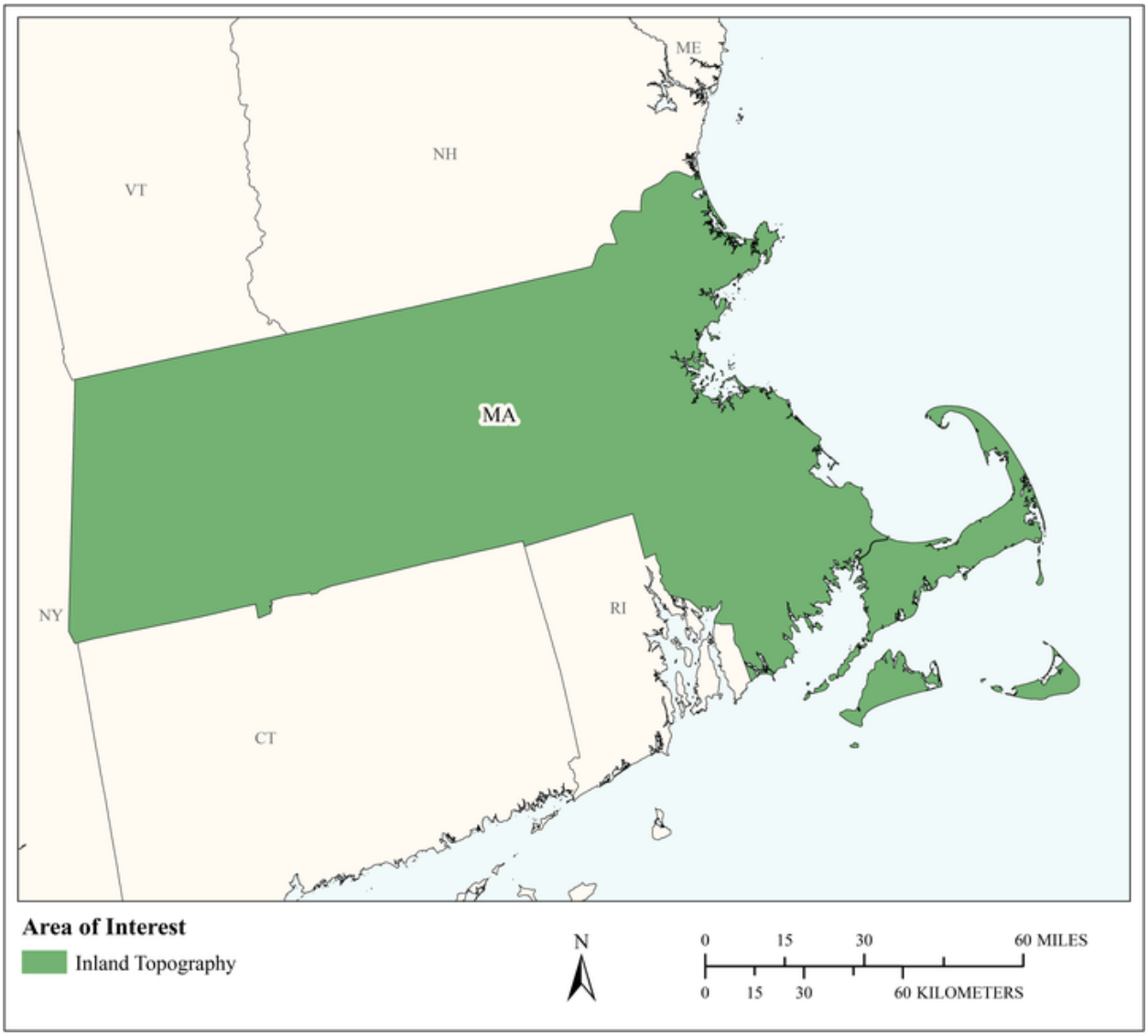
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Mission-driven performance improvements	Moderate	Major	Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Major	Moderate	
Improved response or timeliness	Moderate	Minor	None	
Improved customer experience	Moderate	Moderate	None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Moderate	
Environmental	Major	Major	Major	
Public safety, including life and property	Major	Moderate	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$54,270	Major	Unable to provide		Major	Unable to provide				
Time savings description	No temporal corrections, no height estimations, accurate existing conditions. Accurate existing conditions. Other departments do modeling that I don't have access to. Field inspections are unpredictable in our work. Estimated for future dredge management.			Having inland bathy data for Cape Cod's kettle ponds helps understand the groundwater resource.								
Cost savings/cost reduction	Major	Annual dollars saved/realized	$750,000	Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction description	Beach restoration savings by member towns.											
Cost avoidance	Major	Annual dollars saved/realized	$50,000	Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance description	Hydroplaning studies. Poor quality data leads to inaccurate modelling estimations. Inaccurate point cloud classification is wasted time and money. Using old "best available" data is inaccurate.											
Increased revenues	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Increased revenues description	Higher quality, current data could be used to update current applications and provide additional services. Assist in future dredge operations and beach nourishment.											
Mission-driven performance improvements	Major	Annual percent improvement	42%	Major	Unable to provide		Major	Unable to provide				
Mission-driven performance improvements description	Better data better programs (SLR, stormwater, scenario planning). Coastal Hazard Mitigation, shore line change.			Major benefits of inland bathy data are in Cape Cod's kettle ponds; these are windows into the Cape's groundwater resource. Having inland bathy data helps understand the groundwater resource.								
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Minor			Minor					
Environmental	Moderate			Moderate			Major					
Public safety, including life and property	Moderate			Minor			Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes	Yes	Yes	
Curvature maps	Yes			
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes	Yes	
Hydrologic Flow Accumulation Grids	Yes	Yes	Yes	
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Land Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Road and railroad route selection and maintenance. Slope analysis for autonomous cars. GPS navigation visualization.
MCA Title	Land Navigation and Safety
MCA ID	60228
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Massachusetts
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 19 - Land Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

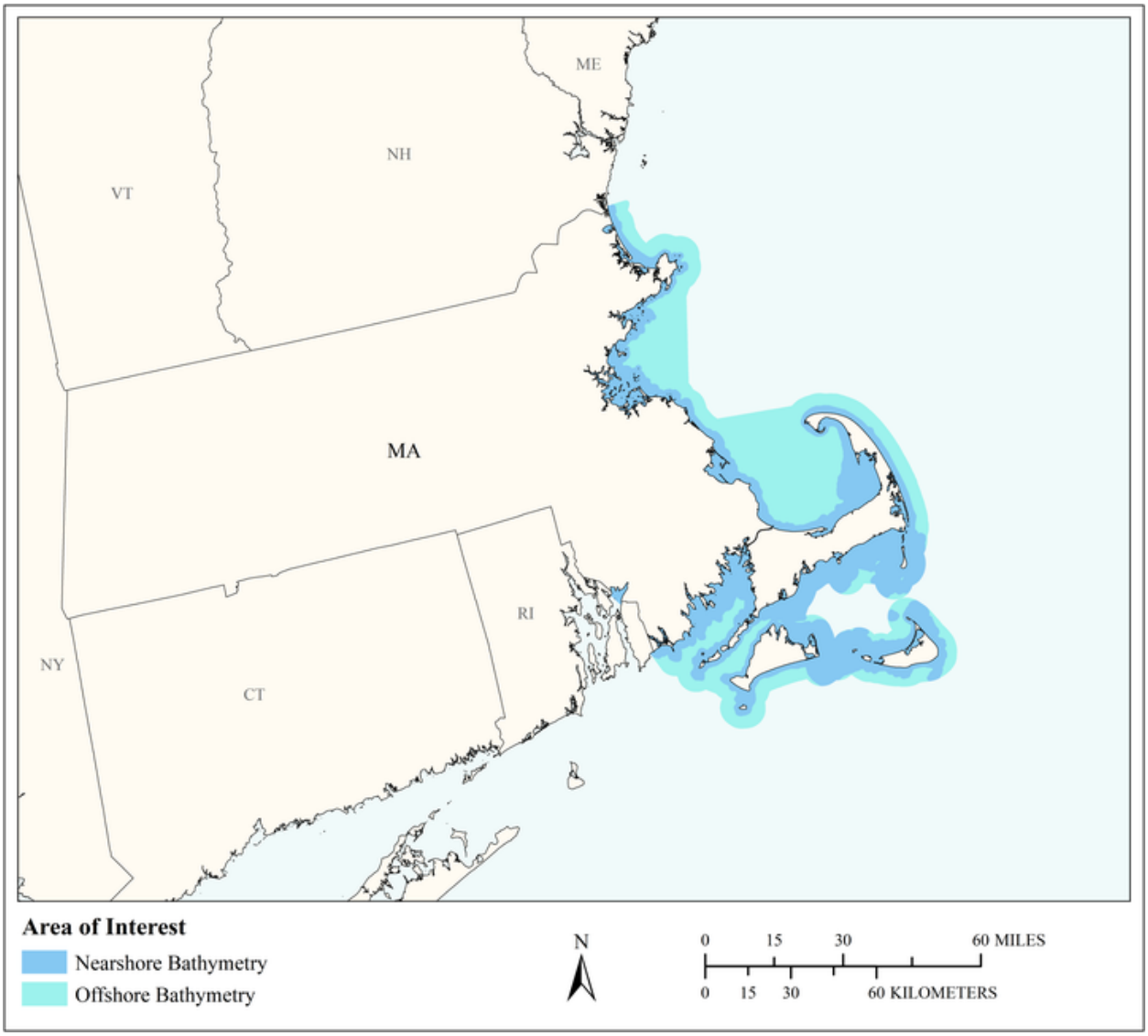
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Moderate			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Moderate	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$105,057									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$8,483									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Marine and Riverine Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type			Required	Required
Geographic Area Requirements			Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Nautical charting. Bathymetric measurements of nearshore submerged coastal topography. Identification of hazards to navigation. Sediment management at coastal navigation projects. Precision marine navigation. Movement of goods and fishing vessels.
MCA Title	Marine and Riverine Navigation and Safety
MCA ID	60229
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Massachusetts
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order			QL0B	I don't know
Update Frequency			2-3 years	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error			Up to 2 meters	I don't know
Acceptable Vertical Error			Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season			Nice to have	I don't know		Nice to have
Entire AOI under same environmental conditions			Nice to have	I don't know		Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless			Required	I don't know		Highly desirable
DEM for entire AOI needs to be seamless			Required	I don't know		Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM			Required	I don't know
DTM			Required	I don't know
DEM			Required	I don't know
Raw point cloud data			Required	I don't know
Classified point cloud			Nice to have	
Edited/cube XYZ			Highly desirable	I don't know
Full waveform			Not required	I don't know
Bathymetric Attributed Grid (BAG)			Highly desirable	I don't know
Breaklines required for standard hydro-flattening				
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	I don't know
Tide Predictions			Required	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	I don't know
Intensity imagery/sidescan imagery			Highly desirable	I don't know
Ground control/ground truthing			Highly desirable	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	I don't know
Nautical and/or navigation charts			Highly desirable	I don't know
Acoustic imagery of the seafloor			Highly desirable	I don't know
Aerial and/or satellite imagery			Highly desirable	I don't know
Underwater videography			Nice to have	I don't know
Bottom texture			Highly desirable	I don't know
Bottom type			Highly desirable	I don't know
Submerged features			Highly desirable	I don't know
Subbottom characteristics			Nice to have	I don't know
Geologic and seismic data			Nice to have	I don't know
Water column properties - Physical			Nice to have	I don't know
Water column properties - Chemical			Nice to have	I don't know
Water column properties - Biological			Nice to have	I don't know
Currents			Highly desirable	I don't know
Tide/wave heights			Highly desirable	I don't know
Sea ice conditions			Nice to have	I don't know
Habitat distribution and classification			Highly desirable	I don't know
Boundaries			Nice to have	I don't know
Routes			Required	I don't know
Offshore cadastral			Nice to have	I don't know
Lease areas			Nice to have	I don't know
Fixed obstructions			Required	I don't know
Floating observation/navigation systems			Required	I don't know
Shorelines – current, historic, change rates			Required	
Land use/land cover			Nice to have	I don't know
Wetlands			Highly desirable	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	I don't know
Inland surface water features			Highly desirable	
Bridges/culverts				
Landmark features			Nice to have	
Cultural resources			Nice to have	
Coastal and riverine structures			Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings			Minor	I don't know
Cost savings/cost reduction			Minor	I don't know
Cost avoidance			Minor	I don't know
Increased revenues			Minor	I don't know
Mission-driven performance improvements			Minor	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services			Minor	I don't know

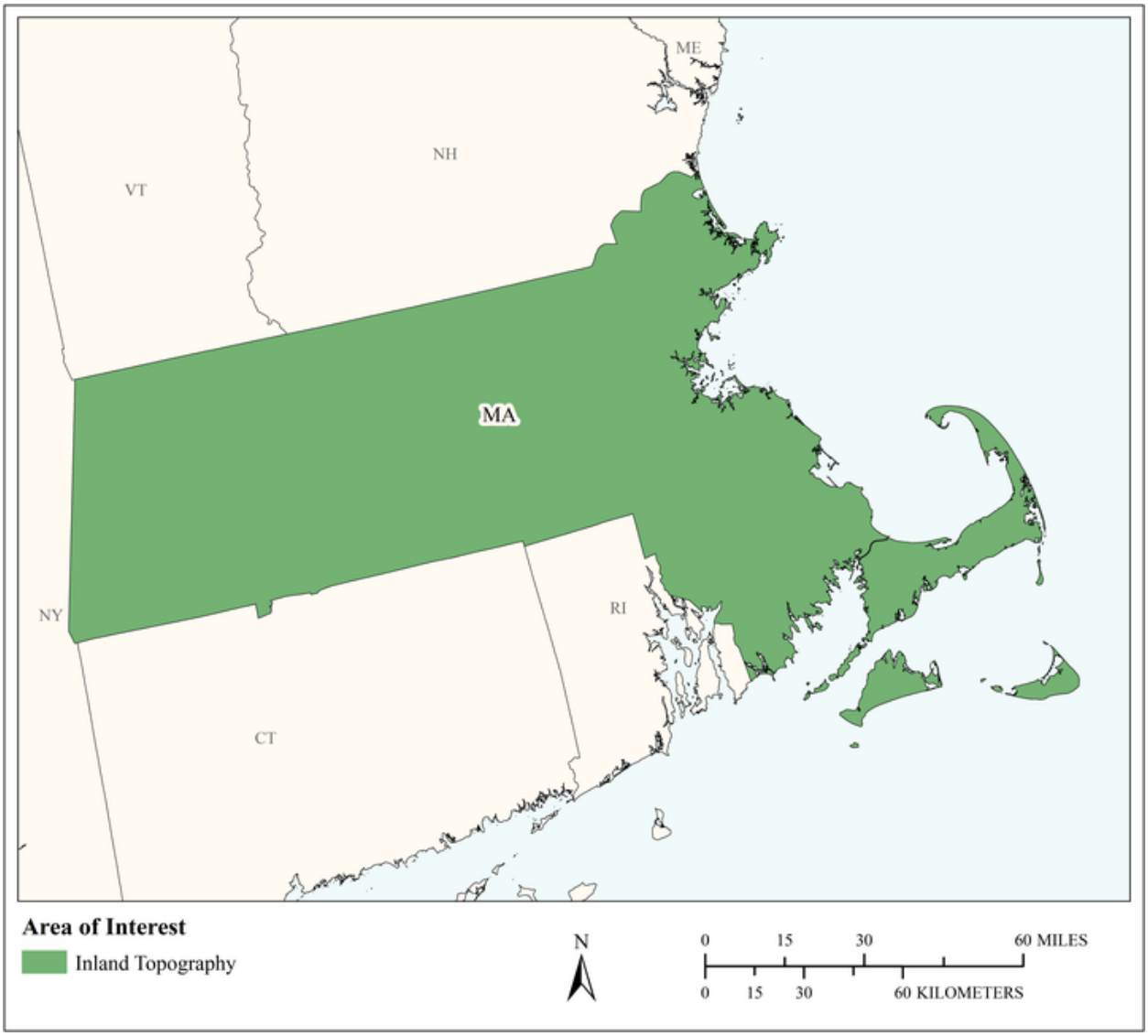
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness			Minor	I don't know
Improved customer experience			Minor	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach			Minor	I don't know
Environmental			Minor	I don't know
Public safety, including life and property			Major	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings							Moderate	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction							Moderate	Unable to provide		I don't know	Unable to provide	
Cost avoidance							Major	Unable to provide		I don't know	Unable to provide	
Increased revenues							Major	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements							Major	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation								Annual dollars saved/ realized	$892,458			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services							Moderate	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness							Major	Unable to provide		I don't know	Unable to provide	
Improved customer experience							Major	Unable to provide		I don't know	Unable to provide	
Future annual customer service benefits added during validation								Annual dollars saved/ realized	$30,216			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach							Minor			I don't know		
Environmental							Major			I don't know		
Public safety, including life and property							Major			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	
Contours			Yes	Yes
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections			Yes	
Height-Above-Ground maps				Yes
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)			Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				Yes

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Aviation Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of in-flight hazards and path obstructions. Aeronautical charting. Runway construction and repair.
MCA Title	Aviation Navigation and Safety
MCA ID	60230
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Massachusetts
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 21 - Aviation Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes			
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Major			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

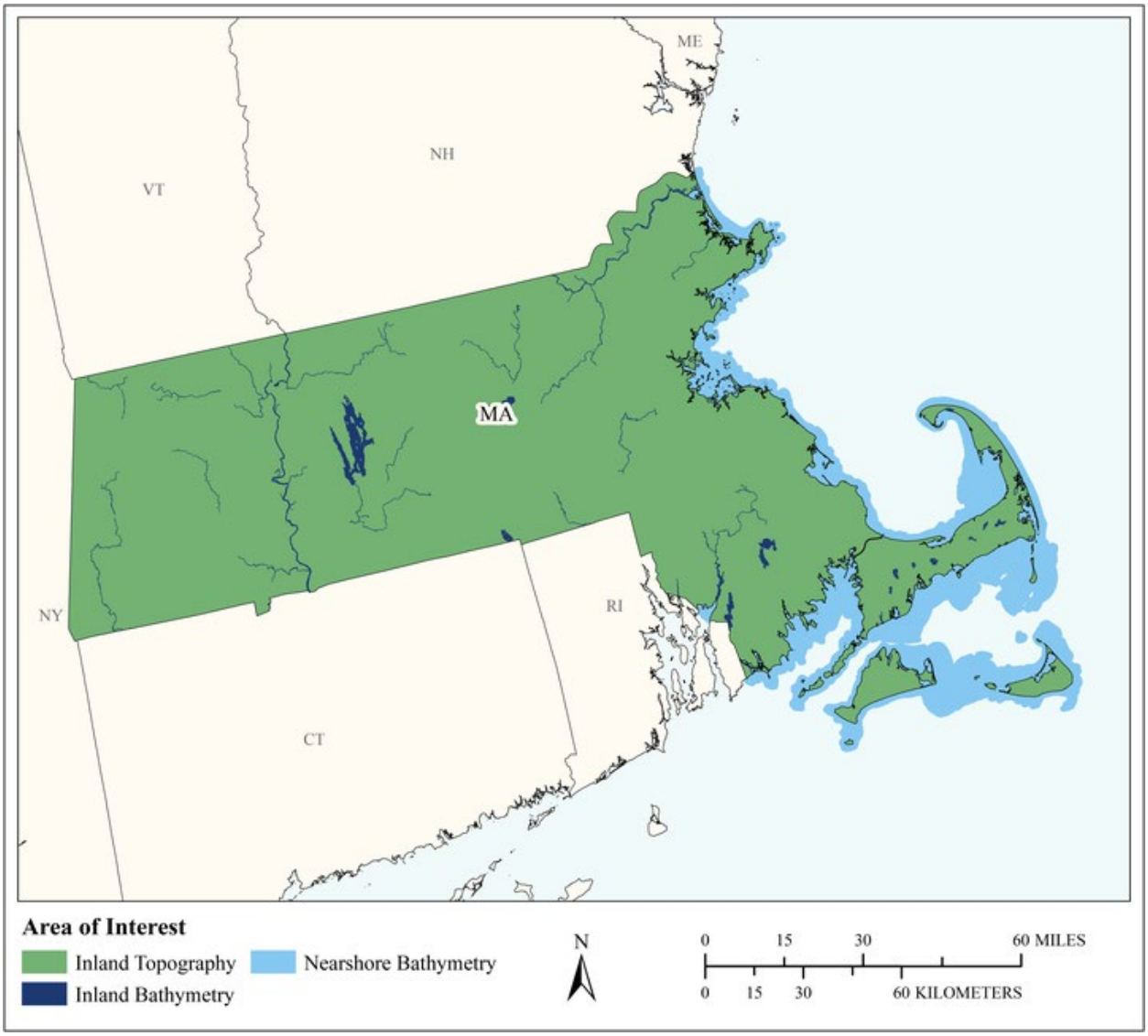
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$27,415									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$34,145									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Moderate											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Dam Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Dam break modeling and inundation mapping, Engineering review and construction of dams, levees, dikes, reservoirs, and coastal structures. Development of Emergency Action Plan and Inundation Maps for all significant and high hazard dams.
MCA Title	Dam Safety
MCA ID	1099
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Massachusetts: Department of Conservation and Recreation, Office of Dam Safety
Sub-Agency or Division	
Organization Mission	To protect, promote and enhance our common wealth of natural, cultural and recreational resources for the well-being of all. In meeting today's responsibilities and planning for tomorrow, DCR's focus is on: Improving outdoor recreational opportunities and natural resource conservation, cultural and recreational resources for the well-being of all.
Program Name	Office of Dam Safety
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Not required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Outlet structures, spillway channels and other misc. control structures

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	Cross sections and/or transects meet needs	QL1B	
Update Frequency	Annually	2-3 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	The best horizontal accuracy achievable for the vertical accuracy I need	Up to 2 meters	
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed	To MHW			
Tide correction requirement				
Cross sections and/or transects meet needs		Yes		
Cross section/transect requirement		The highest vertical accuracy would help better understand and quantify the storage volumes of a dam impoundment, which will in turn help us more accurately model the downstream flooding that would occur if a dam should fail.		

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Nice to have		Highly desirable	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Highly desirable	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Nice to have	Nice to have	
Classified point cloud	Nice to have	Nice to have	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Required	Nice to have	Nice to have	
Ground control/ground truthing	Required	Required	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Nice to have	Highly desirable	Highly desirable	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Nice to have	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Highly desirable	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Required	Highly desirable	Highly desirable	
Wetlands	Required	Highly desirable	Required	
Estuaries			Required	
Inland surface water features	Required	Highly desirable	Required	
Bridges/culverts	Required	Highly desirable		
Landmark features	Nice to have	Nice to have	Highly desirable	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Highly desirable	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	MASSGIS 2017 LIDAR manipulated DEM	Very little exists for inland bathymetry.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	MASS DCR SERVER	MASS -GIS server and scanned plans on a local hard drive		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Cost savings/cost reduction	Major	Major	Minor	
Cost avoidance	Major	Moderate	Minor	
Increased revenues	I don't know	None	None	
Mission-driven performance improvements	Major	Major	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Minor	
Improved response or timeliness	Major	Major	Minor	
Improved customer experience	Moderate	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	None	Minor	
Environmental	Major	Major	Minor	
Public safety, including life and property	Major	Major	Minor	

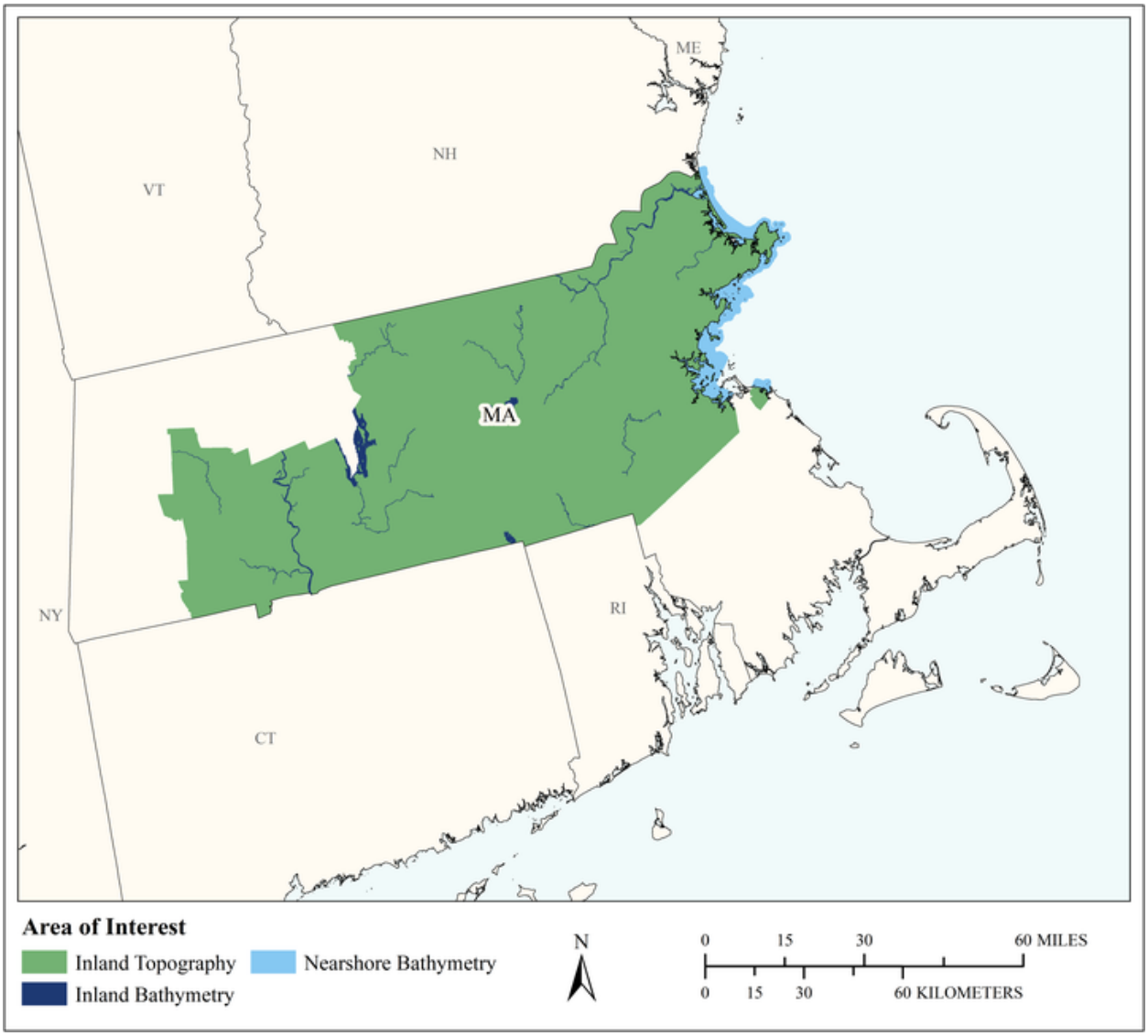
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$18,693	Major	Annual dollars saved/realized	$43,718	Moderate	Unable to provide				
Time savings description	Having existing reliable data would streamline development of the models in use. Less time will be needed to develop maps. Hard to guess a real time savings. This data doesn't exist currently and would need to be built in house. Limits need to establish field elevations and topographic/bathymetric survey work.											
Cost savings/cost reduction	Major	Annual dollars saved/realized	$400,000	Major	Annual dollars saved/realized	$400,000	Moderate	Unable to provide				
Cost savings/cost reduction description	Better estimates at quantities would help eliminate wasting of products. Reduction or removal of subcontractor needs.											
Cost avoidance	Major	Unable to provide		Major	Annual dollars saved/realized	$100,000	Moderate	Unable to provide				
Cost avoidance description	This is event/incident dependent.											
Increased revenues	None			None			Minor	Unable to provide				
Mission-driven performance improvements	Major	Annual percent improvement	13%	Major	Annual percent improvement	15%	Major	Unable to provide				
Mission-driven performance improvements description	Increase our communication sets would help expand the number of individuals we could involve. Better modeling would lead to an increased ability to relay our message and help involve more individuals. This would help us better utilize resources in more distinct/local areas rather than regional blanket treatments.											
Other operational benefits	Major	Annual dollars saved/realized	$9,045									
Other operational benefits description	Our mission is to better understand the upstream and downstream conditions of a dam site. If we had an improved quality of data sets to work with our office could generate a superior product for distributions to emergency professionals impacted by the failure or high flow events with theses dams. Improved inundation modeling.											
Future annual operational benefits added during validation								Annual dollars saved/ realized	$22,893			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$7,538	Major	Annual dollars saved/realized	$6,030	Moderate	Unable to provide				
Value added to products or services description	A better product would allow more precise targeting of potential site development. Improving flooding and hazard mapping would be extremely helpful at assisting the towns with emergency preparedness.											
Improved response or timeliness	Major	Annual dollars saved/realized	$37,362	Major	Annual dollars saved/realized	$18,090	Moderate	Unable to provide				

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Improved response or timeliness description	Improving communication of an event with the use of a more accurate product would help improve the ability of our office to work with local emergency managers/directors during incidents. We would be able to develop a better product faster. This is dependent on the incident. Having a better product to use in the development of inundation mapping would add more accuracy to our predictable losses during an event.											
Improved customer experience	Major	Annual dollars saved/realized	$3,015	None			Moderate	Unable to provide				
Improved customer experience description	Organized data sets would increase efficiency.											
Other customer service benefits	Major	Annual dollars saved/realized	$7,538	Major	Annual dollars saved/realized	$12,060						
Other customer service benefits description	Improving storage area and inflow calculations. This would make modeling more accurate and our predictive modeling more reliable.			Improved modeling output.								
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$622,230					Annual dollars saved/ realized	$3,147			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			None			Minor					
Education or outreach description	Not really an item of concern											
Environmental	Major			Major			Moderate					
Public safety, including life and property	Major			Major			Major					
Other	Improved awareness			Emergency preparedness								
Other benefits	Major			Major								
Other description	Improved awareness of dam safety guidelines and regulations would help continue to strengthen this departments need to the commonwealth			Improvement in response and recovery								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Drinking Water Supply and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements	Essex, Hampden, Hampshire, Middlesex, Norfolk, Suffolk, and Worcester Counties, MA	Essex, Hampden, Hampshire, Middlesex, Norfolk, Suffolk, and Worcester Counties, MA	Essex, Hampden, Hampshire, Middlesex, Norfolk, Suffolk, and Worcester Counties, MA	

MCA Description	Response
Mission Critical Activity	Surface elevation. Elevation data which requires high accuracy elevation on manhole size features and surrounding topography. This data is critical for determining risk to assets due to flooding and ongoing hydraulic modeling of the water network. Inland bathymetry would also be beneficial for reservoir monitoring for water quality.
MCA Title	Drinking Water Supply and Management
MCA ID	1120
Organization Type	State or U.S. Territorial government
Organization Name	Massachusetts Water Resources Authority
Sub-Agency or Division	
Organization Mission	The Massachusetts Water Resources Authority (MWRA) is a Massachusetts public authority established by an act of the Legislature in 1984 to provide wholesale water and sewer services to 3.1 million people and more than 5,500 large industrial users in 61 metropolitan Boston communities.
Program Name	Water and Wastewater programs
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 01 - Water Supply and Quality

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Water infrastructure features like manholes and meters.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have

Inland Bathy Feature Size Requirements	Response
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL0B	QL1B	
Update Frequency	2-3 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Less than 5 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Highly desirable	
DTM	Highly desirable	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Nice to have	Nice to have	
Classified point cloud	Nice to have	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Not required	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Not required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Not required	Nice to have	Nice to have	
Ground control/ground truthing	Nice to have	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Highly desirable	Required	Highly desirable	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Nice to have	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Not required	Nice to have	Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Highly desirable	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Not required	Highly desirable	Highly desirable	
Land use/land cover	Not required	Highly desirable	Highly desirable	
Wetlands	Not required	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Highly desirable	Required	Required	
Bridges/culverts	Nice to have	Required		
Landmark features	Not required	Highly desirable	Highly desirable	
Cultural resources	Not required	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Existing MassGIS Lidar data			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	MassGIS			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know	Major	Minor	
Cost savings/cost reduction	I don't know	Major	Minor	
Cost avoidance	Moderate	Moderate	Minor	
Increased revenues	I don't know	None	None	
Mission-driven performance improvements	Moderate	Moderate	Minor	

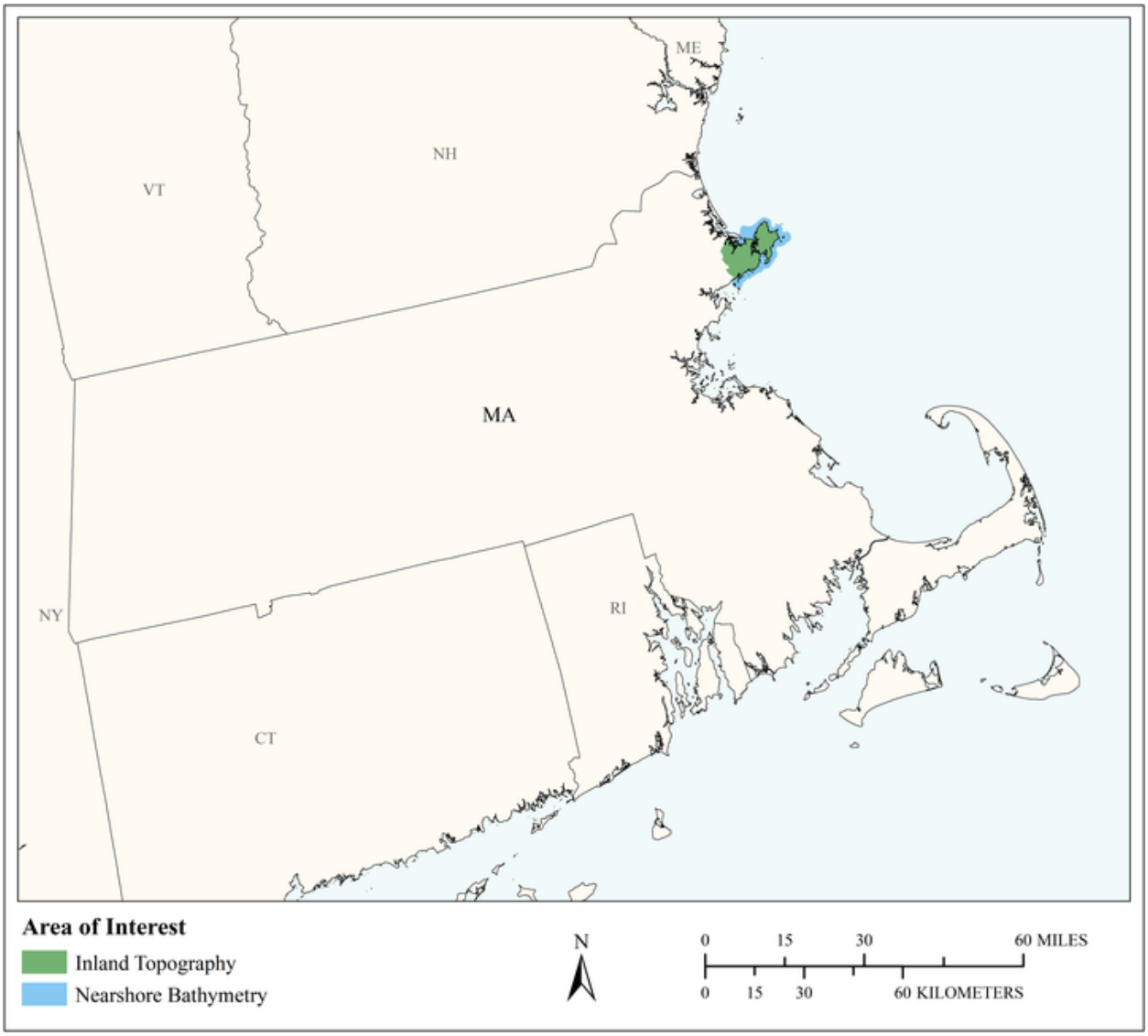
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know	Moderate	Minor	
Improved response or timeliness	None	Major	Minor	
Improved customer experience	None	Minor	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	Minor	Minor	
Environmental	I don't know	Minor	Minor	
Public safety, including life and property	Minor	Moderate	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Time savings description	Many hours went into making a continuous coverage out of different data sources.											
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Increased revenues	None			None			Minor	Unable to provide				
Mission-driven performance improvements	Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$131,817					Annual dollars saved/ realized	$1,435			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Minor	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$387,913					Annual dollars saved/ realized	$197			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			Minor			Minor					
Environmental	I don't know			Moderate			Moderate					
Public safety, including life and property	I don't know			Moderate			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Coastal Planning for Hazard Mitigation and Adaptation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	Custom description		Custom description	
Sub Area Requirements	City of Gloucester, Town of Essex, Town of Manchester by the Sea, Town of Rockport, MA		City of Gloucester, Town of Essex, Town of Manchester by the Sea, Town of Rockport, MA	

MCA Description	Response
Mission Critical Activity	In the planning of coastal infrastructure and land use regulations we utilize high resolution data along with scenario modeling to prioritize coastal hazard mitigation and adaptation strategies.
MCA Title	Coastal Planning for Hazard Mitigation and Adaptation
MCA ID	1463
Organization Type	Regional, County, City, or other local government
Organization Name	City of Gloucester, MA
Sub-Agency or Division	Planning Department
Organization Mission	Planning and land use regulation
Program Name	Planning and land use regulation
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 30 - Maritime and Land Boundary Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Structures and nearshore topography.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1		Cross sections and/or transects meet needs	
Update Frequency	2-3 years		4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm		Up to 1 meter	
Acceptable Vertical Error	Up to 10 cm		Up to 20 cm	
How far onshore needed			To the fall line	
How far down the beach profile needed	To MLLW		Below MLLW	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement			MSL	
Cross sections and/or transects meet needs			Yes	
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required		Nice to have			Nice to have
Entire AOI under same environmental conditions	Not required		Nice to have			Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Not required		Highly desirable			Highly desirable
DEM for entire AOI needs to be seamless	Not required		Highly desirable			Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know		I don't know			I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable		Nice to have	
DTM	Highly desirable		Nice to have	
DEM	Highly desirable		Nice to have	
Raw point cloud data	Nice to have		Nice to have	
Classified point cloud	Nice to have		Nice to have	
Edited/cube XYZ			Not required	
Full waveform	Nice to have		Not required	
Bathymetric Attributed Grid (BAG)			Nice to have	
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Nice to have		Not required	
Ground control/ground truthing	Nice to have		Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required		Nice to have	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have		Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Highly desirable		Nice to have	
Land use/land cover	Highly desirable		Nice to have	
Wetlands	Highly desirable		Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Nice to have	
Inland surface water features	Highly desirable		Nice to have	
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable		Nice to have	
Cultural resources	Highly desirable		Nice to have	
Coastal and riverine structures	Highly desirable		Nice to have	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	2011 Digital Aerial Triangulation of flyover		A variety of topobathy datasets published by NOAA and USACE, in addition to bathymetric data developed through the CZM-USGS Seafloor Mapping Cooperative (https://www.mass.gov/service-details/czm-seafloor-and-habitat-mapping-sediment-mapping).	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes		Yes	
State repositories used	City contracted flyover, 2011.		MassGIS	

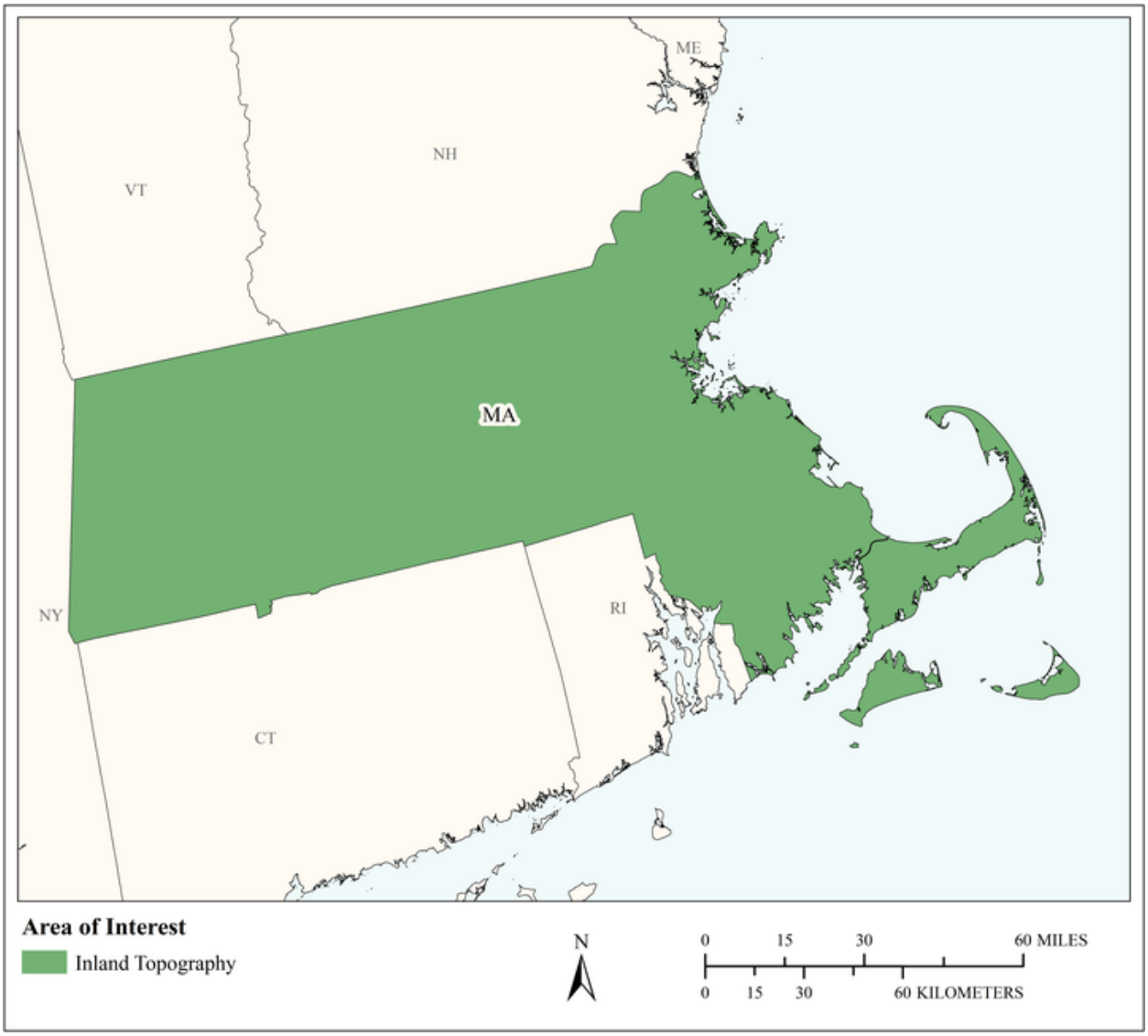
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Minor	
Cost savings/cost reduction	Minor		I don't know	
Cost avoidance	Minor		None	
Increased revenues	Minor		None	
Mission-driven performance improvements	Major		Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		I don't know	
Improved response or timeliness	Major		I don't know	
Improved customer experience	Major		Moderate	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate		Moderate	
Environmental	Moderate		Moderate	
Public safety, including life and property	Moderate		Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide					I don't know	Unable to provide				
Cost savings/cost reduction	I don't know	Unable to provide					I don't know	Unable to provide				
Cost avoidance	I don't know	Unable to provide					I don't know	Unable to provide				
Increased revenues	I don't know	Unable to provide					I don't know	Unable to provide				
Mission-driven performance improvements	Moderate	Unable to provide					I don't know	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide					I don't know	Unable to provide				
Improved response or timeliness	Minor	Unable to provide					I don't know	Unable to provide				
Improved customer experience	I don't know	Unable to provide					I don't know	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate						I don't know					
Environmental	Moderate						I don't know					
Public safety, including life and property	Moderate						I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Urban and Regional Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Land development and zoning. Municipal mapping of building footprints and elevations. Port resilience planning. Parks and transportation planning. Virtual city creation. Urban ecology planning.
MCA Title	Urban and Regional Planning
MCA ID	60231
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Massachusetts
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Required			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

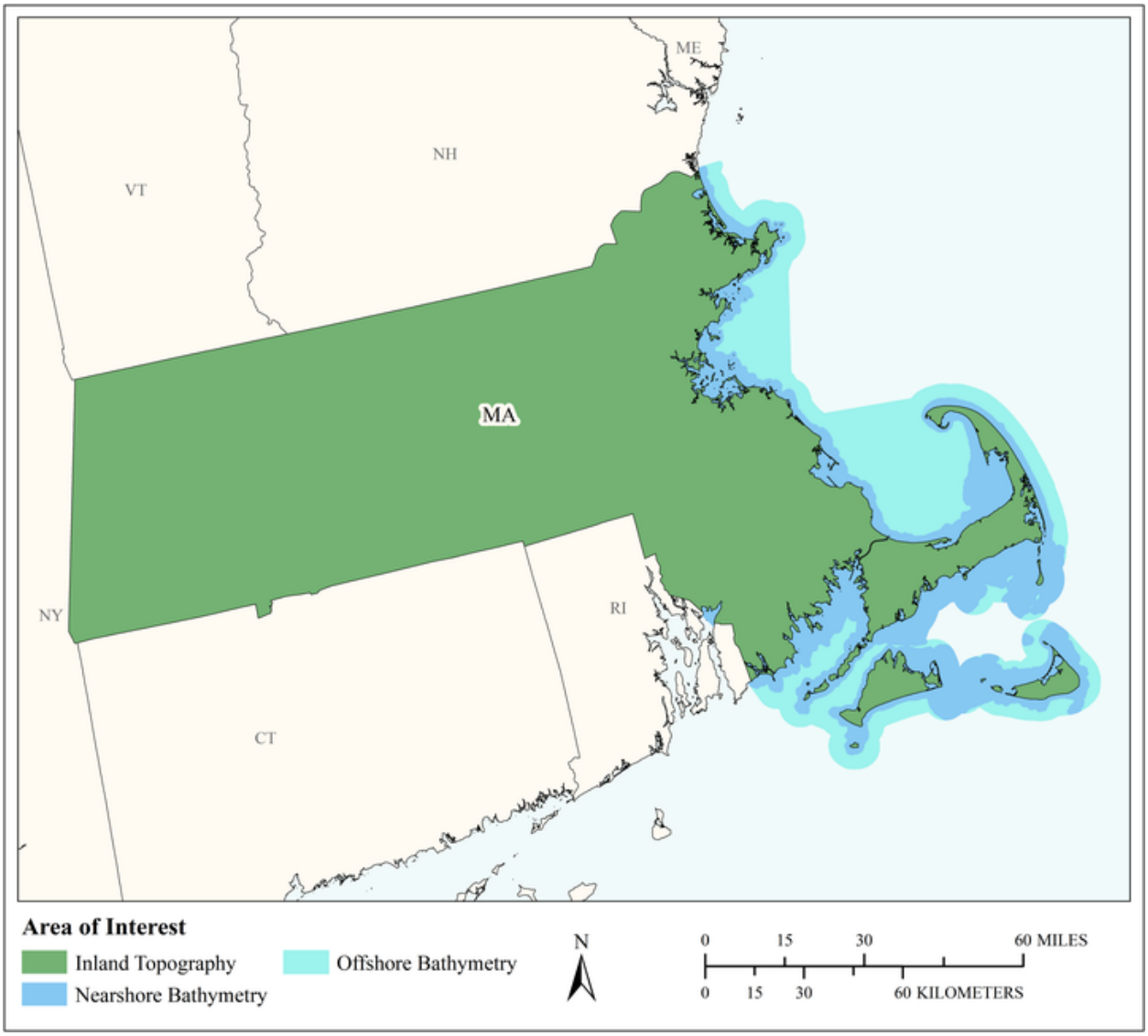
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,182,027									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$251,916									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Maritime and Land Boundary Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	Required
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Delimitation of legal and other coastal boundaries, inland boundaries, and ordinary high water lines (OHWL).
MCA Title	Maritime and Land Boundary Management
MCA ID	60232
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Massachusetts
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 30 - Maritime and Land Boundary Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1		QL0B	I don't know
Update Frequency	6-10 years		2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter		Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 20 cm		Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have		Nice to have	Nice to have		Nice to have
Entire AOI under same environmental conditions	Highly desirable		Nice to have	Nice to have		Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable		Highly desirable	Highly desirable		Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable		Highly desirable	Highly desirable		Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable		Required	Required
DTM	Required		Required	Required
DEM	Highly desirable		Required	Required
Raw point cloud data	Nice to have		Required	Required
Classified point cloud	Highly desirable		Required	
Edited/cube XYZ			Nice to have	Nice to have
Full waveform	Not required		Not required	Nice to have
Bathymetric Attributed Grid (BAG)			Not required	Nice to have
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Not required
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Nice to have		Not required	Not required
Ground control/ground truthing	Highly desirable		Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required		Highly desirable	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Nice to have		Nice to have	Nice to have
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Nice to have
Water column properties - Biological			Not required	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Highly desirable	Nice to have
Routes			Nice to have	Highly desirable
Offshore cadastral			Highly desirable	Nice to have
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Required	Required
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required		Highly desirable	
Land use/land cover	Highly desirable		Highly desirable	Nice to have
Wetlands	Required		Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required		Highly desirable	
Bridges/culverts	Required			
Landmark features	Highly desirable		Highly desirable	
Cultural resources	Nice to have		Highly desirable	
Coastal and riverine structures	Required		Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate		None	I don't know
Cost savings/cost reduction	Moderate		Minor	Moderate
Cost avoidance	Moderate		Minor	Moderate
Increased revenues	Minor		None	I don't know
Mission-driven performance improvements	Major		Moderate	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		None	I don't know

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major		Minor	Moderate
Improved customer experience	Major		Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate		Minor	Moderate
Environmental	Major		Minor	Moderate
Public safety, including life and property	Moderate		Minor	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					Major	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide					Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Moderate	Unable to provide					Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	Minor	Unable to provide					None			I don't know	Unable to provide	
Mission-driven performance improvements	Moderate	Unable to provide					Moderate	Unable to provide		Moderate	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$9,125					Annual dollars saved/ realized	$267,431			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide					Major	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide					Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Moderate	Unable to provide					Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$34,988									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate						Moderate			Moderate		
Environmental	Minor						Major			Major		
Public safety, including life and property	None						Moderate			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	Yes
Contours	Yes		Yes	Yes
Hillshades	Yes		Yes	
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes		Yes	
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

Michigan

The State of Michigan is active with many of the framework spatial data layers. Michigan is very close to achieving complete statewide lidar-based elevation coverage for the first time. This will be at Quality Level 2 (QL2), and the project for the final few counties is currently underway.
https://michigan.maps.arcgis.com/apps/webappviewer/index.html?id=bc644407fab3492e8933c3c6c7bfbc0c

Federal agencies through the 3D Elevation Program (3DEP) have been the primary sources of funding for Michigan lidar. Major funding partners include Federal Emergency Management Agency, Natural Resource Conservation Service, U.S. Forestry Service, and USGS. Partners have been able to take advantage of the Michigan Statewide Authoritative Imagery and Lidar program to acquire data that meets 3DEP requirements.
https://www.michigan.gov/som/0,4669,7-192-78943_78944_78949_78952_63834---,00.html

Michigan looks forward to the results of this 3D Nation Elevation Study to help identify future requirements and to help with the development of plans for the next generation of framework elevation data. Given Michigan's extensive shorelines with four of the five Great Lakes and the large number of inland waterbodies, the emphasis with NOAA on improved bathymetric and topo-bathy data will be very important.

Elevation data are important to geologists, hydrogeologists, and mappers in Michigan. Quality elevation data are critical to mapping the subtle geologic features that may indicate sand zones in glacial features which may be sources of sand and gravel and potential shallow aquifers. Also, features such as eskers, drumlins, ice walled lake plains, etc. can represent sediments that can focus the transport of released contaminants to the groundwater. Identification of slope movements along shorelines is very important.
https://www.youtube.com/watch?v=TmTc5FCdXJs

USFS in Michigan has identified forest management application requirements for higher-resolution elevation data and is currently participating in pilot QL1 projects and most recently a QL0 (16 ppsm) project intended to support vegetation, fuels, and wildlife management objectives in the Luzerne NEPA Planning area of the Huron-Manistee National Forests.
https://www.michigan.gov/documentscgi_old/R9_SAWFAq_2018_Hobbs_640228_7.pdf

The Joint Airborne Lidar Bathymetry Technical Center of Expertise is currently collecting new topobathymetric lidar for the Great Lakes coastal areas around Michigan to support coastal mapping and charting requirements.
https://www.sam.usace.army.mil/Missions/Spatial-Data-Branch/JALBTCX/

The State of Michigan has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

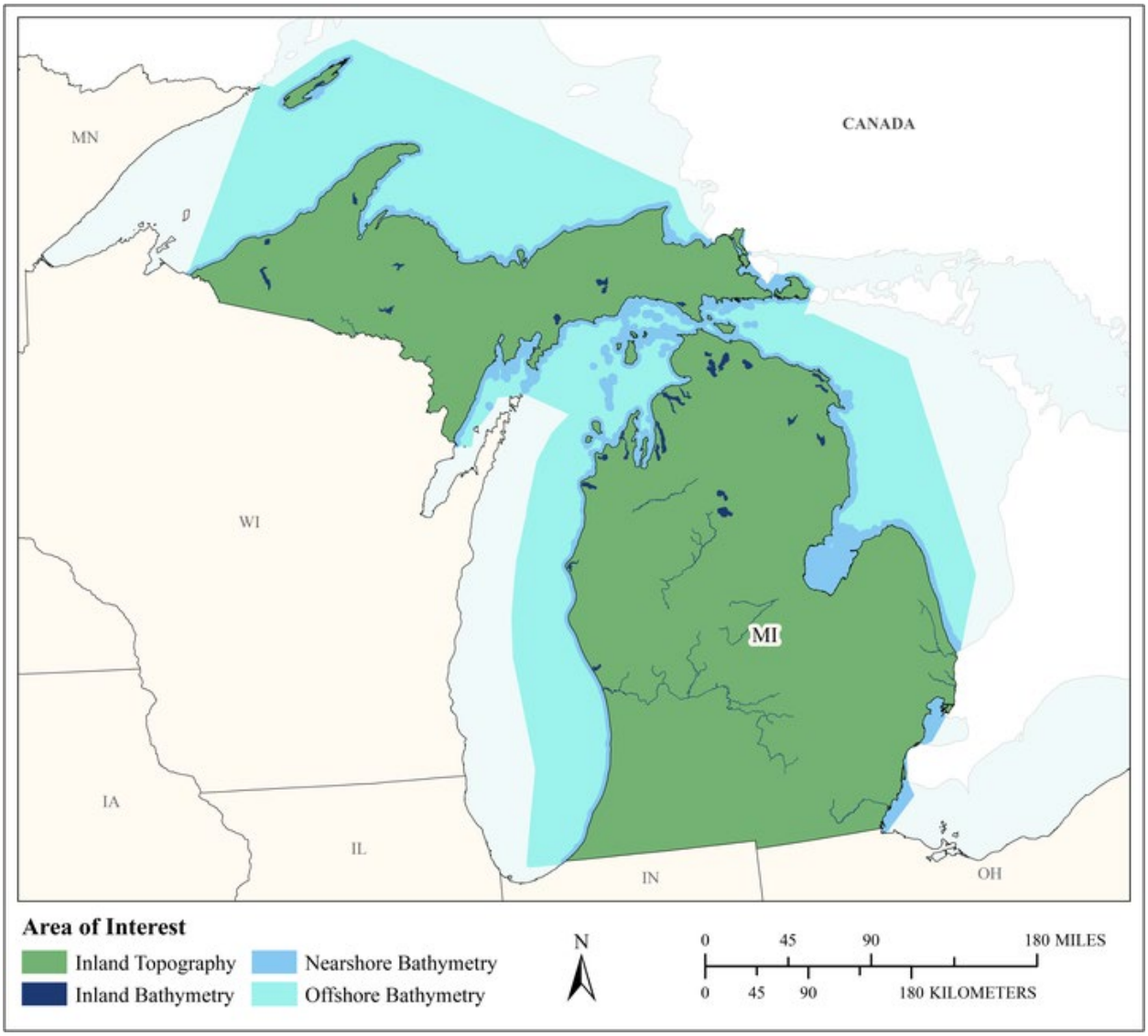
Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	Michigan DEQ - Oil, Gas and Minerals Division	22460	Michigan Environmental Quality and Natural Resources Evaluation	Inland Topo	QL2	4-5 years	$322,061	$86,265	Moderate	Major	Major
				Inland Bathy	QL0B	6-10 years	$1,393,263	$145,601	Moderate	Moderate	Moderate
				Nearshore Bathy	QL0B	6-10 years	$121,941	$200,885	Minor	Major	Major
				Offshore Bathy	Order 2	6-10 years	$41,617	$208,088	Minor	Major	Major
BU 03 – Coastal Zone Management	Michigan Coastal Management Program	1291	Coastal Hazards Mapping and Management	Inland Topo	QL2	4-5 years	$101,033	$17,658	Minor	Moderate	Major
				Nearshore Bathy	QL2B	4-5 years	$828,120	$1,400,865	Minor	Moderate	Major
BU 03 – Coastal Zone Management	Central Upper Peninsula Planning and Development - CUPPAD	21514	Coastal and Regional Planning	Inland Topo	QL0	2-3 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL4B	4-5 years	Unable to quantify	Unable to quantify	Minor	Moderate	Moderate
				Nearshore Bathy	QL4B	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	Minor
BU 08 – Agriculture	State of Michigan	60233	Agriculture and Precision Farming	Inland Topo	QL2	2-3 years	$67,250	$53,313	Major	Major	Minor
BU 09 – Fisheries Management and Aquaculture	Michigan DNR	1465	GIS Support for Infrastructure Management, Vegetation Inventory and Assessment, and Forest Fire Management	Inland Topo	QL2	6-10 years	$59,374	$128,967	I don't know	I don't know	I don't know
				Inland Bathy	QL2B	>10 years	$116,223	$52,897	Major	Major	Moderate
				Nearshore Bathy	QL2B	>10 years	$580,845	$42,658	I don't know	I don't know	I don't know
				Offshore Bathy	Special Order	6-10 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Minor
BU 10 – Geologic Assessment	Michigan Geological Survey	1163	Geologic Mapping and Geohazards Assessment	Inland Topo	QL2	4-5 years	$1,209,602 to $1,224,602	$2,164,068	Major	Major	Major
				Inland Bathy	QL2B	4-5 years	$12,000 to $16,000	Unable to quantify	Moderate	Moderate	Moderate
				Nearshore Bathy	Cross sections and/or transects meet needs	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 11 – Geologic Resource Extraction	State of Michigan	60234	Geologic Resource Mining and Extraction	Inland Topo	QL1 HD	2-3 years	$14,188	$9,411	Minor	Major	Major
				Inland Bathy	QL0B	4-5 years	Unable to quantify	$970	None	Minor	Minor
				Nearshore Bathy	QL3B	I don't know	Unable to quantify	Unable to quantify	I don't know	Moderate	I don't know
				Offshore Bathy	Order 1b	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 12 – Renewable Energy Resources	State of Michigan	60235	Renewable Energy Resources	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	None
				Nearshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Offshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 14 – Cultural Resource Management	State of Michigan	60236	Cultural Resources Preservation and Management	Inland Topo	QL1	4-5 years	$10,646	$9,308	Minor	Minor	Minor
				Inland Bathy	QL0B	6-10 years	$25,531	Unable to quantify	Moderate	Minor	Minor
				Nearshore Bathy	QL0B	4-5 years	$10,582	Unable to quantify	Minor	Moderate	Minor
				Offshore Bathy	Order 1a	6-10 years	$80,820	Unable to quantify	Minor	Moderate	Minor
BU 20 – Marine and Riverine Navigation	State of Michigan	60237	Marine and Riverine Navigation and Safety	Inland Bathy	QL0B	2-3 years	$1,059,525	$139,445	Moderate	Moderate	Moderate
				Nearshore Bathy	QL0B	2-3 years	$2,834,249	$95,959	Minor	Major	Major
				Offshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 21 – Aviation Navigation	State of Michigan	60238	Aviation Navigation and Safety	Inland Topo	QL1 HD	Annually	$196,360	$244,560	Minor	Moderate	Moderate
BU 22 – Infrastructure Management	State of Michigan	60239	Infrastructure and Construction Management	Inland Topo	QL0 HD	4-5 years	$2,610,341	$7,681,709	Minor	Moderate	Major
				Inland Bathy	QL0B	4-5 years	$879,466	$91,322	Minor	Moderate	Moderate
				Nearshore Bathy	QL1B	4-5 years	$77,263	$10,623	Minor	Moderate	Major
				Offshore Bathy	Cross sections and/or transects meet needs	2-3 years	Unable to quantify	Unable to quantify	Minor	Major	Moderate
BU 23 – Urban and Regional Planning	Muskegon County GIS, Muskegon County MI	21709	Geospatial Services	Inland Topo	QL2	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 23 – Urban and Regional Planning	State of Michigan	60240	Urban and Regional Planning	Inland Topo	QL1	4-5 years	$15,628,514	$1,804,319	Moderate	Major	Major
				Inland Bathy	QL1B	6-10 years	$636,522	$805,255	Moderate	Moderate	Major
				Nearshore Bathy	QL2B	4-5 years	$676,705	$713,897	Moderate	Moderate	Moderate
BU 26 – Education and Basic Research	Michigan State University	21932	Higher Education and Research	Inland Topo	QL2	4-5 years	$282,612	$107,537	Major	Moderate	None

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 26 – Education and Basic Research	State of Michigan	60241	Education K12 and Beyond, Basic Research	Inland Topo	QL1 HD	2-3 years	$305,245	$729,625	Major	Major	Major
				Inland Bathy	QL1B	4-5 years	$79,825	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL2B	4-5 years	$24,249	$956	Major	Major	Minor
				Offshore Bathy	Order 1a	6-10 years	$64,550	Unable to quantify	Major	Minor	Minor
BU 27 – Recreation	State of Michigan	60242	Recreation	Inland Topo	QL1	4-5 years	$13,328	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	4-5 years	$8,026	Unable to quantify	Major	Major	Moderate
				Nearshore Bathy	QL0B	4-5 years	$478,499	Unable to quantify	Major	Major	Moderate
				Offshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 30 – Maritime and Land Boundary Management	State of Michigan	60243	Maritime and Land Boundary Management	Inland Topo	QL1	6-10 years	$65,361	$250,599	Moderate	Minor	None
				Inland Bathy	QL2B	6-10 years	$49,051	Unable to quantify	Major	Major	Moderate
				Nearshore Bathy	QL0B	2-3 years	$849,303	Unable to quantify	Moderate	Major	Moderate
				Offshore Bathy	I don't know	2-3 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate

MCA Title: Michigan Environmental Quality and Natural Resources Evaluation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Fate and transport of contaminants. Pollution risk mitigation. Runoff and sedimentation analyses. Point- or non-point source pollution modeling. Management of contaminants and atmospheric pollution; spills; Stream channel analysis and mapping. Stream bank erosion analysis. Aquatic and terrestrial species habitat management. Environmental management. Soils and wetlands mapping and characterization. Modeling of biological and ecological systems. Erosion control. Rainfall penetration studies, impervious surfaces. Geologic mapping and analysis. Sinkhole and mapping, monitoring, and analysis. Identification of geomorphologic units. Karst mapping, including springs and caves. Aquifer recharge. Onshore mineral extraction. Monitoring sand as a local resource. Stockpile analysis. Environmental impact assessment and site restoration. Oil and gas exploration and production. Pipeline and route selection. Facility siting to mitigate geologic hazards. Construction planning. Environmental impact assessment and mitigation. Regulatory compliance. Flood risk modeling and mapping of riverine and coastal areas. Dam/dike/levee safety analysis. Emergency management. Flood forecasts. Development of 3D visualizations of the Earth. Stormwater modeling. Includes impact assessment and monitoring and wetlands mapping. Conservation engineering. Soils and wetlands mapping and characterization. Modeling of biological and ecological systems. Erosion control. Rainfall penetration studies, impervious surfaces. Assessment of blue carbon stocks.
MCA Title	Michigan Environmental Quality and Natural Resources Evaluation
MCA ID	22460
Organization Type	State or U.S. Territorial government
Organization Name	Michigan DEQ - Oil, Gas and Minerals Division
Sub-Agency or Division	
Organization Mission	The Michigan Department of Environmental Quality promotes wise management of Michigan's air, land, and water resources to support a sustainable environment, healthy communities, and vibrant economy
Program Name	Air Quality Division Drinking Water and Municipal Assistance Division Environmental Investigation Section Office of the Great Lakes Oil, Gas, and Minerals Division Remediation and Redevelopment Division Waste Management and Radiological Protection Division Water Resources Division
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 06 - Natural Resources Conservation
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	2 track ruts, boulders culverts and bridges, hydro-enforcement, building elevations

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Other	Required
Other description	Ephemeral streams
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B	QL0B	Order 2
Update Frequency	4-5 years	6-10 years	6-10 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	Less than 50 cm	Less than 50 cm	Up to 20 meters
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm	Less than 10 cm	Up to 2 meters
How far onshore needed			>1 kilometer inland	
How far down the beach profile needed	To MHW		To MHW	
Tide correction requirement			No requirement for tide correction	No requirement for tide correction
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Nice to have	Nice to have		Highly desirable	Required
Entire AOI under same environmental conditions	Required	Highly desirable	Required		Required	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Nice to have	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Required	Required
DTM	Nice to have	Highly desirable	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Nice to have	Nice to have	Nice to have	Nice to have
Classified point cloud	Required	Highly desirable	Required	
Edited/cube XYZ		Nice to have	Highly desirable	Highly desirable
Full waveform	Nice to have	Nice to have	Highly desirable	Highly desirable
Bathymetric Attributed Grid (BAG)		Nice to have	Required	Required

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Required	Highly desirable	Required	Required
Ground control/ground truthing	Nice to have	Nice to have	Nice to have	Nice to have
Other	Required			
Other description	DEM Hillshade, Contours			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Not required	Not required
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Not required	Not required
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Nice to have	Nice to have
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Highly desirable	Highly desirable	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Not required	Not required
Tide/wave heights			Not required	Not required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Not required	Not required
Routes			Not required	Not required
Offshore cadastral			Not required	Not required
Lease areas			Not required	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Fixed obstructions			Not required	Not required
Floating observation/navigation systems			Not required	Not required
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Not required	
Land use/land cover	Highly desirable	Highly desirable	Nice to have	Nice to have
Wetlands	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Highly desirable	Highly desirable	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	LiDAR QL2 or coarser available for 3/4 of Michigan 10m DEM have in house 30m DEM have in house 9DEM have in house	Inland lake contours for large lakes in Michigan	USGS National Map	NOAA nautical charts
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes		Yes	Yes
NCEI				
Open Topography	Yes			
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories		Yes		

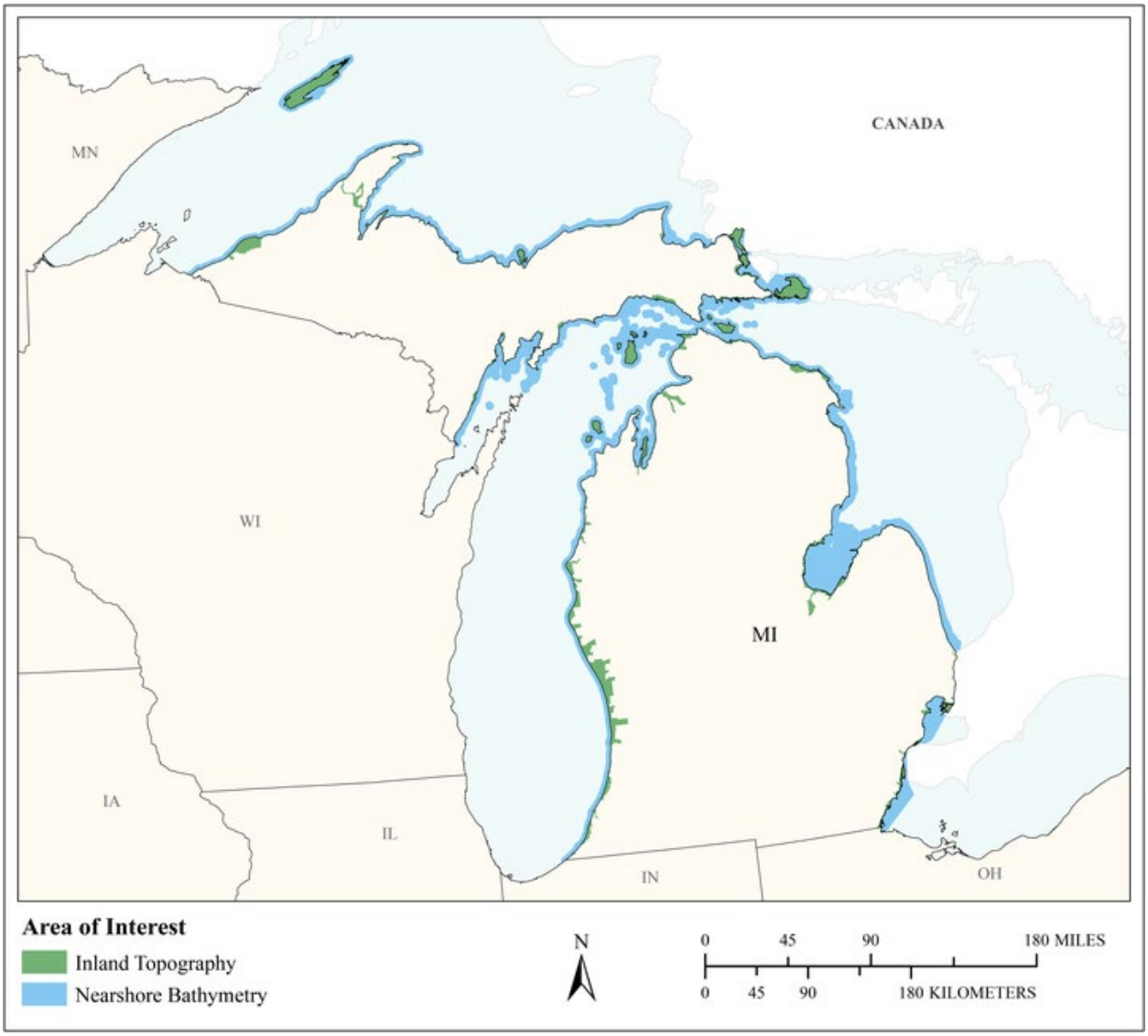
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
State repositories used		Inland lake contours for large lakes in Michigan		
Other	Yes			
Other description	Michigan DEQ compilation			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Moderate	Moderate
Cost savings/cost reduction	Major	Minor	Moderate	Moderate
Cost avoidance	Moderate	Minor	Moderate	Moderate
Increased revenues	Minor	Minor	None	None
Mission-driven performance improvements	Moderate	Minor	Minor	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor	Minor	Minor
Improved response or timeliness	Moderate	Moderate	Moderate	Moderate
Improved customer experience	Moderate	Moderate	Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	Minor
Environmental	Major	Moderate	Moderate	Moderate
Public safety, including life and property	Major	Moderate	Moderate	Moderate
Other Current Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other	Major			
Other description	Better decision making with better data			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Time savings description	Better data better decision making.											
Cost savings/cost reduction	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction description	Being able to review a site remotely without having to visit a site.											
Cost avoidance	Major	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Increased revenues	Minor	Unable to provide		None			None			None		
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Other operational benefits				Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$322,061		Annual dollars saved/ realized	$1,393,263		Annual dollars saved/ realized	$121,941		Annual dollars saved/ realized	$41,617
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Other customer service benefits				Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$86,265		Annual dollars saved/ realized	$145,601		Annual dollars saved/ realized	$200,885		Annual dollars saved/ realized	$208,088
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Minor			Minor		
Environmental	Major			Moderate			Major			Major		
Public safety, including life and property	Major			Moderate			Major			Major		
Other												
Other benefits				Moderate			Moderate			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes	Yes	Yes	Yes
Curvature maps				
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps	Yes	Yes	Yes	Yes
Viewshed maps	Yes	Yes	Yes	Yes
Hydrologic Flow Direction Grids	Yes	Yes	Yes	Yes
Hydrologic Flow Accumulation Grids	Yes	Yes	Yes	Yes
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	Yes
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	Yes
Building footprints	Yes	Yes	Yes	Yes
Breaklines for road edge-of-pavement	Yes	Yes	Yes	Yes
Rugosity/Surface Roughness	Yes	Yes	Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Coastal Hazards Mapping and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	Respondent provided own shapefile, KML, or geodatabase		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements	Minimum 1000 feet above ordinary HWM and further inland			

MCA Description	Response
Mission Critical Activity	Coastal hazards mapping and management. Coastal change detection with bathymetry would allow volumetric approach instead of 1D from imagery. Bathymetry is also needed for sediment budget studies. The State's existing rules and regulations for coastal construction setbacks revolve around measuring and applying a one-dimensional (recession) shoreline change monitoring approach. Availability of 3-D surfaces over time would provide the ability to move into a realm where monitoring is for 3-dimensional erosion rather than recession. Once these capabilities are realized and policy catches up, understanding of coastal change will be vastly improved and have great potential to better predict and protect threatened buildings and infrastructure.
MCA Title	Coastal Hazards Mapping and Management
MCA ID	1291
Organization Type	State or U.S. Territorial government
Organization Name	Michigan Coastal Management Program
Sub-Agency or Division	
Organization Mission	The Coastal Management Program in the Office of the Great Lakes promotes wise management of the cultural and natural resources of Michigan's Great Lakes coast. The program supports healthy and productive coastal ecosystems and resilient, vibrant, and sustainable coastal communities.
Program Name	Coastal Management Program
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 07 - Wildlife and Habitat Management
Tertiary Business Use	BU 23 - Urban and Regional Planning

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Typically trying to extract the top edge of the coastal bluff; also house footprints. Underwater surface, sediment, erosion.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2		QL2B	
Update Frequency	4-5 years		4-5 years	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 2 meters		The best horizontal accuracy achievable for the vertical accuracy I need	
Acceptable Vertical Error	Up to 20 cm		Up to 30 cm	
How far onshore needed			To cover the beach slope	
How far down the beach profile needed	Not applicable		To closure depth	
Tide correction requirement			No requirement for tide correction	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have		Required			Nice to have
Entire AOI under same environmental conditions	Nice to have		Highly desirable			Nice to have
Other	Nice to have					
Other description	Along Great Lakes shorelines, it is nice to have data collections from different years when water levels are at similar elevations.					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable		Required			Nice to have
DEM for entire AOI needs to be seamless	Highly desirable		Required			Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have		Nice to have	
DTM	Required		Highly desirable	
DEM	Required		Highly desirable	
Raw point cloud data	Nice to have		Not required	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Classified point cloud	Nice to have		Not required	
Edited/cube XYZ			Not required	
Full waveform	Not required		Not required	
Bathymetric Attributed Grid (BAG)			Nice to have	
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Not required		Nice to have	
Ground control/ground truthing	Nice to have		Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Not required	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required		Highly desirable	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Not required		Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Offshore cadastral			Not required	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Required		Highly desirable	
Land use/land cover	Highly desirable		Nice to have	
Wetlands	Nice to have		Nice to have	
Estuaries			Nice to have	
Inland surface water features	Nice to have		Nice to have	
Bridges/culverts	Not required			
Landmark features	Nice to have		Nice to have	
Cultural resources	Nice to have		Nice to have	
Coastal and riverine structures	Highly desirable		Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Typically use QL2 bare earth LiDAR-derived raster when available.		QL2 LiDAR and USACE SHOALS data, where available	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes		Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			

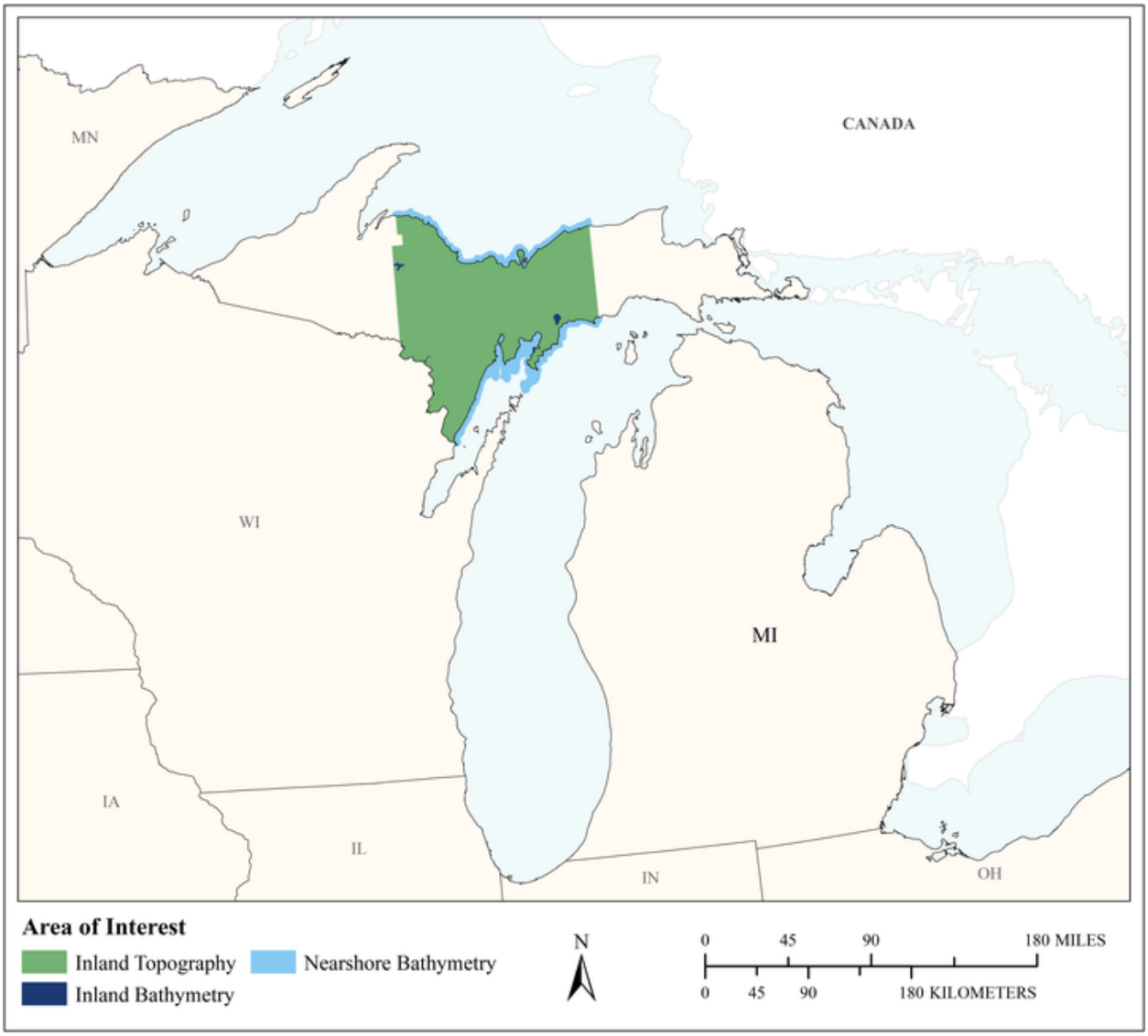
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
State repositories used	Michigan Statewide Authoritative Imagery & LiDAR program.			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor		None	
Cost savings/cost reduction	Moderate		I don't know	
Cost avoidance	Minor		I don't know	
Increased revenues	None		None	
Mission-driven performance improvements	Major		Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate		Moderate	
Improved response or timeliness	Minor		Minor	
Improved customer experience	Moderate		Moderate	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor		Moderate	
Environmental	Moderate		Moderate	
Public safety, including life and property	Moderate		Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$1,206				I don't know	Unable to provide				
Time savings description	Anticipate approximate 5 field days would be saved using elevation data rather than site-collected data.											
Cost savings/cost reduction	Moderate	Unable to provide					I don't know	Unable to provide				
Cost savings/cost reduction description	May save on imagery costs as DEMs could provide necessary information.											
Cost avoidance	Moderate	Unable to provide					Moderate	Unable to provide				
Cost avoidance description	Time-savings would be realized from eliminating the need to digitize features from aerial imagery.											
Increased revenues	None						None					
Mission-driven performance improvements	Major	Unable to provide					Moderate	Unable to provide				
Mission-driven performance improvements description							Increased ability to understand threats to coastal development through improved view of nearshore change. Improved understanding of the effect of shore protection structures.					
Other operational benefits	Moderate	Unable to provide					Moderate	Unable to provide				
Other operational benefits description	Ability to understand coastal change in a volumetric sense rather than one-dimensional recession.						Understanding of coastal processes, impact of structures and sediment budget.					
Future annual operational benefits added during validation		Annual dollars saved/ realized	$99,827					Annual dollars saved/ realized	$828,120			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide					Major	Unable to provide				
Improved customer experience	Moderate	Unable to provide					Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$17,658					Annual dollars saved/ realized	$1,400,865			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor						Minor					
Education or outreach description							Improved ability to educate about how coast changes over time.					
Environmental	Moderate						Moderate					
Public safety, including life and property	Major						Major					
Public safety, including life and property description							Improved understanding of erosional areas leading to better ability to manage.					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	
Contours	Yes		Yes	
Hillshades	Yes		Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes		Yes	
Curvature maps				
Cross sections	Yes		Yes	
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Coastal and Regional Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements	Alger, Delta, Dickinson, Menominee, Marquette and Schoolcraft Counties, MI	Alger, Delta, Dickinson, Menominee, Marquette and Schoolcraft Counties, MI	Alger, Delta, Dickinson, Menominee, Marquette and Schoolcraft Counties, MI	

MCA Description	Response
Mission Critical Activity	Analysis of coastal erosion and inundation. Hurricane storm surge and wind damage modeling and assessment. Coastal hazard modeling and mapping. Coastal hazard mitigation. Tsunami modeling. Land use and environmental planning. Coastal resiliency. Oil spill modeling. Littoral zone management including dunes and beaches. Land development and zoning. Municipal mapping of building footprints and elevations. Port resilience planning. Parks and transportation planning. Virtual city creation. Urban ecology planning.
MCA Title	Coastal and Regional Planning
MCA ID	21514
Organization Type	Regional, County, City, or other local government
Organization Name	Central Upper Peninsula Planning and Development - CUPPAD
Sub-Agency or Division	
Organization Mission	CUPPAD's Mission is the cooperative analysis, planning and action for economic social and physical development and conservation within the six county region. We assist communities with comprehensive planning activities including but not limited to economic and community development, land use planning, plan preparation, grant writing and administration, transportation planning, recreation planning, community surveys, and similar planning related projects. CUPPAD also serves as the contact point and regional clearinghouse for local, state, and federal agencies, grants, and other programs.
Program Name	Hazard mitigation/emergency management
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 23 - Urban and Regional Planning
Tertiary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Roadside Curb, Rock Outcrop, Road Line, Manhole Cover, Power Pole

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL4B	QL4B	
Update Frequency	2-3 years	4-5 years	6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 30 cm	Up to 1 meter	Up to 1 meter	
Acceptable Vertical Error	Up to 10 cm	Up to 20 cm	Up to 50 cm	
How far onshore needed			To cover the beach slope	
How far down the beach profile needed	To MLLW		To MHW	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Nice to have		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Nice to have		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Nice to have		Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Nice to have		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Nice to have	
DTM	Required	Highly desirable	Nice to have	
DEM	Required	Highly desirable	Nice to have	
Raw point cloud data	Nice to have	Highly desirable	Nice to have	
Classified point cloud	Highly desirable	Nice to have	Nice to have	
Edited/cube XYZ		Not required	Not required	
Full waveform	Nice to have	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Not required	Not required	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)			Not required	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Not required	
Ground control/ground truthing	Highly desirable	Nice to have	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Nice to have	
Underwater videography			Not required	
Bottom texture			Highly desirable	
Bottom type			Nice to have	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Highly desirable	
Boundaries			Highly desirable	
Routes			Highly desirable	
Offshore cadastral			Highly desirable	
Lease areas			Nice to have	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Required	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	
Estuaries			Highly desirable	
Inland surface water features	Highly desirable	Highly desirable	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	1ft DEM, 10m DEM,	Data Access Viewer	Do not have Bathmetric data, I have used NOAA's Data Access Viewer.	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI	Yes		Yes	
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	Michigan Center for Shared Solutions	The Center for Shared Solutions (CSS), Michigan		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	I don't know	Minor	

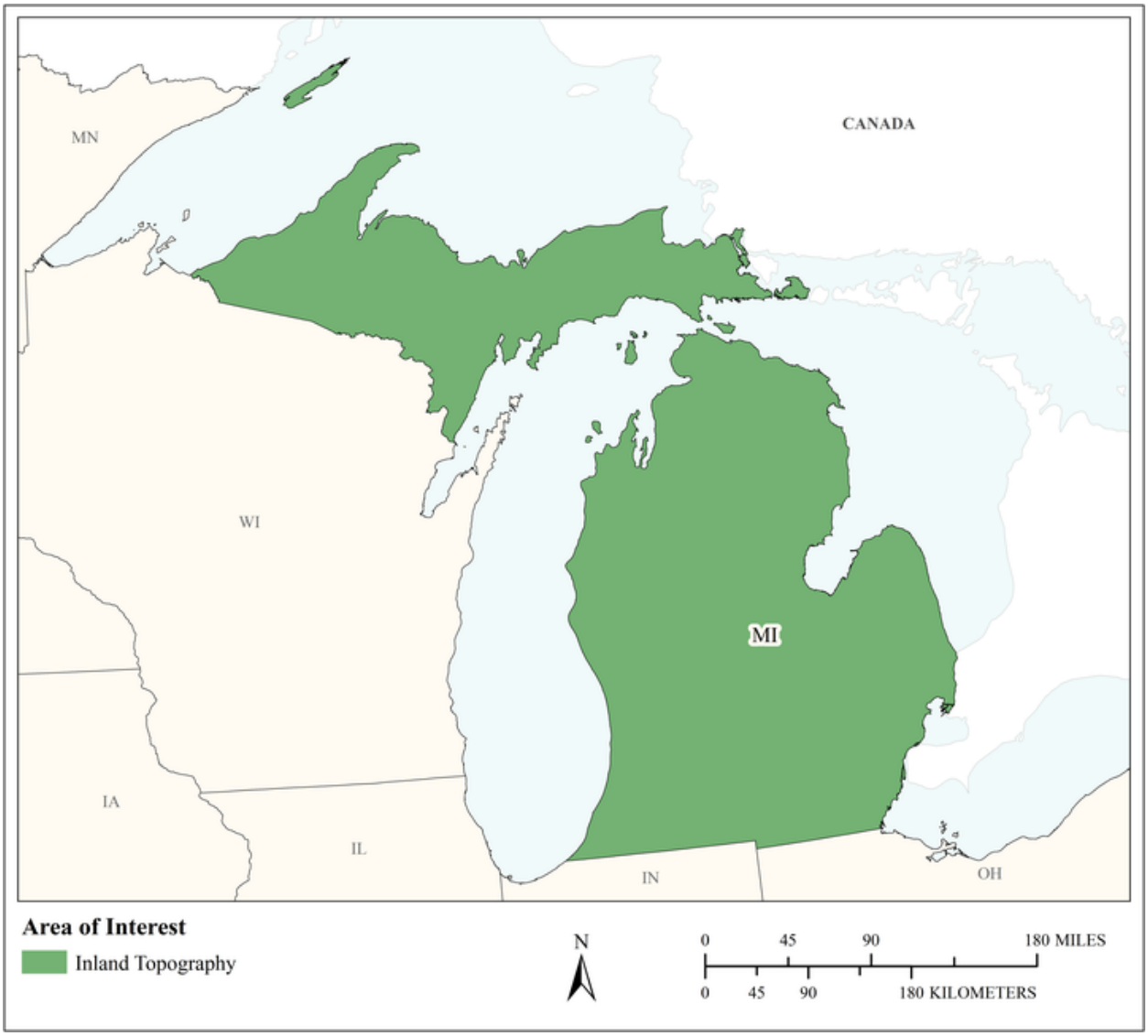
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Cost savings/cost reduction	Major	I don't know	Minor	
Cost avoidance	Moderate	I don't know	Minor	
Increased revenues	Minor	I don't know	Minor	
Mission-driven performance improvements	Moderate	I don't know	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	I don't know	Minor	
Improved response or timeliness	Moderate	I don't know	Minor	
Improved customer experience	Moderate	I don't know	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	I don't know	Minor	
Environmental	Major	Minor	Minor	
Public safety, including life and property	Major	Minor	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Increased revenues	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Minor			Minor					
Education or outreach description	Better informed citizens due to public outreach using data, maps, visualization tools											
Environmental	Moderate			Moderate			Minor					
Environmental description	Enhancements to the environment from restoration of watersheds, stream banks, wetlands, forests, grasslands, habitat areas											
Public safety, including life and property	Moderate			Moderate			Minor					
Public safety, including life and property description	Improved safety of citizens by using 3D elevation data for improved decision making, e.g., to avoid natural or manmade disasters											
Other												
Other benefits				Minor								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Agriculture and Precision Farming



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Farm pond design. Irrigation system design. Detailed site analysis to support precision farming. Analysis of farm sedimentation and runoff. Calibration of fertilizer application, fertilizer management, and irrigation planning. Optimized terraforming.
MCA Title	Agriculture and Precision Farming
MCA ID	60233
Organization Type	State or U.S. Territorial government
Organization Name	State of Michigan
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 08 - Agriculture and Precision Farming
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

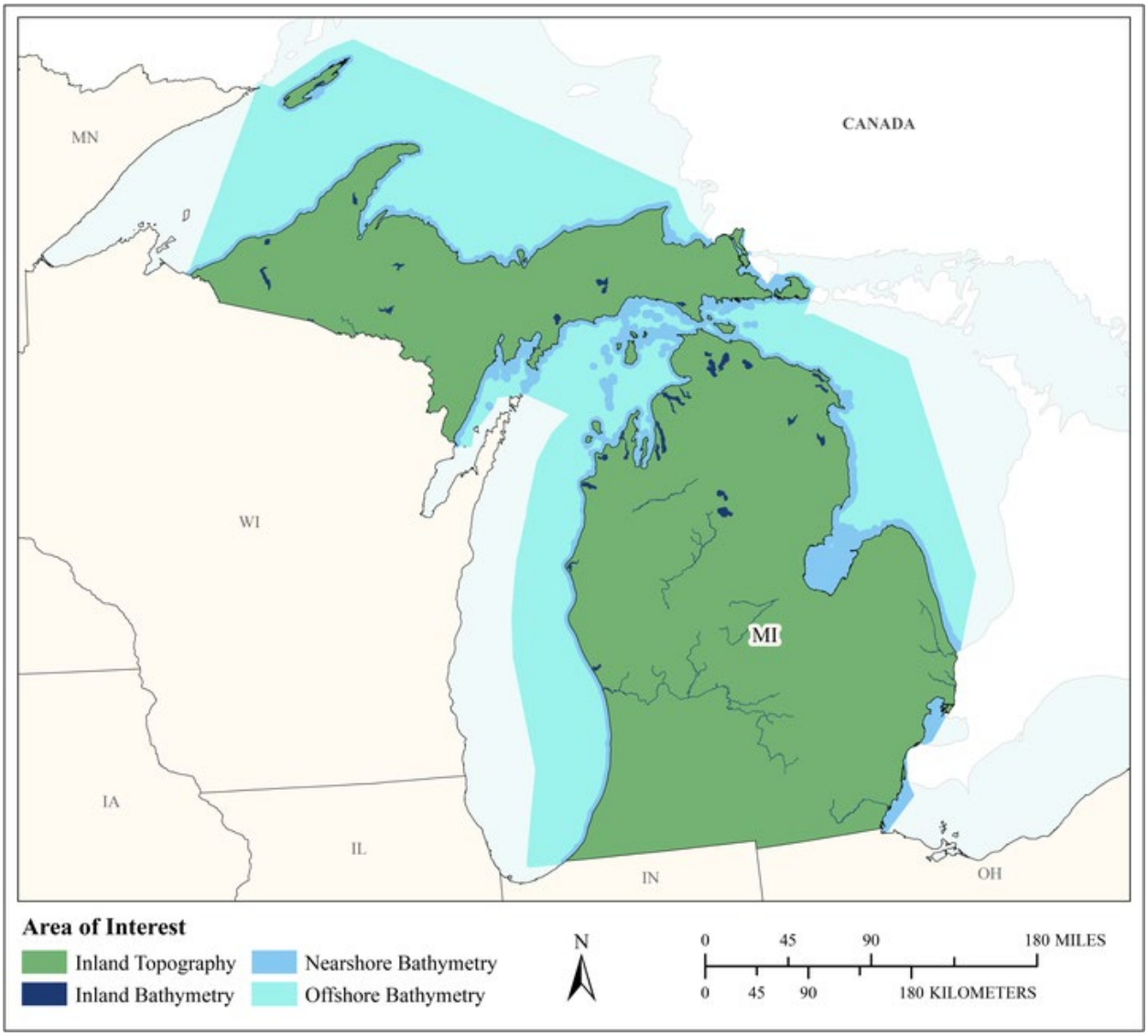
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$67,250									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$53,313									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Minor											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: GIS Support for Infrastructure Management, Vegetation Inventory and Assessment, and Forest Fire Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	GIS support for infrastructure management, vegetation inventory and assessment, and forest fire management. Elevation data are needed for wetland determination, land cover mapping, and contours serve many GIS uses.
MCA Title	GIS Support for Infrastructure Management, Vegetation Inventory and Assessment, and Forest Fire Management
MCA ID	1465
Organization Type	State or U.S. Territorial government
Organization Name	Michigan DNR
Sub-Agency or Division	
Organization Mission	Manage state parks, state game areas and state forest lands and promote use, accessibility and sustainability of natural resources of Michigan.
Program Name	Forest Resources Division Wildlife Division Fish Division Parks and Recreation Division
Total Annual Program Budget	
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	BU 04 - Forest Resources Management
Tertiary Business Use	BU 07 - Wildlife and Habitat Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Buildings, roads, treess, shrubs, bottom surface, submerged vegetation

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Not required
51 - 100 ft	Not required
101 - 500 ft	Required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required

Inland Bathy Feature Size Requirements	Response
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B	QL2B	Special Order
Update Frequency	6-10 years	>10 years	>10 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 5 meters	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed			To MHW	
How far down the beach profile needed	To MLLW		To MHHW	
Tide correction requirement			No requirement for tide correction	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Required	Not required	Nice to have	Required	Not required
Entire AOI under same environmental conditions	Required	Required	Required	Highly desirable	Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required	Highly desirable	Required	Required
DEM for entire AOI needs to be seamless	Required	Required	Required	Highly desirable	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Not required	Required
DTM	Required	Nice to have	Nice to have	Nice to have
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Highly desirable	Nice to have	Nice to have
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Not required	Not required	Nice to have
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Not required	Nice to have

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Nice to have
Tide Predictions			Not required	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Required
Ground control/ground truthing	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Not required	Required
Acoustic imagery of the seafloor			Not required	Required
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Nice to have	Highly desirable
Bottom texture			Nice to have	Required
Bottom type			Nice to have	Required
Submerged features			Nice to have	Required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Not required	Not required	Not required	Nice to have
Water column properties - Physical			Not required	Highly desirable
Water column properties - Chemical			Not required	Highly desirable
Water column properties - Biological			Not required	Highly desirable
Currents			Not required	Highly desirable
Tide/wave heights			Not required	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Not required	Nice to have
Lease areas			Not required	Nice to have
Fixed obstructions			Not required	Required
Floating observation/navigation systems			Nice to have	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Nice to have	
Land use/land cover	Required	Highly desirable	Not required	Nice to have
Wetlands	Required	Required	Nice to have	Highly desirable
Estuaries			Not required	Highly desirable
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Not required		
Cultural resources	Nice to have	Not required	Not required	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	USGS DRG USGS DEM	Historical sounding data from transects across inland lakes conducted by state DNR in mid-1950s	Federal sources	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories		Yes		
State repositories used		Inland Lake bathymetric contours (Fish Division)		
Data that meet my needs are not available				

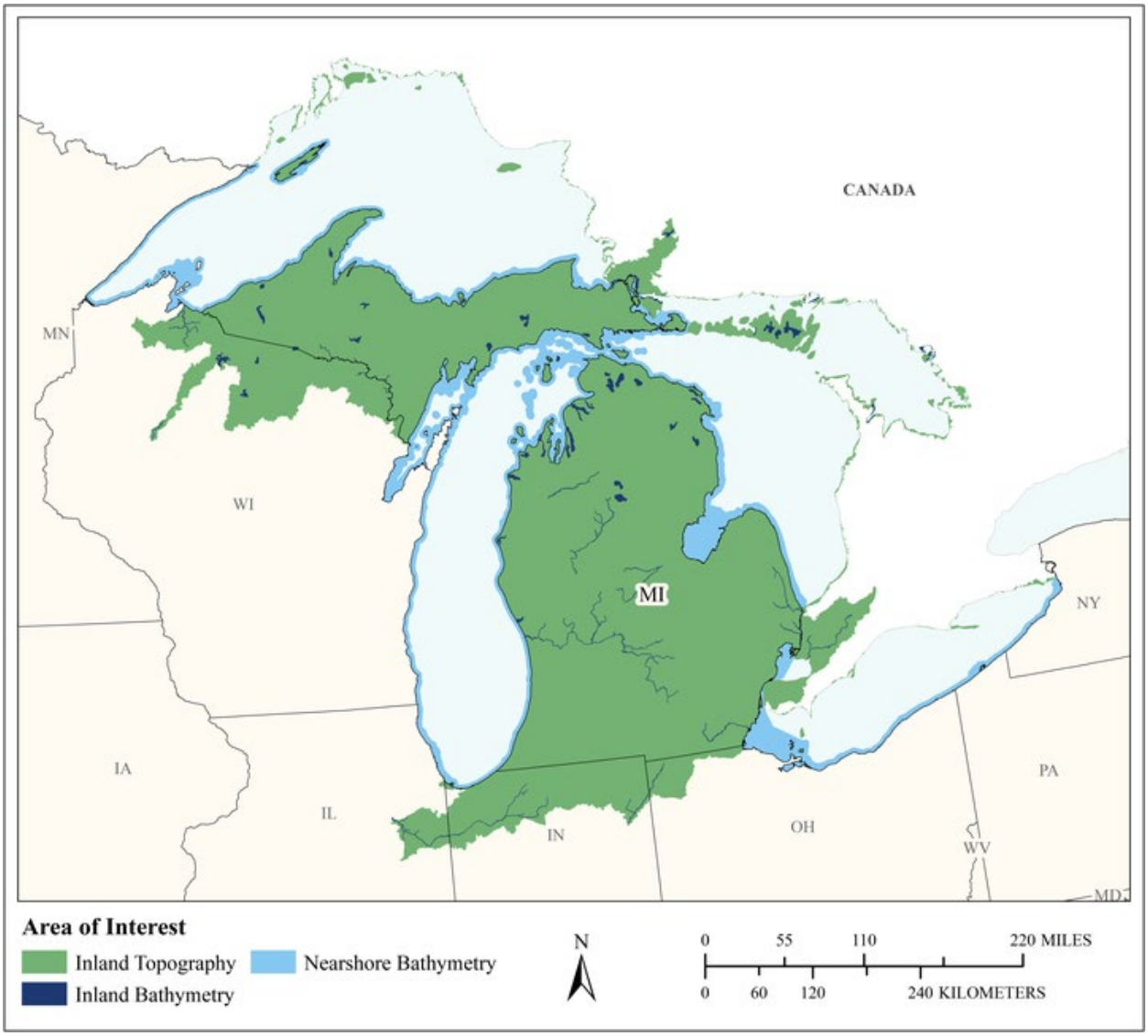
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	I don't know	Moderate
Cost savings/cost reduction	I don't know	I don't know	I don't know	Minor
Cost avoidance	I don't know	I don't know	I don't know	Minor
Increased revenues	I don't know	Moderate	I don't know	None
Mission-driven performance improvements	Major	Major	I don't know	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	I don't know	Moderate
Improved response or timeliness	I don't know	Major	I don't know	Minor
Improved customer experience	I don't know	Major	I don't know	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	None	I don't know	Moderate
Environmental	Major	Moderate	I don't know	Minor
Public safety, including life and property	I don't know	None	I don't know	None

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		Minor	Unable to provide	
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		None		
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		None		
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	I don't know	Unable to provide		Major	Annual percent improvement	100%	I don't know	Unable to provide		Minor	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$59,374		Annual dollars saved/ realized	$116,223		Annual dollars saved/ realized	$580,845			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		Minor	Unable to provide	
Improved response or timeliness	I don't know	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		Minor	Unable to provide	
Improved customer experience	I don't know	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		Minor	Unable to provide	
Other customer service benefits				Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$128,967		Annual dollars saved/ realized	$52,897		Annual dollars saved/ realized	$42,658			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			Major			I don't know			Moderate		
Education or outreach description				Improved bathymetric maps for recreational and commercial fishing purposes								
Environmental	I don't know			Major			I don't know			Moderate		
Environmental description				Fish spawning assessment and research								
Public safety, including life and property	I don't know			Moderate			I don't know			Minor		
Public safety, including life and property description				Improved data for emergency responders to boating accident or contaminant spill								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes			Yes
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic Mapping and Geohazards Assessment



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more Hydrologic Units (HUC8s)	One or more Hydrologic Units (HUC8s)	Nearshore areas along the coast (including the Great Lakes) off one or more Hydrologic Units (HUC8s)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	The mission of the Michigan Geological Survey is to facilitate basic and applied geological research to promote the best use of Michigan's geological resources for their social and economic benefits while protecting associated resource values and the environment. The safety, health, welfare, social and economic benefits of completing these functions will enhance the education and employment opportunities for Michigan residents while preserving the environment. Less than 10% of Michigan has been mapped to provide critical subsurface and surface information associated with the natural resources of the State. LiDAR and other indirect methods are critical to expediting the assessment of critical geographic areas in a timely manner. Elevation data are critical to identification of nearshore and inland geohazards, slope failure, potential sink holes, and releases from accidents. Recent 1-meter DEMs have shown unique geologic/glacial features, eskers, drumlins, ice walled lake plains, and deltas not seen in earlier DEMs. Elevation and geologic data are also needed in areas of proposed highway widening or increased load weights, which would require more road base. This is for releases as well as groundwater flows through an area – i.e. Tunnel Valleys.
MCA Title	Geologic Mapping and Geohazards Assessment
MCA ID	1163
Organization Type	State or U.S. Territorial government
Organization Name	Michigan Geological Survey
Sub-Agency or Division	
Organization Mission	The mission of the Michigan Geological Survey is to facilitate basic and applied geological research to promote the best use of Michigan's geological resources for their social and economic benefits while protecting associated resource values and the environment. The safety, health, welfare, social and economic benefits of completing these functions will enhance the education and employment opportunities for Michigan residents while preserving the environment.
Program Name	Assessment of the natural resources of the State of Michigan. This is water, aggregates natural hazards interior and shoreline, energy development in geologically protective environment to name a few.
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 13 - Oil and Gas Resources
Tertiary Business Use	BU 16 - Sea Level Rise and Subsidence

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	Geologic features that have less than 10 feet of relief that are not depicted on the standard DEM. Many times these are the geologic areas that may require the highest level of knowledge of present to protect them from anthropologic impacts i.e., spills, releases to the subsurface. All must be noted on map or reports, protection zones. Also unique geologic/glacial features such as eskers, drumlins, ice walled lake plains, deltas, etc.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Nice to have
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Other	Highly desirable
Other description	Major streams- > 30 feet wide
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Required
Other	Highly desirable
Other description	Greater than 10Ac

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B	Cross sections and/or transects meet needs	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI	This may be associated with highways or industries in the area in trying to present the high risk areas for any releases of contaminant.			
Acceptable Horizontal Error	Up to 1 meter	Up to 10 meters	Up to 1 meter	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Vertical Error	Up to 30 cm	Up to 40 cm	Up to 50 cm	
How far onshore needed			1 kilometer inland	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs	Partial		Yes	
Cross section/transect requirement	Many areas having Quality 3D, less than a Meter vertical and 5 meters horizontal to help define an area of interest that may need further visual on the ground assessment. To define changes in glacial systems in combination with drilling data and surficial mapping/walking on the site. At least QL 2 for many areas		Near shore to 10 meters depth to 1 kilometer on shore to tie to Land LiDAR assessment.	

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Other		Highly desirable				
Other description		Allows MGS to map continuity between the surface and lakes, but also across larger areas.				
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level		Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	
DTM	Highly desirable	Highly desirable	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Required	Highly desirable	
Classified point cloud	Highly desirable	Required	Highly desirable	
Edited/cube XYZ		Highly desirable	Highly desirable	
Full waveform	Nice to have	Nice to have	Highly desirable	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Required	Required	Required	
Water column properties - Physical			Highly desirable	
Water column properties - Chemical			Highly desirable	
Water column properties - Biological			Highly desirable	
Currents			Highly desirable	
Tide/wave heights			Not required	
Sea ice conditions			Required	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Not required	
Fixed obstructions			Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Required	Required	Required	
Wetlands	Required	Required	Required	
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Highly desirable	Nice to have	Highly desirable	
Cultural resources	Highly desirable	Nice to have		
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Michigan is just now completing QL2 in many areas that have needed this information for years. MGS has found this data invaluable in making and defending geologic issues to the general public and non scientists.	None	Most recent bathymetry along shorelines is from 2012 and we need an update.	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI		Yes	Yes	
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State Repositories				
State repositories used				
Other			Yes	
Other description			CNOS	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available	I don't know	
Cost savings/cost reduction	Major	Inland bathy data not available	I don't know	
Cost avoidance	Major	Inland bathy data not available	I don't know	
Increased revenues	Moderate	Inland bathy data not available	I don't know	
Mission-driven performance improvements	Major	Inland bathy data not available	I don't know	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available	I don't know	
Improved response or timeliness	Major	Inland bathy data not available	I don't know	
Improved customer experience	Major	Inland bathy data not available	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Inland bathy data not available	I don't know	
Environmental	Major	Inland bathy data not available	I don't know	
Public safety, including life and property	Major	Inland bathy data not available	I don't know	

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other Current Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other	Major			
Other description	Major benefit to detailed geology. We cannot currently present geologic and surface features in graphics that are comprehended by a greater audience.			

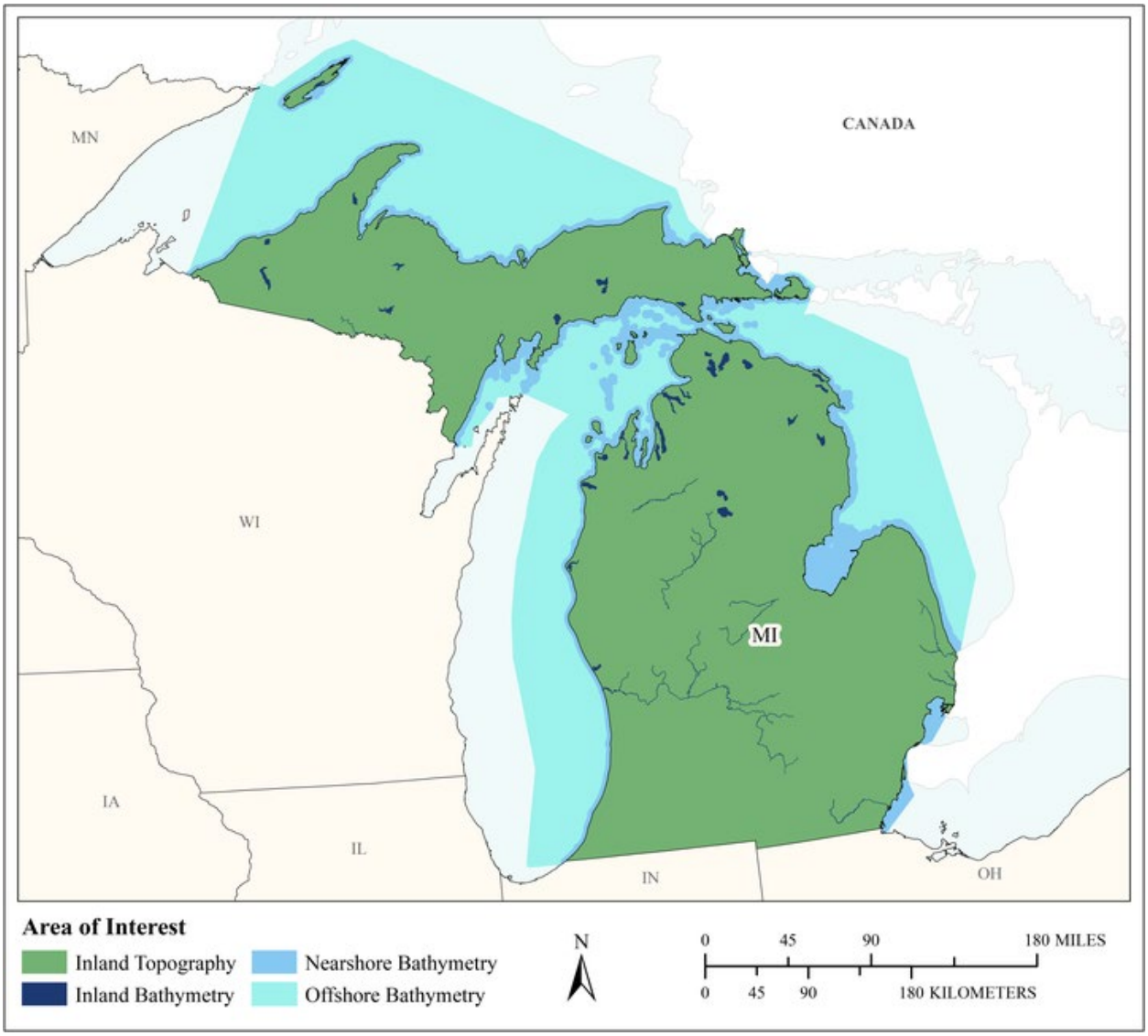
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$24,602	I don't know	Unable to provide		I don't know	Unable to provide				
Time savings description	Assists in completing maps for publication or draft maps for use in further studies. Just getting this information helps to focus on potential problems not seen before. Helps to focus field and data entry for standard presentation. You do not see errors until you have visited or seen the site first-hand. 3D helps to focus field efforts to minimize the errors. Helps to focus a team on process and interpretation, without having to send more than one to the field. Helps field personnel focus on looking for unique features or validating extent of features that may be in woods.			Not easy to project a dollar amount, but it is valuable.			Not easy to project a dollar amount, but it is valuable.					
Cost savings/cost reduction	Major	Annual dollars saved/realized	$60,000	I don't know	Unable to provide		I don't know	Unable to provide				
Cost savings/cost reduction description	Helps to focus our field efforts and getting project (55 sq mi) done more efficiently.			Not easy to project a dollar amount, but it is valuable.			Not easy to project a dollar amount, but it is valuable.					
Cost avoidance	Major	Annual dollars saved/realized	$75,000 to $90,000	I don't know	Unable to provide		I don't know	Unable to provide				
Cost avoidance description	However, one slope failure, or sink hole could save a life or structures. Tough to estimate, but to redo one area, savings of $5000. $5000 per project and we may do 3-6 per year = $15,000 to $30,000 savings.						Not easy to project a dollar amount, but it is valuable.					
Increased revenues	Major	Annual dollars saved/realized	$1,000,000	I don't know	Unable to provide		I don't know	Unable to provide				
Increased revenues description	If this were to support identification of a mineral resource, the benefits could be hundreds of millions of dollars in taxes but also employment.			Not easy to project a dollar amount, but it is valuable.			Not easy to project a dollar amount, but it is valuable.					
Mission-driven performance improvements	Major	Annual percent improvement	80%	I don't know	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements description	Perhaps double our efficiency. This could/would be real time, with less delays. More efficient field practices.			Not easy to project a dollar amount, but it is valuable.			Not easy to project a dollar amount, but it is valuable.					
Other operational benefits	Major	Annual dollars saved/realized	$50,000	Moderate	Annual dollars saved/realized	$12,000 to $16,000	I don't know	Unable to provide				
Other operational benefits description	Mapping can be done more efficiently, therefore more with less or greatly increase with the same staff. This can mean more production with less staff, OR more production for the same dollar amount.			Estimate 20-50 hours/quadrangle @ $80/hour=$4000/ * 4 quads = $12-16,000/year. This could provide that extra level of confidence that we understand the groundwater flow systems.			Not easy to project a dollar amount, but it is valuable.					
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$14,472	I don't know	Unable to provide		I don't know	Unable to provide				
Value added to products or services description	Able to focus on problem areas.			Not easy to project a dollar amount, but it is valuable.			Not easy to project a dollar amount, but it is valuable.					
Improved response or timeliness	Major	Annual dollars saved/realized	$2,065,124	I don't know	Unable to provide		I don't know	Unable to provide				

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Improved response or timeliness description	Focused field response and warnings. As noted before, provides data format more usable to the public. 3D data before and after an event can save millions depending on the event. May not have to go to the site to present an area of concern or needing protection.			Not easy to project a dollar amount, but it is valuable.			Not easy to project a dollar amount, but it is valuable.					
Improved customer experience	Major	Annual dollars saved/realized	$84,472	I don't know	Unable to provide		I don't know	Unable to provide				
Improved customer experience description	Less staff to do the same data output. Could be 5 to 10 times what was noted above. $70,000 to millions.			Not easy to project a dollar amount, but it is valuable.			Not easy to project a dollar amount, but it is valuable.					
Other customer service benefits	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Other customer service benefits description	Back to what loss has been prevented, Thousands to millions of dollars or saving lives. The value can change if you have a major/hazardous spill and did not protect a potential water or natural resource from the impact of the release. Groundwater, soils removal costs can be large $$ because of area of impact by a hazardous chemical was costly to remove. Response to areas of concern can receive a higher level of scrutiny within hours, versus having to go to field check.			Not easy to project a dollar amount, but it is valuable.			Not easy to project a dollar amount, but it is valuable.					
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate			I don't know					
Education or outreach description	Ability to present data in a current visual method that can be understood by non-scientists.			Provide additional dimension of scientific information not provided before.								
Environmental	Major			Moderate			I don't know					
Environmental description	Identify areas of concern or needing protection, which can be greater than originally estimated even with google earth.			Provide additional dimension of scientific information not provided before to protect the environment.								
Public safety, including life and property	Major			Moderate			I don't know					
Public safety, including life and property description	Highest level of benefit, saves lives.			Yes to life saving								
Other	Stakeholders/society will come to Survey for factual data, not Wikipedia!!!			The go to for scientific information								
Other benefits	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps	Yes	Yes		
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes	Yes		
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Geologic Resource Mining and Extraction



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Onshore or offshore mineral extraction. Monitoring sand as a local resource. Seabed resources. Open mine volume computations. Stockpile analysis. Environmental impact assessment and site restoration.
MCA Title	Geologic Resource Mining and Extraction
MCA ID	60234
Organization Type	State or U.S. Territorial government
Organization Name	State of Michigan
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 11 - Geologic Resource Mining and Extraction
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B	QL3B	Order 1b
Update Frequency	2-3 years	4-5 years	I don't know	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Nice to have	Nice to have	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Nice to have	Highly desirable	Highly desirable	Nice to have	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Nice to have	Highly desirable	Highly desirable	Nice to have	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Nice to have	Nice to have
DTM	Required	Highly desirable	Nice to have	Nice to have
DEM	Required	Highly desirable	Nice to have	Nice to have
Raw point cloud data	Nice to have	Highly desirable	Highly desirable	Highly desirable
Classified point cloud	Highly desirable	Nice to have	Nice to have	
Edited/cube XYZ		Not required	Not required	Not required
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Nice to have	Nice to have
Ground control/ground truthing	Nice to have	Highly desirable	Nice to have	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Highly desirable	Not required	Not required
Underwater videography			Not required	Not required
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Not required	Not required
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Not required	Not required
Tide/wave heights			Not required	Not required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Not required	Not required
Fixed obstructions			Not required	Not required
Floating observation/navigation systems			Not required	Not required
Shorelines – current, historic, change rates	Not required	Highly desirable	Nice to have	
Land use/land cover	Nice to have	Not required	Nice to have	Nice to have
Wetlands	Nice to have	Highly desirable	Not required	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Nice to have	Nice to have
Inland surface water features	Highly desirable	Nice to have	Nice to have	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Nice to have	Nice to have	Not required	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	I don't know	I don't know
Cost savings/cost reduction	Moderate	Moderate	I don't know	I don't know
Cost avoidance	Moderate	Moderate	I don't know	I don't know
Increased revenues	None	None	I don't know	I don't know
Mission-driven performance improvements	Moderate	Moderate	I don't know	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	None	I don't know	I don't know

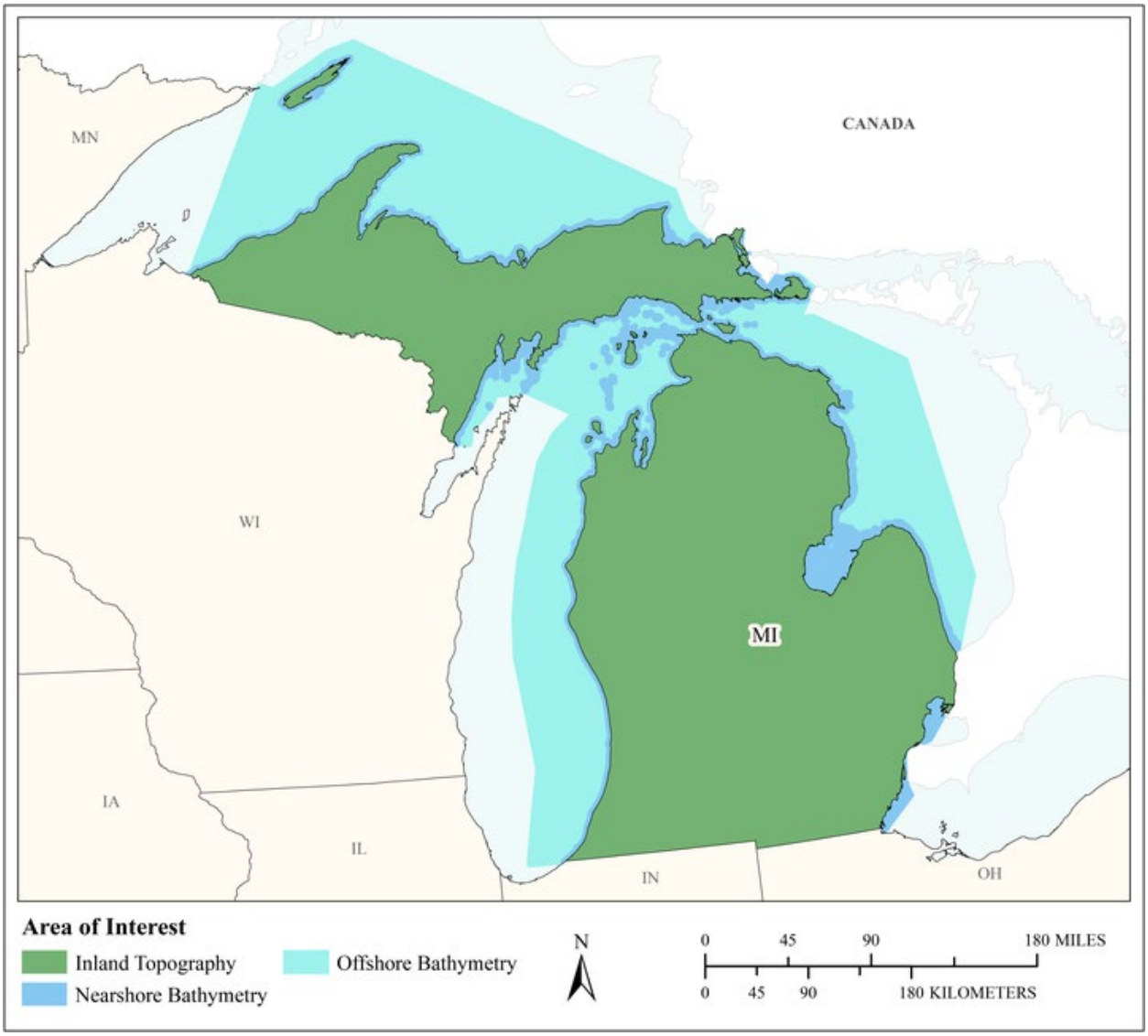
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	None	I don't know	I don't know
Improved customer experience	Moderate	None	I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	None	I don't know	I don't know
Environmental	Major	Minor	I don't know	I don't know
Public safety, including life and property	Moderate	None	I don't know	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Minor	Unable to provide		Minor	Unable to provide		None			I don't know	Unable to provide	
Cost avoidance	Minor	Unable to provide		Moderate	Unable to provide		None			I don't know	Unable to provide	
Increased revenues	None			None			None			I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide		None			I don't know	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$14,188									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide		None			None			I don't know	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$9,411		Annual dollars saved/ realized	$970						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			None			I don't know			I don't know		
Environmental	Major			Minor			Moderate			I don't know		
Public safety, including life and property	Major			Minor			I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Renewable Energy Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	Required
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Alternate energy development – solar, tidal, wind, wave, and ocean current. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Low head power potential for hydropower.
MCA Title	Renewable Energy Resources
MCA ID	60235
Organization Type	State or U.S. Territorial government
Organization Name	State of Michigan
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2		I don't know	I don't know
Update Frequency	6-10 years		I don't know	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter		I don't know	I don't know
Acceptable Vertical Error	Up to 20 cm		I don't know	I don't know
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable		I don't know	I don't know		I don't know
Entire AOI under same environmental conditions	Highly desirable		I don't know	I don't know		I don't know
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable		I don't know	I don't know		I don't know
DEM for entire AOI needs to be seamless	Highly desirable		I don't know	I don't know		I don't know
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		I don't know	I don't know		I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required		I don't know	I don't know
DTM	Required		I don't know	I don't know
DEM	Required		I don't know	I don't know
Raw point cloud data	Highly desirable		I don't know	I don't know
Classified point cloud	Highly desirable		I don't know	
Edited/cube XYZ			I don't know	I don't know
Full waveform	Nice to have		I don't know	I don't know
Bathymetric Attributed Grid (BAG)			I don't know	I don't know
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			I don't know	I don't know
Tide Predictions			I don't know	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			I don't know	I don't know
Intensity imagery/sidescan imagery	Not required		I don't know	I don't know
Ground control/ground truthing	Highly desirable		I don't know	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			I don't know	I don't know
Nautical and/or navigation charts			I don't know	I don't know
Acoustic imagery of the seafloor			I don't know	I don't know
Aerial and/or satellite imagery	Highly desirable		I don't know	I don't know
Underwater videography			I don't know	I don't know
Bottom texture			I don't know	I don't know
Bottom type			I don't know	I don't know
Submerged features			I don't know	I don't know
Subbottom characteristics			I don't know	I don't know
Geologic and seismic data	Not required		I don't know	I don't know
Water column properties - Physical			I don't know	I don't know
Water column properties - Chemical			I don't know	I don't know
Water column properties - Biological			I don't know	I don't know
Currents			I don't know	I don't know
Tide/wave heights			I don't know	I don't know
Sea ice conditions			I don't know	I don't know
Habitat distribution and classification			I don't know	I don't know
Boundaries			I don't know	I don't know
Routes			I don't know	I don't know
Offshore cadastral			I don't know	I don't know
Lease areas			I don't know	I don't know
Fixed obstructions			I don't know	I don't know
Floating observation/navigation systems			I don't know	I don't know
Shorelines – current, historic, change rates	Nice to have		I don't know	
Land use/land cover	Highly desirable		I don't know	I don't know
Wetlands	Nice to have		I don't know	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			I don't know	I don't know
Inland surface water features	Nice to have		I don't know	
Bridges/culverts	Nice to have			
Landmark features	Nice to have		I don't know	
Cultural resources	Not required		I don't know	
Coastal and riverine structures	Nice to have		I don't know	
Overhead structures			I don't know	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate		I don't know	I don't know
Cost savings/cost reduction	Moderate		I don't know	I don't know
Cost avoidance	Moderate		I don't know	I don't know
Increased revenues	None		I don't know	I don't know
Mission-driven performance improvements	Minor		I don't know	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor		I don't know	I don't know

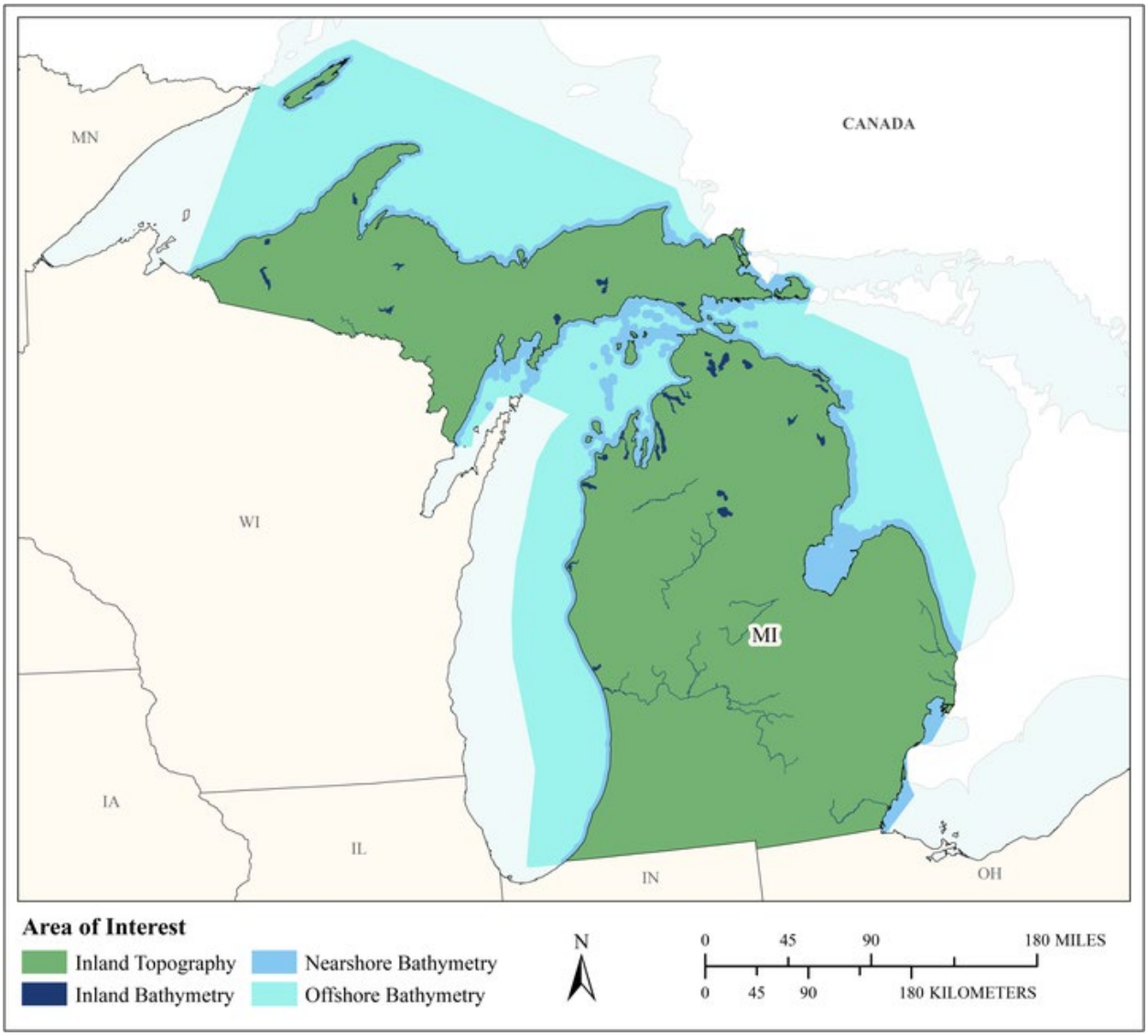
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor		I don't know	I don't know
Improved customer experience	Minor		I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor		I don't know	I don't know
Environmental	Minor		I don't know	I don't know
Public safety, including life and property	Minor		I don't know	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues	Moderate	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Minor	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor						I don't know			I don't know		
Environmental	Minor						I don't know			I don't know		
Public safety, including life and property	None						I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Cultural Resources Preservation and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Discovery and analysis of underwater archaeological and historical cultural sites. Site protection and preservation planning. Discovery and analysis of Native American and other historical cultural sites and subsistence activities.
MCA Title	Cultural Resources Preservation and Management
MCA ID	60236
Organization Type	State or U.S. Territorial government
Organization Name	State of Michigan
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	Order 1a
Update Frequency	4-5 years	6-10 years	4-5 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Not required	Nice to have	Nice to have	Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	Required
DTM	Required	Highly desirable	Nice to have	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Not required	Not required	Not required	Not required
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Not required	Nice to have
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Nice to have	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Highly desirable
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Nice to have	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Required
Nautical and/or navigation charts			Highly desirable	Required
Acoustic imagery of the seafloor			Highly desirable	Required
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Nice to have
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Required	Required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have	Highly desirable	Highly desirable	Highly desirable
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Highly desirable	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Highly desirable	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Required	Required
Floating observation/navigation systems			Highly desirable	Required
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Required	
Land use/land cover	Nice to have	Highly desirable	Nice to have	Highly desirable
Wetlands	Nice to have	Highly desirable	Nice to have	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Nice to have	Highly desirable	Nice to have	
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Nice to have	Highly desirable	Highly desirable	
Cultural resources	Required	Highly desirable	Required	
Coastal and riverine structures	Nice to have	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	Moderate
Cost savings/cost reduction	Moderate	Minor	Minor	Minor
Cost avoidance	Minor	Minor	Minor	Minor
Increased revenues	None	Minor	None	None
Mission-driven performance improvements	Moderate	Moderate	Minor	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor	None	Minor

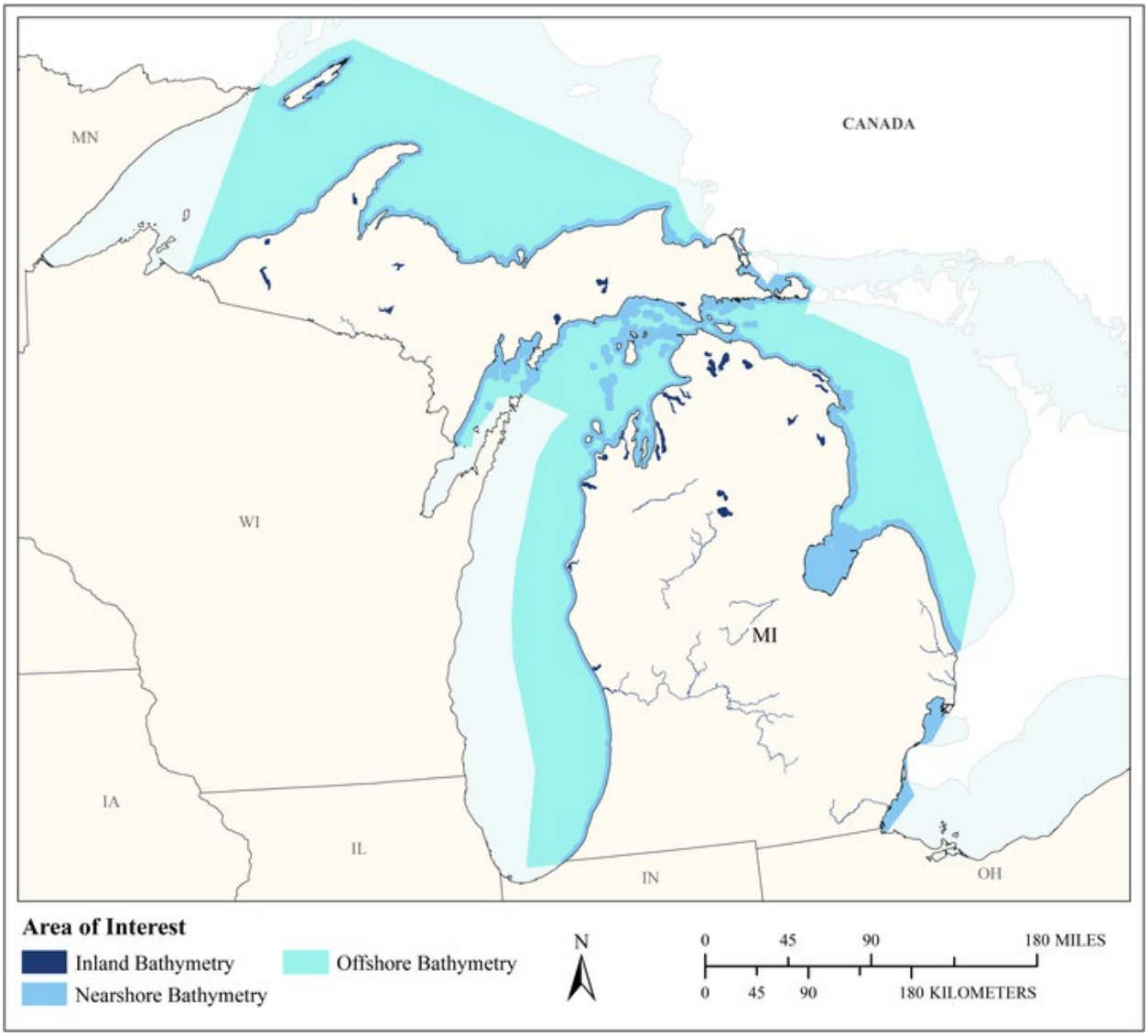
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major	Minor	Moderate
Improved customer experience	Moderate	Moderate	Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	Minor	Minor
Environmental	Minor	Moderate	Minor	Moderate
Public safety, including life and property	Minor	Moderate	None	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Increased revenues	None			None			None			None		
Mission-driven performance improvements	Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$10,646		Annual dollars saved/ realized	$25,531		Annual dollars saved/ realized	$10,582		Annual dollars saved/ realized	$80,820
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$9,308									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Moderate			Minor			Minor		
Environmental	Minor			Minor			Moderate			Moderate		
Public safety, including life and property	Minor			Minor			Minor			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				Yes

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Marine and Riverine Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type		Required	Required	Required
Geographic Area Requirements		One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Nautical charting. Bathymetric measurements of nearshore submerged coastal topography. Identification of hazards to navigation. Sediment management at coastal navigation projects. Precision marine navigation. Movement of goods and fishing vessels.
MCA Title	Marine and Riverine Navigation and Safety
MCA ID	60237
Organization Type	State or U.S. Territorial government
Organization Name	State of Michigan
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Nice to have
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order		QL0B	QL0B	I don't know
Update Frequency		2-3 years	2-3 years	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error		Up to 2 meters	Up to 2 meters	I don't know
Acceptable Vertical Error		Up to 30 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season		Nice to have	Nice to have	I don't know		Nice to have
Entire AOI under same environmental conditions		Nice to have	Nice to have	I don't know		Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless		Required	Required	I don't know		Highly desirable
DEM for entire AOI needs to be seamless		Required	Required	I don't know		Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness		Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM		Highly desirable	Required	I don't know
DTM		Highly desirable	Required	I don't know
DEM		Required	Required	I don't know
Raw point cloud data		Nice to have	Required	I don't know
Classified point cloud		Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Highly desirable	I don't know
Full waveform		Not required	Not required	I don't know
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	I don't know
Breaklines required for standard hydro-flattening		Not required		
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	I don't know
Tide Predictions			Required	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	I don't know
Intensity imagery/sidescan imagery		Nice to have	Highly desirable	I don't know
Ground control/ground truthing		Nice to have	Highly desirable	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	I don't know
Nautical and/or navigation charts			Highly desirable	I don't know
Acoustic imagery of the seafloor			Highly desirable	I don't know
Aerial and/or satellite imagery		Required	Highly desirable	I don't know
Underwater videography			Nice to have	I don't know
Bottom texture			Highly desirable	I don't know
Bottom type			Highly desirable	I don't know
Submerged features			Highly desirable	I don't know
Subbottom characteristics			Nice to have	I don't know
Geologic and seismic data		Not required	Nice to have	I don't know
Water column properties - Physical			Nice to have	I don't know
Water column properties - Chemical			Nice to have	I don't know
Water column properties - Biological			Nice to have	I don't know
Currents			Highly desirable	I don't know
Tide/wave heights			Highly desirable	I don't know
Sea ice conditions			Nice to have	I don't know
Habitat distribution and classification			Highly desirable	I don't know
Boundaries			Nice to have	I don't know
Routes			Required	I don't know
Offshore cadastral			Nice to have	I don't know
Lease areas			Nice to have	I don't know
Fixed obstructions			Required	I don't know
Floating observation/navigation systems			Required	I don't know
Shorelines – current, historic, change rates		Required	Required	
Land use/land cover		Nice to have	Nice to have	I don't know
Wetlands		Required	Highly desirable	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	I don't know
Inland surface water features		Required	Highly desirable	
Bridges/culverts		Highly desirable		
Landmark features		Nice to have	Nice to have	
Cultural resources		Highly desirable	Nice to have	
Coastal and riverine structures		Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts		Yes	Yes	
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings		Major	Minor	I don't know
Cost savings/cost reduction		I don't know	Minor	I don't know
Cost avoidance		Major	Minor	I don't know
Increased revenues		None	Minor	I don't know
Mission-driven performance improvements		Minor	Minor	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services		None	Minor	I don't know

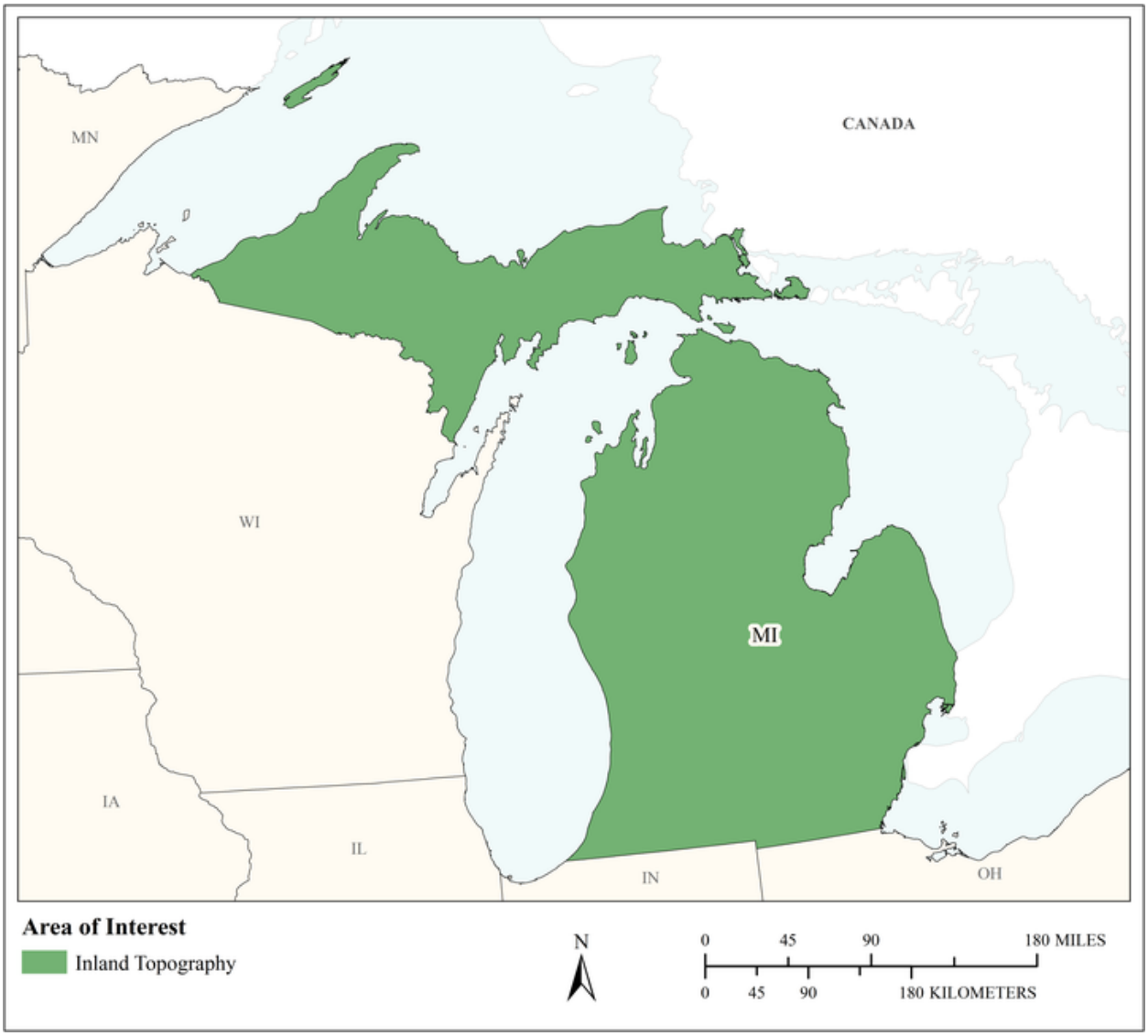
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness		None	Minor	I don't know
Improved customer experience		None	Minor	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach		None	Minor	I don't know
Environmental		None	Minor	I don't know
Public safety, including life and property		None	Major	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings				Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction				Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Cost avoidance				Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Increased revenues				Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements				Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation					Annual dollars saved/ realized	$1,059,525		Annual dollars saved/ realized	$2,834,249			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services				Minor	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness				Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Improved customer experience				Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Future annual customer service benefits added during validation					Annual dollars saved/ realized	$139,445		Annual dollars saved/ realized	$95,959			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach				Moderate			Minor			I don't know		
Environmental				Moderate			Major			I don't know		
Public safety, including life and property				Moderate			Major			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes	Yes	
Contours		Yes	Yes	Yes
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps				Yes
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)		Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints		Yes		
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				Yes

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Aviation Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of in-flight hazards and path obstructions. Aeronautical charting. Runway construction and repair.
MCA Title	Aviation Navigation and Safety
MCA ID	60238
Organization Type	State or U.S. Territorial government
Organization Name	State of Michigan
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 21 - Aviation Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes			
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Major			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

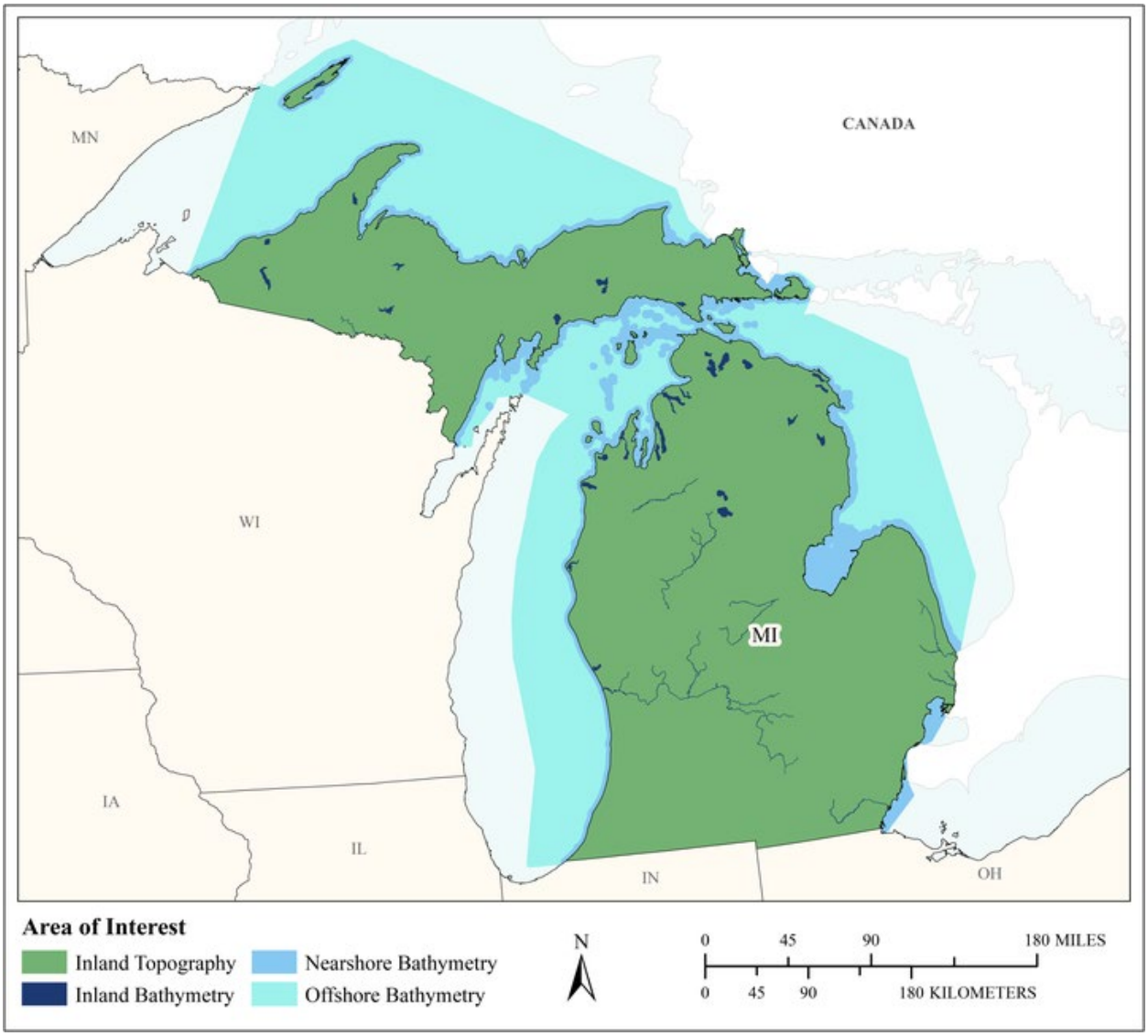
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$196,360									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$244,560									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Moderate											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Infrastructure and Construction Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Marine construction. Bridge design and construction. Engineering and construction of dams, levees, dikes, reservoirs, and coastal structures. Shipyard and port construction. Water, sewer, or power line planning and vegetation analysis. Pump, drain, and well placement. Stormwater modeling. Cut and fill analysis for earth-moving. Building site analysis. Road infrastructure. Infrastructure hardening or mitigation for climate change effects, e.g. sea level change.
MCA Title	Infrastructure and Construction Management
MCA ID	60239
Organization Type	State or U.S. Territorial government
Organization Name	State of Michigan
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B	QL1B	Cross sections and/or transects meet needs
Update Frequency	4-5 years	4-5 years	4-5 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	Up to 2 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				Yes
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Highly desirable	Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Highly desirable	Highly desirable
DTM	Required	Required	Required	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Nice to have	Nice to have	Highly desirable
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Nice to have
Ground control/ground truthing	Required	Highly desirable	Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Highly desirable
Nautical and/or navigation charts			Nice to have	Nice to have
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required	Required	Highly desirable	Nice to have
Underwater videography			Not required	Nice to have
Bottom texture			Not required	Nice to have
Bottom type			Nice to have	Nice to have
Submerged features			Highly desirable	Nice to have
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Not required	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Nice to have	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Nice to have	Nice to have
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Highly desirable	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Highly desirable	Nice to have
Floating observation/navigation systems			Highly desirable	Nice to have
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Required	Highly desirable	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	Moderate
Cost savings/cost reduction	Major	Major	Minor	Moderate
Cost avoidance	Major	Moderate	Minor	Moderate
Increased revenues	Minor	None	None	Moderate
Mission-driven performance improvements	Moderate	Moderate	Minor	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate	Minor	Moderate

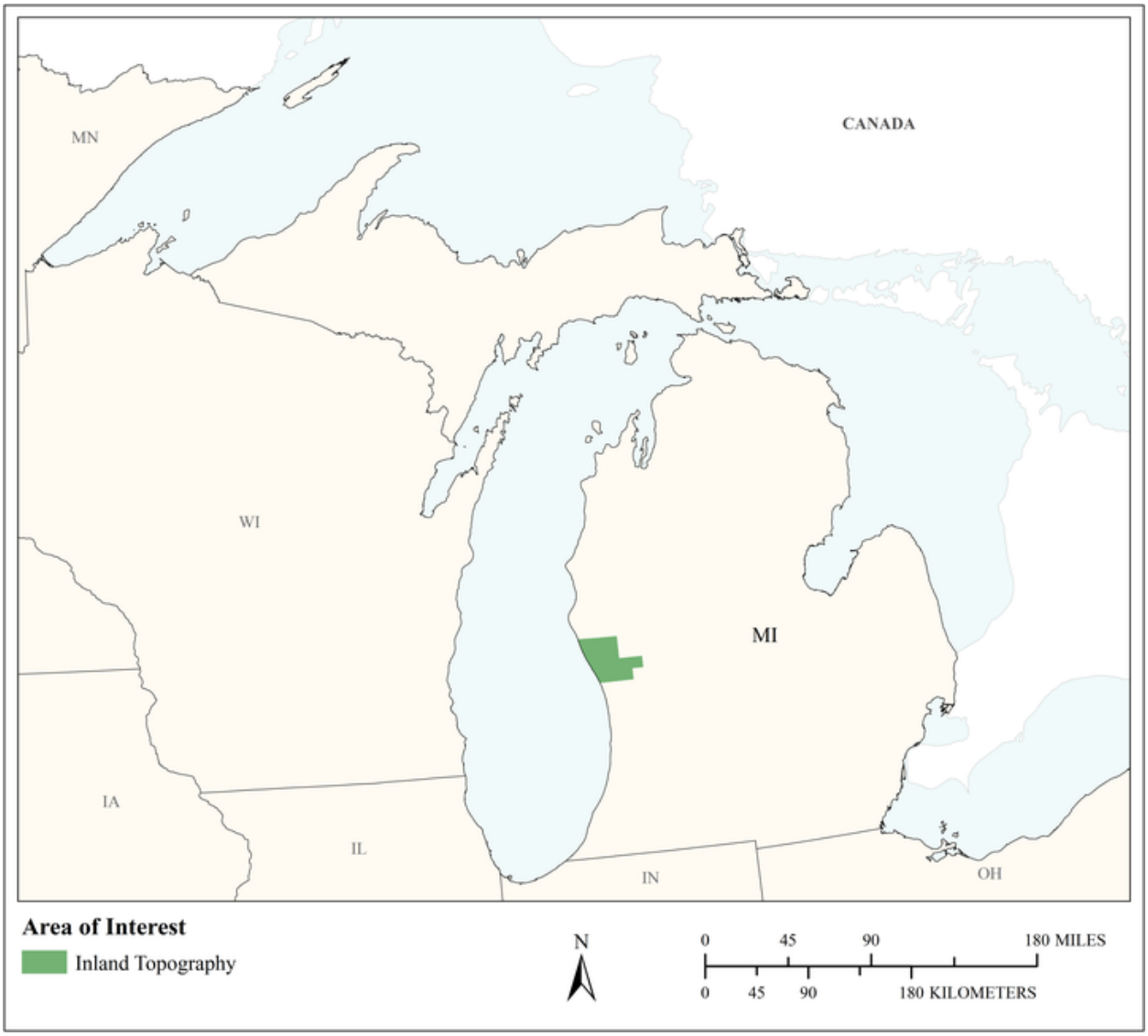
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major	Minor	Moderate
Improved customer experience	Moderate	Minor	Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	Minor	Moderate
Environmental	Moderate	Minor	Minor	Moderate
Public safety, including life and property	Moderate	Moderate	Minor	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	None			None			Minor	Unable to provide		None		
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,610,341		Annual dollars saved/ realized	$879,466		Annual dollars saved/ realized	$77,263			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$7,681,709		Annual dollars saved/ realized	$91,322		Annual dollars saved/ realized	$10,623			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			Minor			Minor		
Environmental	Moderate			Moderate			Moderate			Major		
Public safety, including life and property	Major			Moderate			Major			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geospatial Services



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements	Muskegon County, MI			

MCA Description	Response
Mission Critical Activity	Geographic Information Services, Geospatial Services. Provide county GIS services to municipal entities. Elevation data are needed to perform watershed delineations for drainage districts and for administering FEMA floodplain programs.
MCA Title	Geospatial Services
MCA ID	21709
Organization Type	Regional, County, City, or other local government
Organization Name	Muskegon County GIS, Muskegon County MI
Sub-Agency or Division	
Organization Mission	County Government Services
Program Name	Geographic Information Services and Property Assessment
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 01 - Water Supply and Quality
Tertiary Business Use	BU 15 - Flood Risk Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Base of bridges, houses, structures and water course delineations

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed	To MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial			
Cross section/transect requirement	I don't know			

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Local LiDAR, 2016 QL2			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	Local data acquisition			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	Minor			
Mission-driven performance improvements	Moderate			

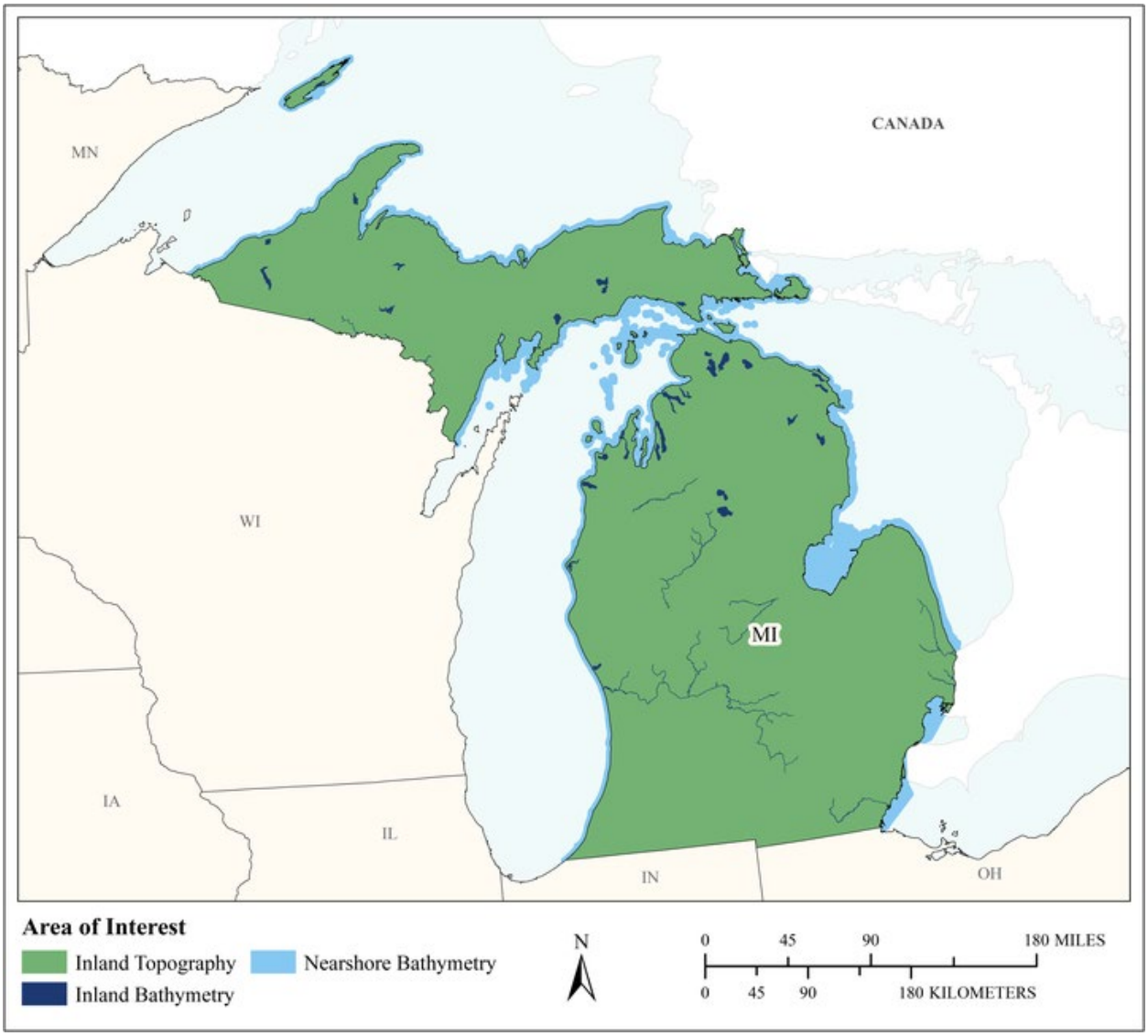
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			
Improved response or timeliness	None			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	I don't know	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	I don't know	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide										
Improved response or timeliness	I don't know	Unable to provide										
Improved customer experience	I don't know	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	1
Update frequency	3

MCA Title: Urban and Regional Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Land development and zoning. Municipal mapping of building footprints and elevations. Port resilience planning. Parks and transportation planning. Virtual city creation. Urban ecology planning.
MCA Title	Urban and Regional Planning
MCA ID	60240
Organization Type	State or U.S. Territorial government
Organization Name	State of Michigan
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL2B	
Update Frequency	4-5 years	6-10 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Required	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Required	Nice to have	Highly desirable	
Classified point cloud	Required	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Required	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Nice to have	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Minor	
Cost savings/cost reduction	Major	Minor	Minor	
Cost avoidance	Major	Minor	Minor	
Increased revenues	Minor	Minor	None	
Mission-driven performance improvements	Major	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Minor	

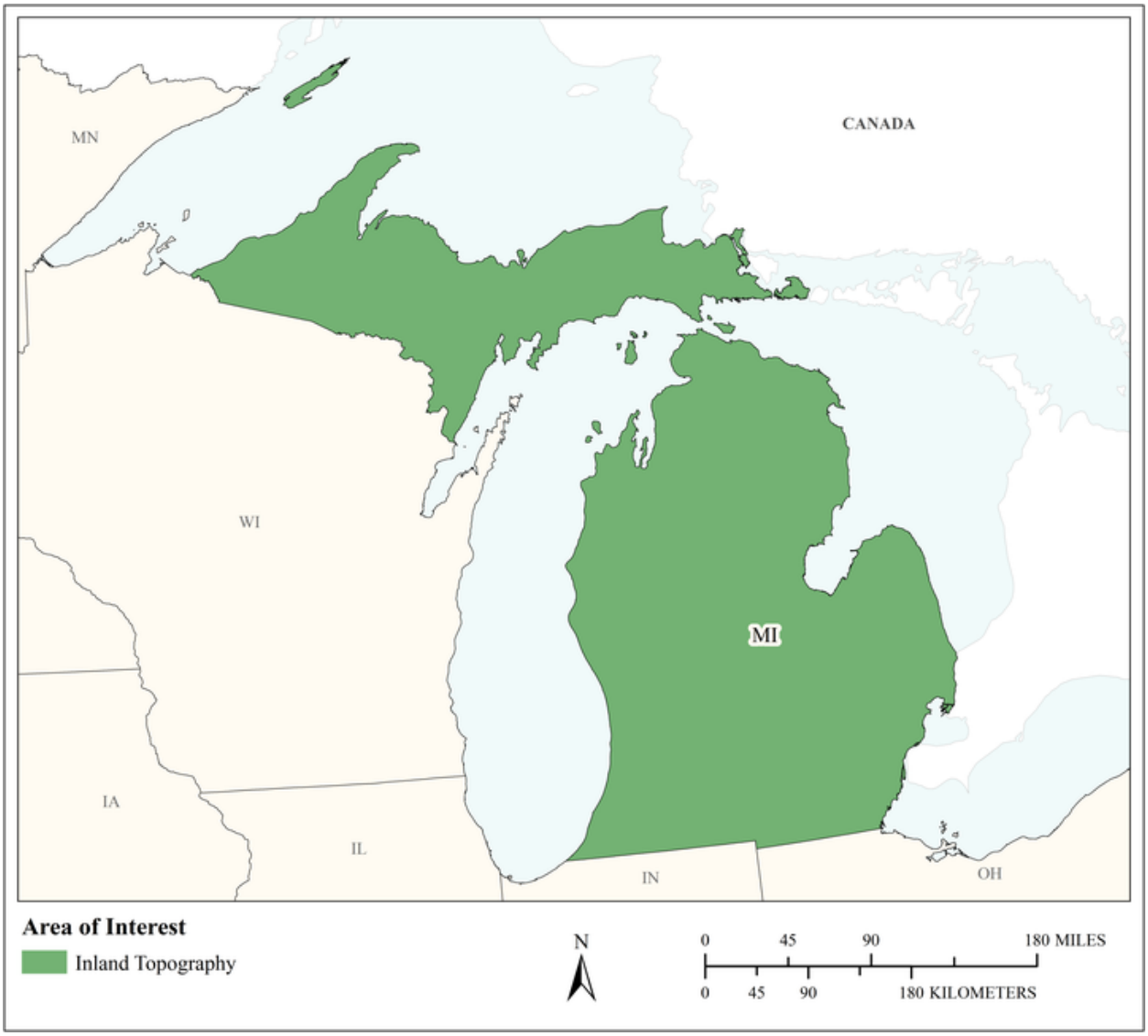
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	Minor	
Improved customer experience	Major	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	
Environmental	Major	Minor	Minor	
Public safety, including life and property	Major	Minor	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$15,628,514		Annual dollars saved/ realized	$636,522		Annual dollars saved/ realized	$676,705			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,804,319		Annual dollars saved/ realized	$805,255		Annual dollars saved/ realized	$713,897			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate					
Environmental	Major			Moderate			Moderate					
Public safety, including life and property	Major			Major			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	
Hillshades	Yes		Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Higher Education and Research



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Providing education to researchers and professionals regarding topographic analysis as it relates to water movement, vegetation, erosion, cold air drainage, pollution and flooding.
MCA Title	Higher Education and Research
MCA ID	21932
Organization Type	Academic or Not-for-Profit
Organization Name	Michigan State University
Sub-Agency or Division	
Organization Mission	Provide geospatial services to research faculty, not-for-profits, local/state/federal government and private industry.
Program Name	Remote Sensing and GIS Outreach
Total Annual Program Budget	
Primary Business Use	BU 26 - Education K12 and Beyond, Basic Research
Secondary Business Use	BU 02 - Riverine Ecosystem Management
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Narrow ridges affecting small drainage areas, narrow drains and streams, shrubs and trees of about 2 foot in size, very small structures such as small sheds and fences, forest openings, woody debris such as fallen logs

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 60 cm			
Acceptable Vertical Error	Up to 20 cm			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed				
How far down the beach profile needed	To MHHW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	I am currently using a combination of QL2, QL3 LiDAR and LiDAR-derived DEMs, as well as 10-meter DEMS from NED			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Michigan			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor			
Cost savings/cost reduction	None			
Cost avoidance	Major			

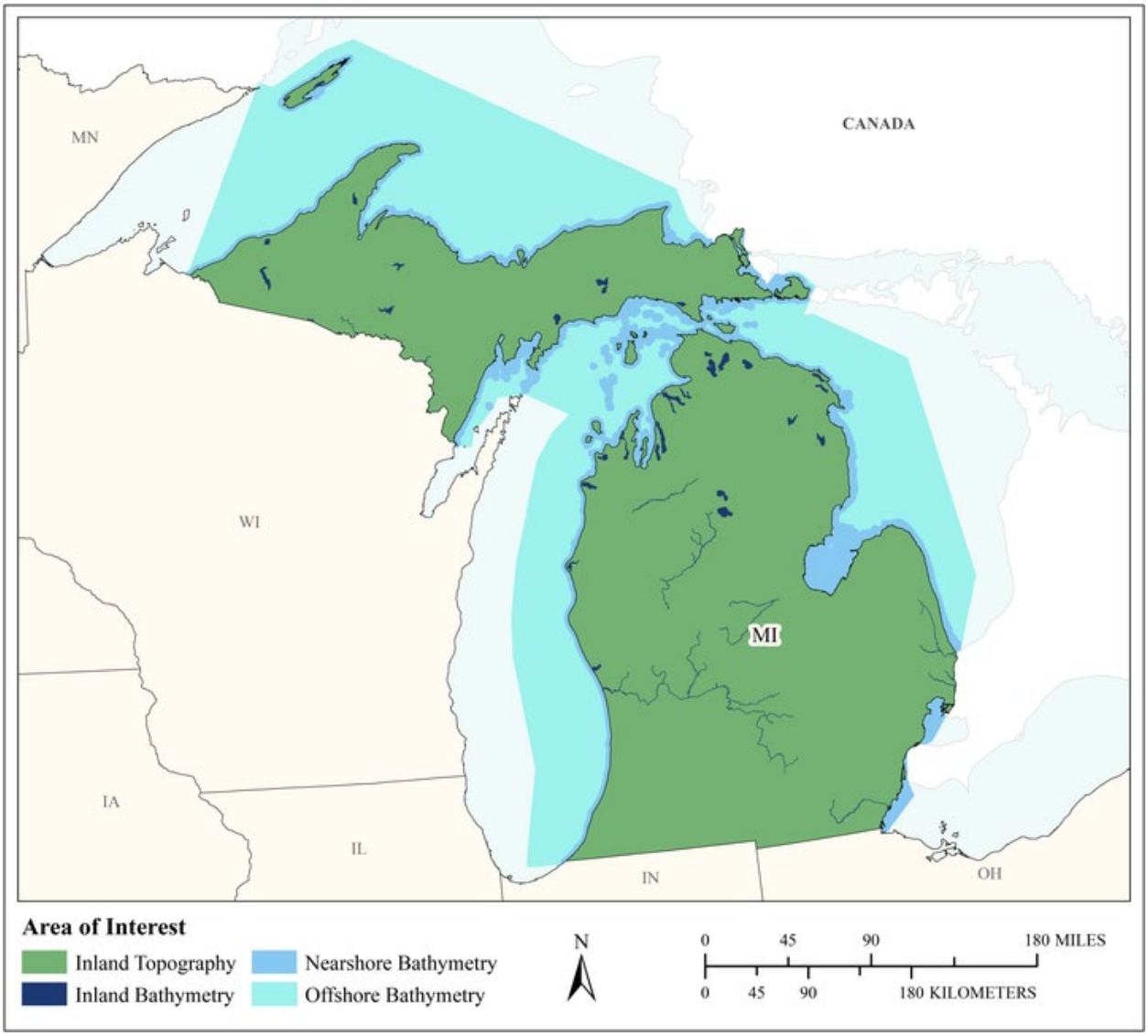
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	Moderate			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Minor			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	I don't know			
Public safety, including life and property	I don't know			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$22,612									
Time savings description	Some field hours saved but processing hours are increased due to sizes of datasets. Hourly savings from reduced processing or integration with other data. Avoidance of repeated processing and lower QC. Savings by avoiding unnecessary iterative processing.											
Cost savings/cost reduction	Moderate	Annual dollars saved/realized	$100,000									
Cost savings/cost reduction description	Cost of obtaining this information through contracting a vendor for each AOI of need.											
Cost avoidance	Moderate	Annual dollars saved/realized	$60,000									
Cost avoidance description	This would be passed onto clients due to increased quality. Vendor would provide much of the processing, which is covered in previous question.											
Increased revenues	Major	Annual dollars saved/realized	$100,000									
Increased revenues description	Considerable analysis is possible with LiDAR, leading to new services.											
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$107,538									
Value added to products or services description	Opens up new capabilities and resulting services. Reduced processing.											
Improved response or timeliness	None											
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Education or outreach description	This data will assist with various workshops and terrain analysis services											
Environmental	Moderate											
Environmental description	This data will allow our unit to provide services relating to runoff that could reduce environmental impacts											
Public safety, including life and property	None											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Education K12 and Beyond, Basic Research



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Development of 3-D visualizations to help students understand the Earth they live on. Understanding of continental-scale climate change impacts. Ocean science. Ocean education. Scientific research. Data dissemination. Development of training simulators.
MCA Title	Education K12 and Beyond, Basic Research
MCA ID	60241
Organization Type	State or U.S. Territorial government
Organization Name	State of Michigan
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 26 - Education K12 and Beyond, Basic Research
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL1B	QL2B	Order 1a
Update Frequency	2-3 years	4-5 years	4-5 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Nice to have	Not required	Highly desirable	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Required	Nice to have	Not required	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required	Highly desirable	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Required	Required
DTM	Required	Highly desirable	Required	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Required	Required	Required	Required
Classified point cloud	Required	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Nice to have	Nice to have
Ground control/ground truthing	Highly desirable	Highly desirable	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Highly desirable
Underwater videography			Nice to have	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Highly desirable	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Highly desirable
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Required	Highly desirable	Highly desirable	Nice to have
Wetlands	Required	Highly desirable	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Nice to have	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Major	Minor
Cost savings/cost reduction	Major	Minor	Moderate	Minor
Cost avoidance	Major	Minor	Major	Moderate
Increased revenues	Minor	None	Minor	None
Mission-driven performance improvements	Major	Moderate	Major	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Major	Moderate

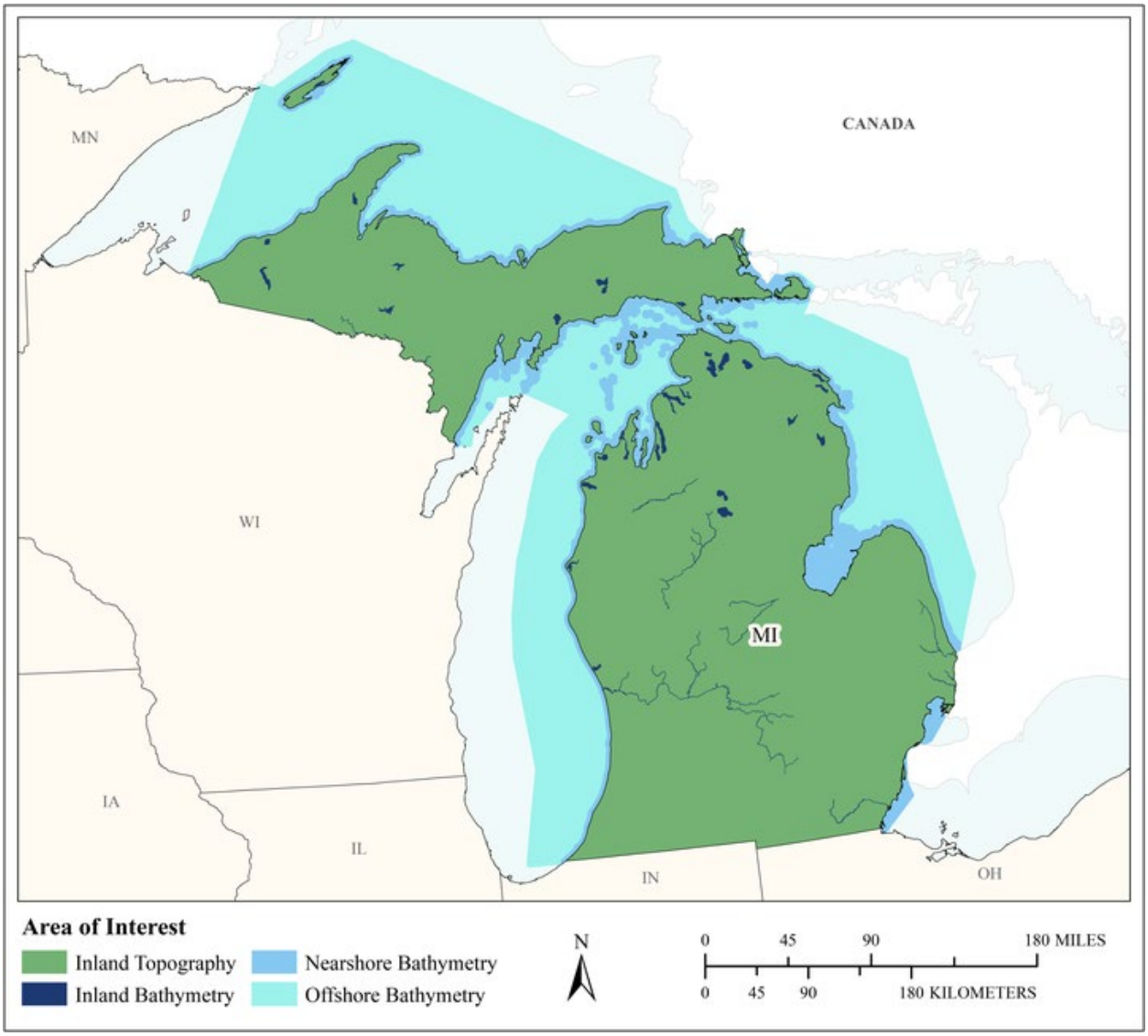
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	Minor	Minor
Improved customer experience	Major	Minor	Moderate	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major	Major	Major
Environmental	Major	Minor	Minor	Minor
Public safety, including life and property	Major	Moderate	Minor	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$305,245		Annual dollars saved/ realized	$79,825		Annual dollars saved/ realized	$24,249		Annual dollars saved/ realized	$64,550
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$729,625					Annual dollars saved/ realized	$956			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major			Major		
Environmental	Major			Major			Major			Minor		
Public safety, including life and property	Major			Major			Minor			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes			Yes
Aspect maps	Yes			Yes
Curvature maps	Yes			
Cross sections	Yes		Yes	Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Recreation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Planning and development of recreational facilities such as rafting, boating, swimming, diving, and fishing areas; ski slopes; and golf courses. Location- based products and services such as maps and guides. Tourism. Trail and vista site planning. Orienteering.
MCA Title	Recreation
MCA ID	60242
Organization Type	State or U.S. Territorial government
Organization Name	State of Michigan
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 27 - Recreation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	I don't know
Update Frequency	4-5 years	4-5 years	4-5 years	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required	Highly desirable	I don't know	Not required	Not required
Entire AOI under same environmental conditions	Required	Not required	Highly desirable	I don't know	Not required	Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Nice to have	I don't know	Nice to have	Not required
DEM for entire AOI needs to be seamless	Required	Nice to have	Nice to have	I don't know	Nice to have	Not required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	I don't know
DTM	Nice to have	Highly desirable	Highly desirable	I don't know
DEM	Required	Required	Required	I don't know
Raw point cloud data	Nice to have	Nice to have	Not required	I don't know
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Nice to have	I don't know
Full waveform	Not required	Nice to have	Not required	I don't know
Bathymetric Attributed Grid (BAG)		Highly desirable	Nice to have	I don't know
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	I don't know
Tide Predictions			Nice to have	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	I don't know
Intensity imagery/sidescan imagery	Not required	Nice to have	Not required	I don't know
Ground control/ground truthing	Nice to have	Nice to have	Not required	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	I don't know
Nautical and/or navigation charts			Not required	I don't know
Acoustic imagery of the seafloor			Not required	I don't know
Aerial and/or satellite imagery	Required	Required	Not required	I don't know
Underwater videography			Not required	I don't know
Bottom texture			Nice to have	I don't know
Bottom type			Highly desirable	I don't know
Submerged features			Highly desirable	I don't know
Subbottom characteristics			Nice to have	I don't know
Geologic and seismic data	Not required	Highly desirable	Nice to have	I don't know
Water column properties - Physical			Nice to have	I don't know
Water column properties - Chemical			Nice to have	I don't know
Water column properties - Biological			Nice to have	I don't know
Currents			Nice to have	I don't know
Tide/wave heights			Nice to have	I don't know
Sea ice conditions			Not required	I don't know
Habitat distribution and classification			Highly desirable	I don't know
Boundaries			Not required	I don't know
Routes			Nice to have	I don't know
Offshore cadastral			Nice to have	I don't know
Lease areas			Nice to have	I don't know
Fixed obstructions			Highly desirable	I don't know
Floating observation/navigation systems			Highly desirable	I don't know
Shorelines – current, historic, change rates	Not required	Highly desirable	Highly desirable	
Land use/land cover	Nice to have	Highly desirable	Highly desirable	I don't know
Wetlands	Highly desirable	Highly desirable	Highly desirable	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	I don't know
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Not required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Minor	I don't know
Cost savings/cost reduction	Moderate	Minor	Minor	I don't know
Cost avoidance	Major	Minor	Minor	I don't know
Increased revenues	None	Minor	Minor	I don't know
Mission-driven performance improvements	Major	Minor	Minor	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor	Minor	I don't know

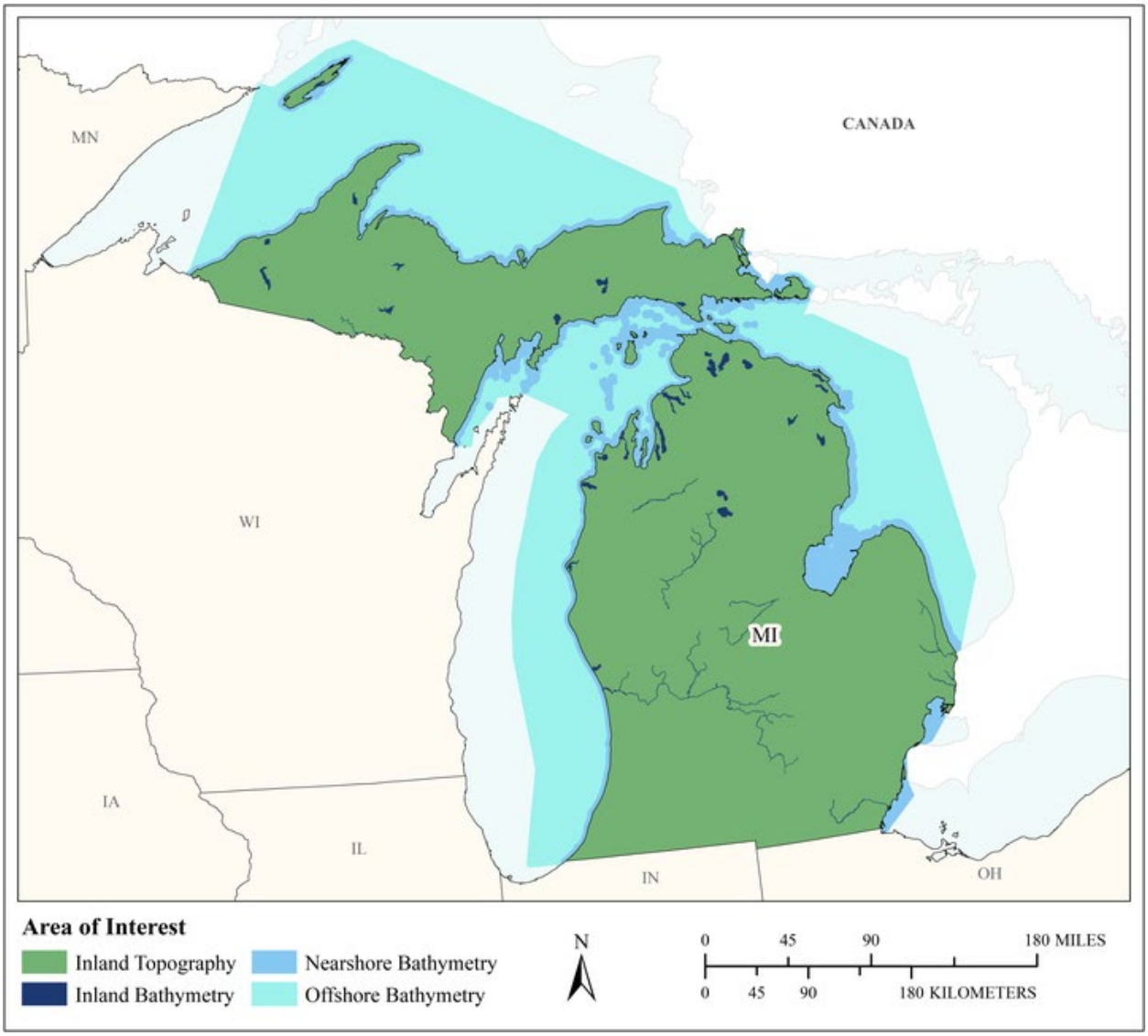
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	Minor	Minor	I don't know
Improved customer experience	Moderate	Minor	Minor	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	I don't know
Environmental	Major	Minor	Minor	I don't know
Public safety, including life and property	Major	Minor	Minor	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Increased revenues	None			Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$13,328		Annual dollars saved/ realized	$8,026		Annual dollars saved/ realized	$478,499			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Major			I don't know		
Environmental	Moderate			Major			Major			I don't know		
Public safety, including life and property	Moderate			Moderate			Moderate			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes		
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Maritime and Land Boundary Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Delimitation of legal and other coastal boundaries, inland boundaries, and ordinary high water lines (OHWL).
MCA Title	Maritime and Land Boundary Management
MCA ID	60243
Organization Type	State or U.S. Territorial government
Organization Name	State of Michigan
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 30 - Maritime and Land Boundary Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B	QL0B	I don't know
Update Frequency	6-10 years	6-10 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Highly desirable	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Nice to have	Nice to have	Highly desirable	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable	Highly desirable	Required	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable	Highly desirable	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	Required
DTM	Required	Required	Required	Required
DEM	Highly desirable	Required	Required	Required
Raw point cloud data	Nice to have	Highly desirable	Required	Required
Classified point cloud	Highly desirable	Highly desirable	Required	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Not required	Nice to have
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Not required
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Nice to have	Required	Not required	Not required
Ground control/ground truthing	Highly desirable	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Required	Highly desirable	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Nice to have
Water column properties - Biological			Not required	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Highly desirable	Nice to have
Routes			Nice to have	Highly desirable
Offshore cadastral			Highly desirable	Nice to have
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Required	Required
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Nice to have
Wetlands	Required	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Highly desirable	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Minor	None	I don't know
Cost savings/cost reduction	Moderate	None	Minor	Moderate
Cost avoidance	Moderate	None	Minor	Moderate
Increased revenues	Minor	None	None	I don't know
Mission-driven performance improvements	Major	None	Moderate	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None	None	I don't know

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	None	Minor	Moderate
Improved customer experience	Major	None	Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	Moderate
Environmental	Major	Minor	Minor	Moderate
Public safety, including life and property	Moderate	None	Minor	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	Minor	Unable to provide		None			None			I don't know	Unable to provide	
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$65,361		Annual dollars saved/ realized	$49,051		Annual dollars saved/ realized	$849,303			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$250,599									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Moderate			Moderate		
Environmental	Minor			Major			Major			Major		
Public safety, including life and property	None			Moderate			Moderate			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps		Yes		
Cross sections		Yes		
Height-Above-Ground maps		Yes		
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

Minnesota

Current status of elevation data for Minnesota

Minnesota is fortunate to have a rich history of collecting and curating geospatial elevation data guided by input from the user community. Though several elevation data products are collected and utilized for many Business Uses in Minnesota, including off-shore and near-shore bathymetry and sonar, the most frequently used elevation data types is terrestrial lidar. In the early 2000s, a committee of stakeholders across Minnesota united to form the first Digital Elevation Committee. This group managed Minnesota's initial lidar acquisition under the Minnesota Elevation Mapping Project. The goal of that project was to develop and deliver a seamless digital elevation map of the State of Minnesota, based on data collected using lidar technology available at the time. Starting in 2007, this initiative guided lidar procurement projects until the state was blanketed with lidar data in 2012. Although Minnesota's first generation lidar data was state of the art at the time of procurement, and one of the first available statewide lidar datasets in the nation, less than one lidar-elevation point per square meter was collected (0.6 points/square meter) during leaf-off conditions. As a result, the data now classifies as Quality Level 3 (QL3) lidar data, the lowest quality of lidar, and does not meet the nation's current standards for high-quality elevation data.

Presently, there are a growing number of smaller data collection efforts that have resulted in high-density lidar, bathymetry, and derived products. These efforts are mainly funded by grants, the Federal Emergency Management Agency (FEMA), Department of Homeland Security, US Army Corp of Engineers, NOAA, and in some cases, counties and private companies. There is also a growing level of interest amongst many stakeholders in the region towards undertaking mapping of the shoreline and the lake bottom of the Great Lakes using bathymetric lidar. In 2010, the Great Lakes Restoration Initiative (GLRI) funded NOAA to collect bathymetric lidar along Minnesota's North Shore of Lake Superior to support mapping of the near-shore environment. In 2019, the Joint Airborne Lidar Bathymetry Technical Center of Expertise (JALBTCX) flew topobathymetric lidar along the entire Lake Superior shoreline. Also in 2019, a coordinated initiative began at a bi-national regional summit to harmonize governmental and non-governmental efforts "to bring together new and existing bathymetric data to create a map of the lake floor that's easy to use and open to everyone", titled Lakebed 2030. As a coastal state in the Great Lakes Basin and at the headwaters of the Mississippi River Basin, Minnesota is in a unique position to be a leader in advocating for and coordinating the collection of high quality elevation data.

A renewed concerted effort to acquire the whole state with high quality elevation data began in 2016 with the formation of the Minnesota Geospatial Advisory Council's 3D Geomatics Committee (3DGeo). The Minnesota Geospatial Advisory Council (GAC) is a 23-member council that acts as a coordinating body for the Minnesota geospatial community. It represents a cross-section of organizations that includes counties, cities, universities, businesses, nonprofit organizations, federal and state agencies, tribal government, and other stakeholder groups that benefit from geospatial technology. The GAC sets priorities annually, and GAC committees and workgroups lead the efforts necessary to work towards those priorities. High-density lidar acquisition for Minnesota ranks among one of the highest priorities identified, and the 3D Geo Committee leads this this effort. The 3DGeo Committee is organized by workgroup sectors; each sector has members with specialization in GIS, remote sensing, and lidar technologies. The 3DGeo Committee works to identify and promote the need for planning, funding, acquisition, and management of three-dimensional geomatic data and derived products. Workgroups are comprised of multi-disciplinary and multi-sector data stewards, data developers, and users of lidar-derived products who have close working relationships with end users and decision makers. These associations with users, coupled with hands-on knowledge of lidar-derived products, makes them ideally situated for providing guidance in lidar acquisition and derived product development across Minnesota, and ensures that these data are widely accessible and meet user expectations and business needs.

3DGeo published the first draft of the Minnesota State Lidar Plan. The creation of the Plan and its implementation is guided by the partnership of the 3DGeo Committee, the National States Geographic Information Council, and Minnesota's Geospatial Information Office (MnGeo). The Plan is a tool and a living document to facilitate the acquisition of the new lidar data, the creation of derivative products and distribution of the data, educational outreach, and support for an ongoing and evolving process that will take several years. The Plan has several objectives. One objective is to document and communicate the need for and value of new and higher quality lidar data in Minnesota. Another objective is to provide proposed geographic lidar collection areas. The document also identifies cost estimates for lidar acquisition, derivative data product creation, and ongoing storage and distribution. The Plan includes a summary of how the lidar acquisition efforts and status will be communicated to the broader GIS community to ensure their involvement and understanding of the effort.

In the fall of 2019, the 3DGeo Committee's Lidar Acquisition Working Group submitted an application to the USGS 3D Elevation Program (3DEP) Broad Agency Announcement (BAA). This shared funding request was in support for the collection of high-density lidar at QL1 covering over 9,000 square miles across four of the largest counties in Northern Minnesota, titled the Rainy Lake Block of the State Lidar Plan. The total acquisition cost for this collect is an estimated $3.7 million dollars, and several partners came together to contribute over $1.2 million, including the U.S. Forest Service, the Natural Resources Conservation Service, the Minnesota Department of Natural Resources, the Minnesota Department of Transportation (MnDOT), MnGeo, and St. Louis, Lake, and Koochiching Counties. The Rainy Lake Block is the first phase of the State Lidar Plan and is set to be acquired in spring 2021. The 3DGeo Committee will continue with 3DEP lidar acquisition requests in the Lake Superior Block, and possibly also the SE Driftless Area Block, in fall 2020, depending on funding contributions from local, state, and federal partners.

Importance of elevation data to Minnesota

The State of Minnesota is known as “The Land of 10,000 Lakes” and elevation data are extremely important to managing its natural resources. As the Minnesota State Lidar Plan describes in the section on the *Value and Benefit of New Lidar to the State*, the state is located at the confluence of three major ecological regions and five major river basins, which ultimately cover nearly 40% of the nation. The total surface water area, including wetlands, is over 20,000 square miles with over 40,000 linear miles of lakeshore (Minnesota is nearly 87,000 square miles in size). In northern Minnesota, the headwaters of the Mississippi River supply clean drinking water for millions of people downstream. Minnesota is home to Lake Superior, the largest freshwater lake by surface area on Earth, and part of the Great Lakes Basin which contains 20% of the world’s freshwater supply.

The aforementioned water resources are surface waters, all of which have important underwater and bottomland features and conditions that need frequent mapping and assessment. The depth and volume estimation and elevation profiles of these water resources are important for many research studies and business uses, including: hydrogeomorphology, recreational boating, commercial shipping, and navigational safety. Periodic nearshore bathymetry is also needed along the coast of Lake Superior to address the dynamic pressures of erosion from strong storm surges and changes in lake levels. These data also support navigational safety in shipping channels and ports, and monitoring the vitality of Minnesota’s inland and off-shore waters to serve the commercial fishing and recreational economies.

It is these valued water resources that have Minnesota’s eye on the emerging science of hydrography data development from both terrestrial and bathymetric lidar. Terrestrial lidar data products use the 3D capture of land formations that collect, pool, and transport water to develop hydrography features like streams, ditches, rivers, lakes, and wetlands. Known as elevation-derived hydrography (EleHydro) these data represent a harmonization between two formerly independently mapped and managed datasets. To make

Minnesota's 3D data even more robust, Minnesota's Lidar Plan is ensuring in-water elevation capture is also part of Minnesota's future. The Coastal States Organization's Near Shore Habitat Assessment Project writes, "Many Great Lakes shoreline reaches have deteriorated in function and quality due in part to land use change, shoreline alterations, coastal infrastructure, and other influences. Effective restoration actions in these dynamic, complex systems require integrated approaches to enhance coastal biodiversity and promote ecological resilience." Bathymetric lidar and acoustic sonar have been vital datasets strategically utilized for Great Lakes shoreline restoration and lakebed mapping projects for many years.

This vision of combining land, water, and submerged feature mapping into a single product known as Topographic and Bathymetric Lidar (TopoBathy) brings a synchronization of foundational data never before available to Minnesotans. The errors and misalignments of water features on modern maps will be replaced with accurate and fully integrated hydrography data. Additionally, TopoBathy can provide nearshore aquatic vegetation mapping valuable to biologists and erosion control experts for lake and shoreline conservation efforts. Coordination through efforts like Lakebed 2030 and committees like 3DGeomatics are key to maintaining momentum in the collection and application of these data for the broadest use and highest return on investment.

Over the last two decades, topographic lidar data have been acquired to support several mapping projects across many sectors. Over time, a growing and broad range of applications of lidar derived products have been realized, including: assessment of solar insolation suitability, forest resources assessment, wildlife habitat management, precision farming, conservation and restoration prioritization, flood risk management, infrastructure and construction management, water supply and quality, coastal zone management, geologic and mineral resources assessment, and many other Business Uses.

While existing elevation data may be moderately accurate in most areas, they used technologies that have advanced over time, and only represent a snapshot in time on a landscape that has experienced intense changes. Natural resources such as soils, forests, rivers, lakes, and wetlands are dynamic features that are highly dependent on both large to small geographic and time scales, influenced by local to landscape scale land use practices, and conditional to both weather and climatic factors that need monitoring and mitigation. Best management practices to mitigate these challenges rely on highly accurate and frequently acquired elevation data (both in terms of relative age of the data and positional accuracy).

The Minnesota State Lidar Plan outlines the history of lidar in Minnesota, the partnerships and user community to support data collection, practices, and stewardship, and the importance of elevation information for many example uses. The key Business Uses detailed in the Plan include, Hydrologic Resources; Geology, Groundwater, and Mineral Resources Applications; Infrastructure and Construction Management; Forest Resources Assessment; and several other examples briefly mentioned where having high-density elevation information would result in cost savings. The 3DGeo Committee recommends in the Plan that QL1 elevation be collected during leaf-off spring conditions to strike a balance between the need for high-density point cloud information above ground to support vegetative applications and high-definition ground elevation information to support hydrologic applications.

High-level summary of elevation data requirements

The Minnesota State Lidar Plan targets lidar collection at QL1 specifications. At eight pulses per square meter minimum, this level of quality far exceeds QL2 and enables DEMs at 0.5-meter resolution and up to 1-foot contour line creation. The higher point density in a QL1 lidar point cloud also enables vast improvements in automated mapping methods for above ground features, like buildings and vegetation structure. Additionally, high-density lidar propels Minnesota into the new era of 3D capture of natural and built environments for emerging and future applications of lidar and derived products. For example, high-density lidar is valuable for vegetation habitat related applications. Without the high point density, tree

crowns and branches are not resolved with enough detail, thus introducing bias into any derived models using low-density lidar information.

Additionally, high-density lidar resolves with greater detail water conveyance features that are often missed by other mapping technologies and lesser lidar densities because such features are too small or hidden underneath vegetation (e.g., obstruction from dense cattail beds around wetlands and stands of sedge grasses in floodplains, and overhanging woody vegetation in small streams). These water conveyance features include sewers, culverts, and other human made infrastructure to move water away from an area. If these features are not identified and utilized in the treatment and correction of digital elevation hydrological modeling, baseline mapping of water flow and direction for water mitigation efforts are left incorrect and inadequate. Inland bathymetric lidar paired with GPS-enabled chart plotters can also vastly improve the mapping water features by enabling a greater understanding of the volume and quality of freshwater resources. High quality specifications of these 3D datasets can vastly improve and speed up the process of mapping these features, both because of the enhanced detail available in high-density lidar and because of the improvement in modern algorithms and computational power.

For example, MnDOT collects an average of about 700 corridor miles of aerial survey data each year. MnDOT calculated, based on a QL1 collection, found production time savings of up to 60% and digital terrain model compilation savings up to 75%. As mentioned in an earlier section of the Plan, there can be significant cost saving in conducting forest inventory using a model assisted approach, where results have shown that the use of high-density lidar data for modeling key forest inventory metrics can cut inventory costs by about 55% and add significant value to many tangential projects that are difficult to quantify. Though the resolution and data needs may vary by project and not all projects will see these significant savings, the overall savings are quite apparent and have already paid dividends.

The 3DGeo Committee and stakeholders across Minnesota feel that it is critical its lidar data meet and exceed the high-quality data standards to ensure the broadest base of end-user applications and virtually guarantee a higher return on investment. The Minnesota State Lidar Plan will follow the USGS Base Specifications V 2.1. (or most current) and will meet or exceed the minimum requirements for USGS 3DEP. Unlike early lidar acquisition projects, which focused mostly on the products derived from lidar such as the bare-earth DEM and contour lines, the Plan places emphasis on the source lidar point cloud density and supporting metadata to ensure that the point cloud is of the highest quality, consistency, and robustness across all specifications and applications as possible.

High-level summary of benefits that would come from higher resolution elevation data

Minnesota was an early adopter and national leader for statewide elevation data using lidar technology, largely before the USGS lidar base specifications were in place. However, Minnesota's current lidar data are more than 10 years old, does not contain bathymetric features, and no longer meets the state's expanded business needs that require much higher data quality. Additionally, over the last decade Minnesota's landscape has experienced significant natural and anthropogenic changes that are not reflected in these data, including floods, erosion and deposition, blowdown, fire, terrestrial invasive species, and substantial urban and rural development.

The Minnesota State Lidar Plan (https://www.mngeo.state.mn.us/committee/3dgeo/acquisition/Minnesota_State_Lidar_Plan.pdf) outlines the need for new high-density lidar collection in Minnesota and the path to acquire and support it. The Plan is designed to be a living framework as the statewide work to acquire high-density lidar evolves over the next five years and beyond. Minnesota's goal is to exceed current USGS standards, and to provide more accurate data (higher densities) for more sectors than the previous statewide lidar data allowed. In the Plan, mission-critical stakeholders and end user business needs have been identified. Information for a host of disciplines and applications are incorporated in the Plan, including: improved mapping for

transportation and infrastructure assets, wildlife habitats, micro drainage, and precision agriculture and hydrologic terrain modeling; more accurate ground level windspeed forecasting for windfarms, solar panel suitability, forest biomass (structure) analyses and inventory, and archeological resources assessment.

Through materials like the Plan and an accompanying StoryMap (https://storymaps.arcgis.com/stories/980394f96f894980a35c6758653bb5ab), as well as several outreach and educational meetings and conference calls, the 3DGeomatics Committee strives to inform the lidar user community on opportunities for data usage, and to educate decision makers on the return on investment (ROI) for high-density lidar data collection in Minnesota. In 2010, it was recognized that the ROI for lidar was 5 to 1. Today, based on the preliminary results of the 3DNation Study, the ROI has increased to more than 8 to 1. It is clear that Minnesotans recognize that enhanced and updated statewide high-density airborne lidar is essential to meet current and future business needs.

Additional Comments

The 3DGeo Committee recommends in the Minnesota State Lidar Plan that QL1 elevation data be collected during leaf-off spring conditions, ideally with contiguous major river basin collection blocks, statewide. This level of quality is desired in order to both strike a balance between the need for high-density point cloud information above ground to support vegetative applications and to ensure high-definition ground elevation information to support hydrologic applications. 3DGeo does not recommend changing the QL depending on the land cover type or region, because of the nature of Minnesota's complex landscape and intimate relationship with water. There are over 20,000 square miles of lake and wetland surface water, with over 40,000 linear miles of lakeshore (this does not include rivers). Adjacent to these water features are seasonally fluctuating water levels, perennial vegetation with varying phenologies, and a wide range of freeze-thaw timelines. To ensure all business needs of all sectors, high-density lidar, as well as inland and off-shore bathymetry, must be collected.

There are challenges with regard to funding multiple type of elevation data collection in a state with over 75% private ownership of the land. Beyond the expense of acquisition of high-density lidar, there is perhaps an even greater need to invest in the creation of lidar derived products. As such, the 3DGeomatics Committee fully endorses the USGS's EleHydro efforts. In addition, long term support is needed for data storage, dissemination, and educational resources for the user community.

The State of Minnesota has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	Minnesota Geological Survey	21655	Geological Mapping	Inland Topo	QL1	6-10 years	$150,750	$60,300	Major	Major	Major
				Inland Bathy	QL2B	6-10 years	$15,075	Unable to quantify	Moderate	Moderate	Moderate
				Nearshore Bathy	QL1B	6-10 years	$3,015	$3,015	Minor	Minor	Minor
				Offshore Bathy	Order 1a	6-10 years	$3,015	$15,075	Minor	Minor	Minor
BU 01 – Water Supply and Quality	MN MINIT services at DNR	21698	Natural Resource Management for the State of Minnesota	Inland Topo	QL1	6-10 years	$50,598	Unable to quantify	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$18,090	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL1B	6-10 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Offshore Bathy	Order 1a	6-10 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 01 – Water Supply and Quality	State of Minnesota Department of Health	32974	Environmental Public Health	Inland Topo	QL1	4-5 years	Unable to quantify	Unable to quantify	Minor	Moderate	None
				Inland Bathy	QL3B	4-5 years	Unable to quantify	Unable to quantify	I don't know	Minor	Minor
				Nearshore Bathy	QL3B	4-5 years	Unable to quantify	Unable to quantify	I don't know	Minor	Minor
BU 02 – Riverine Ecosystem Management	State of Minnesota	60605	Riverine Ecosystem Management	Inland Topo	QL1 HD	6-10 years	$129,150	$12,900	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$68,750	$4,847	Major	Major	Major
				Nearshore Bathy	QL0B	2-3 years	$5,436	$4,154	Moderate	Moderate	Moderate
				Offshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 03 – Coastal Zone Management	Minnesota Department of Natural Resources	21691	Coastal Hazard Mitigation	Inland Topo	QL0	4-5 years	$59,535	$10,407	Moderate	Moderate	Moderate
				Inland Bathy	QL1B	4-5 years	$255,748	$149,931	Minor	Moderate	Moderate
				Nearshore Bathy	QL0B	6-10 years	$12,171	$20,589	Major	I don't know	Moderate
				Offshore Bathy	I don't know	Event driven	$184,910	$36,917	I don't know	I don't know	I don't know
BU 04 – Forest Resource Management	Minnesota Department of Natural Resources	11471	Natural Resources and Forest Resources Management	Inland Topo	QL1	4-5 years	$1,750,000	$483,609	Major	Major	Major
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL2B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	I don't know
BU 04 – Forest Resource Management	University of Minnesota	22184	Environmental Analysis and Decision Making	Inland Topo	QL1 HD	Annually	Unable to quantify	Unable to quantify	Major	Major	Major
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL1B	Event driven	Unable to quantify	Unable to quantify	Major	Major	I don't know
BU 05 – Rangeland Management	State of Minnesota	60606	Rangeland Management	Inland Topo	QL1	Annually	Unable to quantify	Unable to quantify	Minor	Major	I don't know
				Inland Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

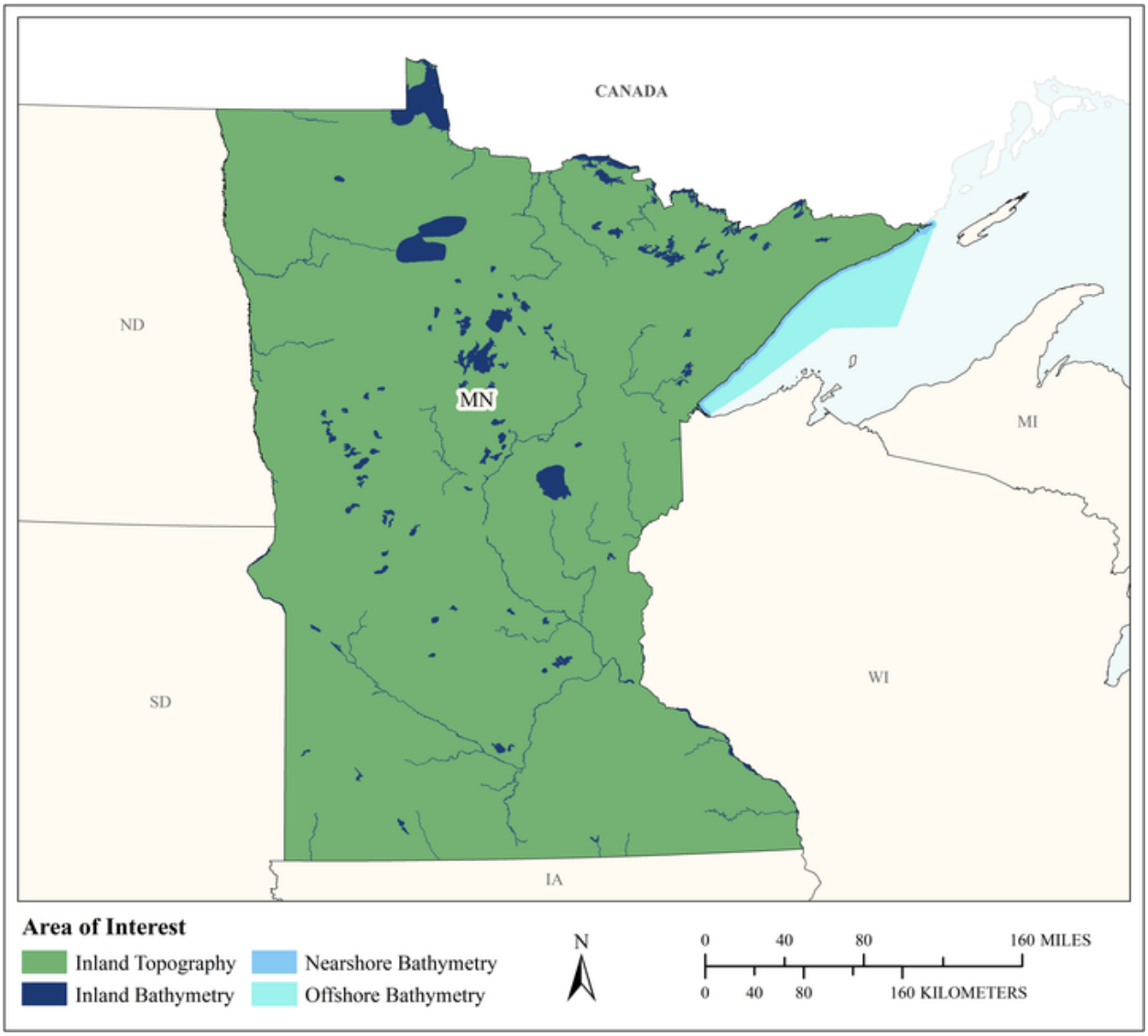
MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 06 – Natural Resource Management	University of Minnesota	1237	Water Quality and Erosion Control	Inland Topo	QL0 HD	4-5 years	$3,256	$2,170	Major	Moderate	I don't know
BU 06 – Natural Resource Management	Minnesota Board of Water and Soil Resources	21542	Restore and Protect Surface and Groundwater Resources	Inland Topo	QL1	6-10 years	$3,309,520	$12,153,567	Major	Major	I don't know
				Inland Bathy	Cross sections and/or transects meet needs	6-10 years	$448,568	$20,193	Major	Major	I don't know
				Nearshore Bathy	Cross sections and/or transects meet needs	6-10 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Offshore Bathy	Cross sections and/or transects meet needs	4-5 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
BU 07 – Wildlife and Habitat Management	State of Minnesota	60607	Wildlife and Habitat Management	Inland Topo	QL1	4-5 years	$20,099	$58,052	Moderate	Major	Moderate
				Inland Bathy	QL2B	4-5 years	$161,078	$97,362	Moderate	Moderate	Moderate
				Nearshore Bathy	QL0B	4-5 years	$53	$3	Moderate	Major	Moderate
				Offshore Bathy	Special Order	4-5 years	$2,329	$162	Moderate	Major	Major
BU 08 – Agriculture	Minnesota Department of Agriculture	32950	Agriculture and Precision Farming	Inland Topo	QL1	2-3 years	$97,690	$77,445	Major	Major	Minor
				Inland Bathy	QL4B	4-5 years	$171,155	$77,445	Moderate	Major	Major
BU 09 – Fisheries Management and Aquaculture	State of Minnesota	60608	Fisheries Management and Aquaculture	Inland Topo	QL1	2-3 years	$86,250	$187,343	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	6-10 years	$168,830	$76,841	Major	Major	Moderate
				Nearshore Bathy	QL0B	6-10 years	$8,538	$627	Moderate	Major	Minor
				Offshore Bathy	Special Order	6-10 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Minor
BU 10 – Geologic Assessment	State of Minnesota	60609	Geologic Assessment and Hazard Mitigation	Inland Topo	QL1	4-5 years	$17,811,181	$312,675	Major	Major	Major
				Inland Bathy	QL1B	6-10 years	$235,767	$259,070	Moderate	Moderate	Major
				Nearshore Bathy	QL1B	4-5 years	$4,191	$6,744	Major	Moderate	Major
				Offshore Bathy	Special Order	4-5 years	$3,528,044	Unable to quantify	Major	Moderate	Major
BU 11 – Geologic Resource Extraction	State of Minnesota	60610	Geologic Resource Mining and Extraction	Inland Topo	QL1 HD	2-3 years	$20,610	$13,672	Minor	Major	Major
				Inland Bathy	QL1B	4-5 years	Unable to quantify	$1,409	None	Minor	Minor
				Nearshore Bathy	QL1B	I don't know	Unable to quantify	Unable to quantify	I don't know	Moderate	I don't know
				Offshore Bathy	Order 1b	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 12 – Renewable Energy Resources	Minnesota Power	1086	Project Planning and Infrastructure Maintenance Including Vegetation Management	Inland Topo	QL1 HD	4-5 years	Unable to quantify	Unable to quantify	Moderate	Minor	I don't know
BU 13 – Oil and Gas Resources	State of Minnesota	60611	Oil and Gas Resources	Inland Topo	QL1	Annually	$37,034	Unable to quantify	Minor	Major	Major
BU 14 – Cultural Resource Management	State of Minnesota	60612	Cultural Resources Preservation and Management	Inland Topo	QL1	4-5 years	$15,465	$13,521	Minor	Minor	Minor
				Inland Bathy	QL0B	6-10 years	$37,087	Unable to quantify	Moderate	Minor	Minor
				Nearshore Bathy	QL0B	4-5 years	$155	Unable to quantify	Minor	Moderate	Minor
BU 15 – Flood Risk Management	Minnesota DNR	21506	Support of Water Resource Management	Inland Topo	QL2	6-10 years	$11,842,813	$2,072,121	Major	Moderate	Moderate
				Inland Bathy	QL2B	>10 years	$822,683	$923,663	Major	Major	Minor
				Nearshore Bathy	Cross sections and/or transects meet needs	>10 years	$10,290	$7,626	Major	Moderate	Major
				Offshore Bathy	Special Order	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 16 – Sea Level Rise and Subsidence	State of Minnesota	60613	Sea Level Rise and Subsidence	Inland Topo	QL1 HD	4-5 years	$4,442,244	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Minor
BU 17 – Wildfire Management	State of Minnesota	60614	Wildfire Management, Planning, and Response	Inland Topo	QL1	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Nearshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 18 – Homeland Security	State of Minnesota	60615	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management	Inland Topo	QL1	4-5 years	Unable to quantify	Unable to quantify	Major	Moderate	Major
				Inland Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	Major	Moderate	Major
				Nearshore Bathy	QL1B	6-10 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Major
BU 19 – Land Navigation	State of Minnesota	60616	Land Navigation and Safety	Inland Topo	QL0	2-3 years	$1,093,054	$88,269	Minor	Major	Major
				Inland Bathy	QL0B	2-3 years	$46,623	$482	Minor	Moderate	Moderate
				Nearshore Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	None	Moderate	Moderate
BU 20 – Marine and Riverine Navigation	State of Minnesota	60617	Marine and Riverine Navigation and Safety	Inland Topo	QL0 HD	2-3 years	Unable to quantify	Unable to quantify	None	None	Minor
				Inland Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
				Nearshore Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	Minor	Major	Major

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 21 – Aviation Navigation	State of Minnesota	60618	Aviation Navigation and Safety	Inland Topo	QL1 HD	Annually	Unable to quantify	Unable to quantify	Minor	Moderate	Moderate
				Inland Bathy	QL0B	Annually	Unable to quantify	Unable to quantify	Moderate	Major	Major
				Nearshore Bathy	I don't know	Annually	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 22 – Infrastructure Management	Houston Engineering, Inc.	21731	Civil Engineering and Water Resource Modeling	Inland Topo	QL1 HD	6-10 years	Unable to quantify	Unable to quantify	None	None	None
				Inland Bathy	Cross sections and/or transects meet needs	6-10 years	Unable to quantify	Unable to quantify	None	None	None
BU 22 – Infrastructure Management	Widseth Smith Nolting & Associates	22150	Engineering, Architecture, Survey, Environmental, and Geospatial Services Consulting	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate
				Inland Bathy	QL1B	>10 years	Unable to quantify	Unable to quantify	Minor	Major	Moderate
BU 22 – Infrastructure Management	Minnesota DOT	22173	Minnesota Multimodal Transportation Planning and Design	Inland Topo	QL0 HD	Event driven	$582,750	Unable to quantify	I don't know	I don't know	I don't know
				Inland Bathy	Varies by project	Varies by project	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	Varies by project	Varies by project	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 22 – Infrastructure Management	Combined response from representative counties	22222	County Government Services	Inland Topo	QL1	6-10 years	$6,633 to $7,537	Unable to quantify	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	Major
				Nearshore Bathy	QL1B	6-10 years	Unable to quantify	Unable to quantify	I don't know	I don't know	Major
BU 22 – Infrastructure Management	State of Minnesota	60619	Infrastructure and Construction Management	Inland Topo	QL0 HD	4-5 years	$3,791,890	$11,158,769	Minor	Moderate	Major
				Inland Bathy	QL0B	4-5 years	$1,277,548	$132,658	Minor	Moderate	Moderate
				Nearshore Bathy	QL1B	4-5 years	$1,135	$156	Minor	Moderate	Major
				Offshore Bathy	Cross sections and/or transects meet needs	2-3 years	Unable to quantify	Unable to quantify	Minor	Major	Moderate
BU 23 – Urban and Regional Planning	State of Minnesota	60620	Urban and Regional Planning	Inland Topo	QL1	4-5 years	$22,702,626	$2,621,028	Moderate	Major	Major
				Inland Bathy	QL1B	6-10 years	$924,638	$1,169,747	Moderate	Moderate	Major
				Nearshore Bathy	QL2B	4-5 years	$9,947	$10,494	Moderate	Moderate	Moderate
BU 24 – Health and Human Services	State of Minnesota	60621	Health and Human Services	Inland Topo	QL1	6-10 years	$30,106	$3	Moderate	Moderate	Major
				Inland Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 26 – Education and Basic Research	State of Minnesota	60622	Education K12 and Beyond, Basic Research	Inland Topo	QL1 HD	2-3 years	$443,412	$1,059,884	Major	Major	Major
				Inland Bathy	QL1B	4-5 years	$115,957	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL2B	4-5 years	$356	$14	Major	Major	Minor
				Offshore Bathy	Order 1a	6-10 years	$4,580	Unable to quantify	Major	Minor	Minor
BU 27 – Recreation	State of Minnesota	60623	Recreation	Inland Topo	QL1	4-5 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Moderate
				Nearshore Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Moderate
				Offshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 28 – Telecom-munications	State of Minnesota	60624	Telecommunications	Inland Topo	QL1	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Inland Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	Major
				Nearshore Bathy	QL2B	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 29 – Military	State of Minnesota	60625	Military	Inland Topo	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Inland Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 30 – Maritime and Land Boundary Management	State of Minnesota	60626	Maritime and Land Boundary Management	Inland Topo	QL1	6-10 years	Unable to quantify	Unable to quantify	Moderate	Minor	None
				Inland Bathy	QL2B	6-10 years	Unable to quantify	Unable to quantify	Major	Major	Moderate
				Nearshore Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate
				Offshore Bathy	I don't know	2-3 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate

MCA Title: Geological Mapping



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Geological mapping. Elevation data are needed for coordinating with neighboring Great Lakes states, groundwater protection, and creating county geologic atlases. Minnesota Geological Survey needs elevation data for geologic models, which are done in conjunction with DNR and other state and county agencies. Consultants use the geologic maps for wellhead protect, land use management, groundwater management, monitoring nitrate concentrations, and water level maintenance. Existing lidar data are used with soil maps and the water well database for drilling efforts. The maps show near surface and subsurface formations. The data are also used to identify locations of sand and gravel, clay, till, deposits, and other sediment types. Sand and gravel resources are needed by every county for construction. Rock distribution can be inferred from sediment types, especially southeastern and northeastern Minnesota. Lidar helps expose the bedrock structure. Elevation data are also used to identify bedrock vs. beaches on islands and predict the likelihood of lakewater/groundwater interaction.
MCA Title	Geological Mapping
MCA ID	21655
Organization Type	State or U.S. Territorial government
Organization Name	Minnesota Geological Survey
Sub-Agency or Division	
Organization Mission	Minnesota Geological Survey serves the people of Minnesota by providing systematic geological, geophysical, and geochemical information needed to support stewardship of water, land, and mineral resources.
Program Name	Geological mapping
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 11 - Geologic Resource Mining and Extraction
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Exposed rock, boulders, scarps

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B	QL1B	Order 1a
Update Frequency	6-10 years	6-10 years	6-10 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				10m horizontal resolution is OK, 1m horizontal resolution is better
Acceptable Horizontal Error	Up to 80 cm	Up to 1 meter	Up to 1 meter	Up to 1 meter
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 20 cm	Less than 1 meter
How far onshore needed			>1 kilometer inland	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MLLW	MLLW
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required	Not required	Not required	Not required	Not required
Entire AOI under same environmental conditions	Not required	Not required	Not required	Not required	Not required	Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Not required	Not required	Not required	Not required	Not required
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Not required	Not required	Not required
DTM	Not required	Not required	Not required	Not required
DEM	Required	Required	Required	Required
Raw point cloud data	Not required	Not required	Not required	Not required
Classified point cloud	Not required	Not required	Not required	
Edited/cube XYZ		Not required	Not required	Not required
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Not required	Not required	Not required

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Not required	Not required		
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)			Not required	Not required
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Not required	Not required	Not required	Not required
Ground control/ground truthing	Not required	Not required	Not required	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Required	Required
Aerial and/or satellite imagery	Highly desirable	Required	Required	Required
Underwater videography			Not required	Not required
Bottom texture			Required	Required
Bottom type			Required	Required
Submerged features			Not required	Not required
Subbottom characteristics			Required	Required
Geologic and seismic data	Highly desirable	Required	Required	Required
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Not required	Not required
Tide/wave heights			Not required	Not required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Not required	Not required
Boundaries			Not required	Not required
Routes			Not required	Not required
Offshore cadastral			Not required	Not required
Lease areas			Not required	Not required
Fixed obstructions			Not required	Not required
Floating observation/navigation systems			Not required	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Not required	Not required	Not required	Not required
Wetlands	Highly desirable	Required	Required	Required
Estuaries			Required	Required
Inland surface water features	Highly desirable	Required	Required	
Bridges/culverts	Not required	Not required		
Landmark features	Highly desirable	Required	Required	
Cultural resources	Highly desirable	Required	Required	
Coastal and riverine structures	Not required	Not required	Required	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL3, 2008-2012	Hydrographic charts, ~1980	Hydrographic charts, ~1980	Hydrographic charts, ~1980
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes	Yes	
State repositories used	MN DNR	MN DNR	MN DNR	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Minor	Minor
Cost savings/cost reduction	Major	Moderate	Minor	Minor
Cost avoidance	Major	Moderate	Minor	Minor

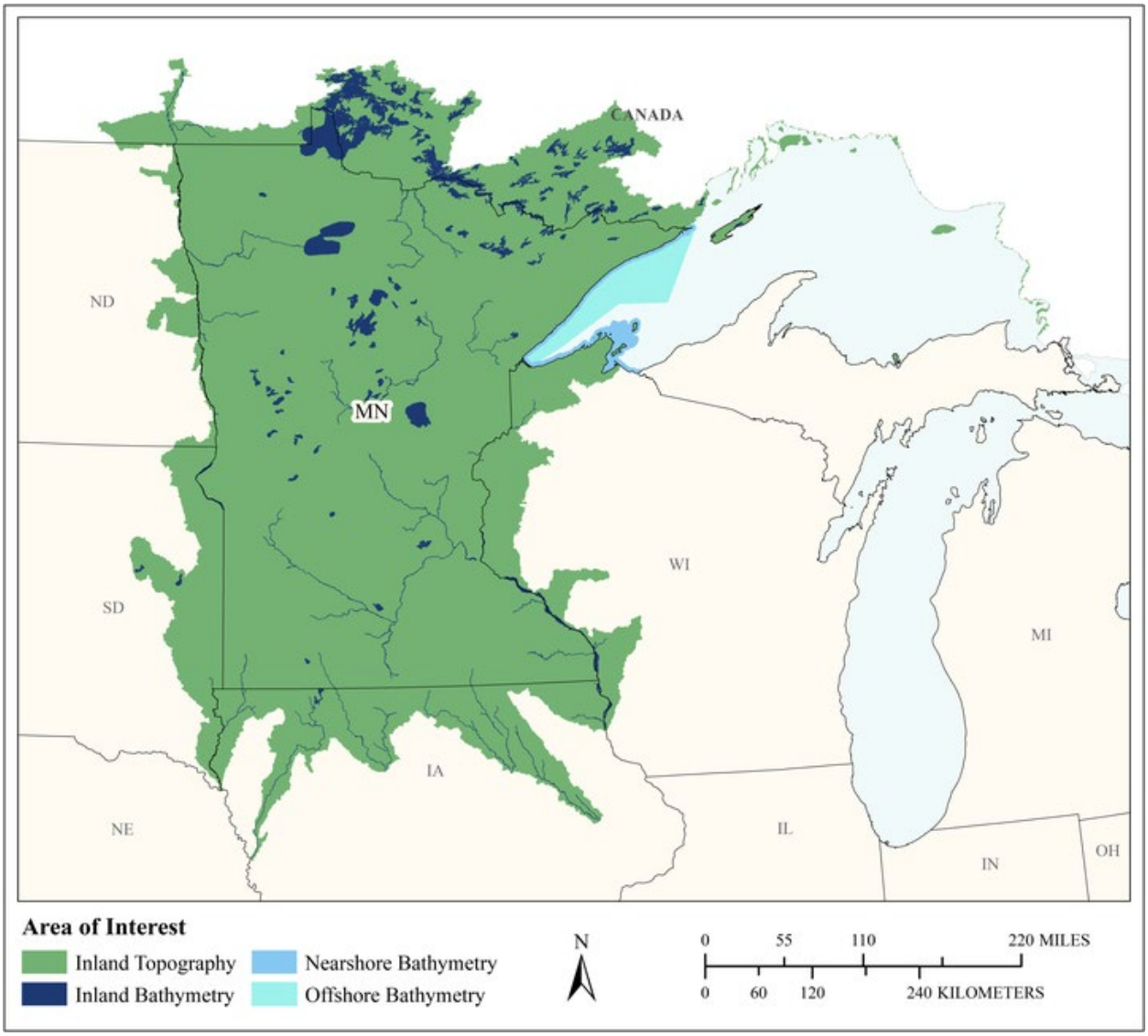
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Increased revenues	None	None	None	None
Mission-driven performance improvements	Major	Moderate	Minor	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Minor	Minor
Improved response or timeliness	Major	Moderate	Minor	Minor
Improved customer experience	Major	Moderate	Minor	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Minor	Minor
Environmental	Major	Moderate	Minor	Minor
Public safety, including life and property	Major	Moderate	Minor	Minor
Other Current Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other				Minor
Other description				

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$150,750	Moderate	Annual dollars saved/realized	$15,075	Minor	Annual dollars saved/realized	$3,015	Minor	Annual dollars saved/realized	$3,015
Time savings description	Increased efficiency in geologic map production.			More efficient geological mapping.			Increased efficiency in geological mapping.			Increased efficiency in geological mapping.		
Cost savings/cost reduction	None			None			None			None		
Cost avoidance	None			None			I don't know	Unable to provide		None		
Increased revenues	None			None			None			None		
Mission-driven performance improvements	Major	Annual percent improvement	20%	Moderate	Unable to provide		Minor	Annual percent improvement	2%	Minor	Annual percent improvement	2%
Mission-driven performance improvements description	Increased quality of geologic map production.			Improved geological mapping.			Improved geological mapping.			Improved geologic mapping.		
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	None			None			None			None		
Improved response or timeliness	None			None			None			None		
Improved customer experience	Moderate	Annual dollars saved/realized	$60,300	Moderate	Unable to provide		Minor	Annual dollars saved/realized	$3,015	Minor	Annual dollars saved/realized	$15,075
Improved customer experience description	Improved geologic maps.			Improved geologic maps.			Improved geological mapping.			Improved geologic mapping.		
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate			Minor			Minor		
Education or outreach description	Improved geologic maps			Improved geologic maps			Improved geological mapping			Improved geologic mapping		
Environmental	Major			Moderate			Minor			Minor		
Environmental description	Improved geologic maps			Improved geologic maps			Improved geological mapping			Improved geologic mapping		
Public safety, including life and property	Major			Moderate			Minor			Minor		
Public safety, including life and property description	Improved geologic maps			Improved geologic maps			Improved geological mapping			Improved geologic mapping		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps				
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Natural Resource Management for the State of Minnesota



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Nice to have
Geographic Area Requirements	One or more Hydrologic Units (HUC8s)	One or more Hydrologic Units (HUC8s)	Custom description	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements			Minnesoata and Wisconsin shorelines	

MCA Description	Response
Mission Critical Activity	Terrain analysis using digital elevation models to serve environmental management business needs related to wildlife, fisheries, vegetation, mining, and water across the state of Minnesota. Elevation data are needed for hydro terrain analysis and routing concentrated flow across the landscape into streams and rivers.
MCA Title	Natural Resource Management for the State of Minnesota
MCA ID	21698
Organization Type	State or U.S. Territorial government
Organization Name	MN MINIT services at DNR
Sub-Agency or Division	
Organization Mission	Natural Resource Management for the State of Minnesota.
Program Name	Water resource management
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 06 - Natural Resources Conservation
Tertiary Business Use	BU 07 - Wildlife and Habitat Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Individual rocks, trees, shrubs, shallow and narrow water conveyance land forms that route concentrated flow on the landscape. Rocks for example would be much greater in size than what is generally recognized as gravel, more similar to rock rip-rap (sized for erosion control) that influence the watercourse morphology.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL1B	Order 1a
Update Frequency	6-10 years	4-5 years	6-10 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 30 cm	Less than 50 cm	Up to 1 meter	Less than 50 cm
Acceptable Vertical Error	Up to 10 cm	Up to 20 cm	Up to 20 cm	Less than 1 meter
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed	Below MLLW		To MLLW	
Tide correction requirement			No requirement for tide correction	No requirement for tide correction
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Required	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Required	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Required	Required
DTM	Required	Required	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Required	Required	Required	Required
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Highly desirable	Highly desirable	Required
Full waveform	Required	Required	Highly desirable	Required
Bathymetric Attributed Grid (BAG)		Required	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Required	Nice to have	Highly desirable	Nice to have
Ground control/ground truthing	Required	Highly desirable	Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Nice to have	Nice to have
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Required
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Nice to have	Nice to have
Submerged features			Not required	Not required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Not required
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Not required	Not required
Tide/wave heights			Nice to have	Highly desirable
Sea ice conditions			Nice to have	Not required
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Not required
Lease areas			Not required	Not required
Fixed obstructions			Nice to have	Highly desirable
Floating observation/navigation systems			Nice to have	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Required	Not required	
Land use/land cover	Required	Highly desirable	Highly desirable	Highly desirable
Wetlands	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Classified LAS - QL3, 2008 - 2012 DSM - QL3, 2008 - 2012 DEM - QL3, 2008 - 2012	None	None	None
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Internal Minnesota DNR Data holdings and MN DNR online tool called MnTOPO.			
Other			Yes	
Other description			None	
Data that meet my needs are not available		Yes		

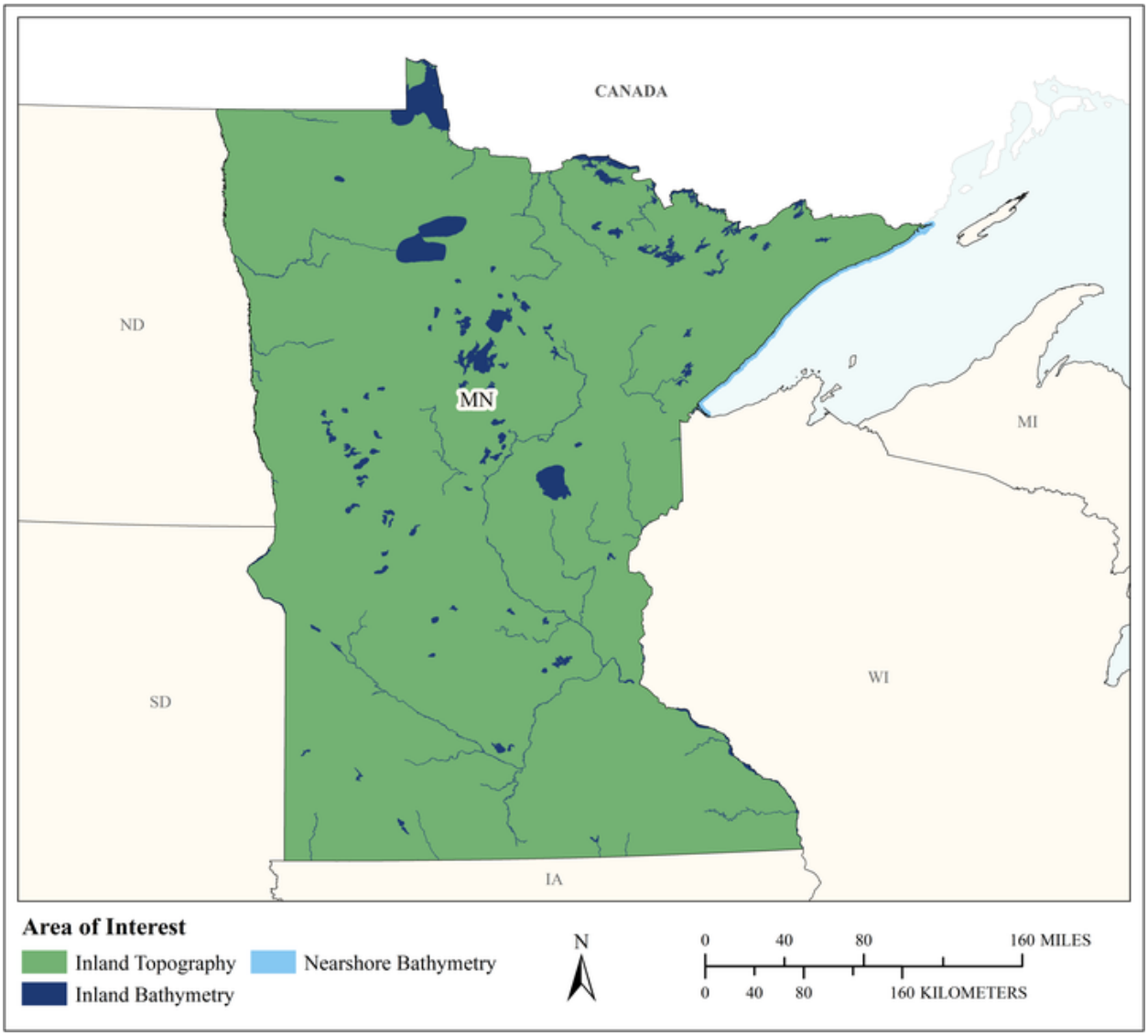
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available	None	None
Cost savings/cost reduction	Major	Inland bathy data not available	None	None
Cost avoidance	Major	Inland bathy data not available	None	None
Increased revenues	Major	Inland bathy data not available	None	None
Mission-driven performance improvements	Major	Inland bathy data not available	None	None
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available	None	None
Improved response or timeliness	Major	Inland bathy data not available	None	None
Improved customer experience	Major	Inland bathy data not available	None	None
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Inland bathy data not available	None	None
Environmental	Major	Inland bathy data not available	None	None
Public safety, including life and property	Major	Inland bathy data not available	None	None

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$39,798	Major	Annual dollars saved/realized	$18,090	Moderate	Unable to provide		I don't know	Unable to provide	
Time savings description	Difficult to calculate or put a value on this but it must be significant. All of our modeling, site reviews, reporting, and mapping is now dependent on LiDAR data and derived products. Faster customer response time.			Permitting process could be streamlined for customers. We could perform more accurate and efficient modeling and customer advice. Users I serve can't be expected to do this work every time they use the data and our time saved from having to do this work for every request is substantial.								
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction description				Our home-brew/in agency lake bathymetric mapping would be retired allowing for those staff to shift the time to other projects.								
Cost avoidance	Major	Annual dollars saved/realized	$10,800	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Cost avoidance description				Our state floodplain work and cooperative work with FEMA for flood studies would benefit.								
Increased revenues	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Annual percent improvement	67%	Major	Unable to provide		I don't know	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Value added to products or services description				The ability to have improved lake shoreline mapping with a continuous surface of topobathy at the shoreline would be tremendously valuable to our mission.								
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Improved customer experience description	Most of our customers have imagery in the palm of their hands, LiDAR-derived products is setting the new standard for customer confidence.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major			I don't know		
Education or outreach description	LiDAR has changed the way we communicate with our customers.			Inland bathymetric data with full topobathy integration will allow us to better educate our customers about Ordinary/Mean High Water Levels in relation to their projects								
Environmental	Major			Major			Major			I don't know		
Environmental description	LiDAR has changed the way we approach natural resource management.			Inland bathymetric data with full topobathy integration will revolutionize water resource management for Minnesota								
Public safety, including life and property	Major			Major			Major			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes	Yes		
Curvature maps	Yes			
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Environmental Public Health



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Environmental Public Health, particularly around drinking water protection via identifying and mitigating risks from contaminants, and waterborne disease monitoring.
MCA Title	Environmental Public Health
MCA ID	32974
Organization Type	State or U.S. Territorial government
Organization Name	State of Minnesota Department of Health
Sub-Agency or Division	
Organization Mission	To protect, maintain and improve the health of all Minnesotans.
Program Name	Environmental Health
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	A wellhouse, pumpstation, or individual well.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL3B	QL3B	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter	Up to 1 meter	
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 40 cm	
How far onshore needed			>1 kilometer inland	
How far down the beach profile needed	Not applicable		Below MLLW	
Tide correction requirement			No requirement for tide correction	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Not required	Not required		Not required	Not required
DEM for entire AOI needs to be seamless	Highly desirable	Nice to have	Nice to have		Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know		I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Nice to have	
DTM	Highly desirable	Nice to have	Nice to have	
DEM	Required	Highly desirable	Highly desirable	
Raw point cloud data	Not required	Not required	Not required	
Classified point cloud	Not required	Not required	Not required	
Edited/cube XYZ		Not required	Not required	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Not required	Not required	
Breaklines required for standard hydro-flattening	Not required	Not required		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Not required	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Not required	Nice to have	Nice to have	
Ground control/ground truthing	Not required	Not required	Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Highly desirable	Nice to have	Nice to have	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Nice to have	
Submerged features			Not required	
Subbottom characteristics			Not required	
Geologic and seismic data	Highly desirable	Nice to have	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Not required	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates	Highly desirable	Nice to have	Nice to have	
Land use/land cover	Nice to have	Nice to have	Nice to have	
Wetlands	Nice to have	Not required	Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Not required	
Inland surface water features	Highly desirable	Nice to have	Nice to have	
Bridges/culverts	Highly desirable	Nice to have		
Landmark features	Nice to have	Not required	Not required	
Cultural resources	Not required	Not required	Not required	
Coastal and riverine structures	Nice to have	Not required	Nice to have	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Minnesota statewide LiDAR derived DEM, as found in the "MnTOPO" app. We believe this is mostly QL3.	https://gisdata.mn.gov/dataset/water-lake-bathymetry	https://gisdata.mn.gov/dataset/water-lake-bathymetry	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes	Yes	
State repositories used	MnTOPO	Minnesota Geospatial Commons	MN Geospatial Commons	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	I don't know	I don't know	
Cost savings/cost reduction	Moderate	I don't know	I don't know	
Cost avoidance	Moderate	I don't know	I don't know	

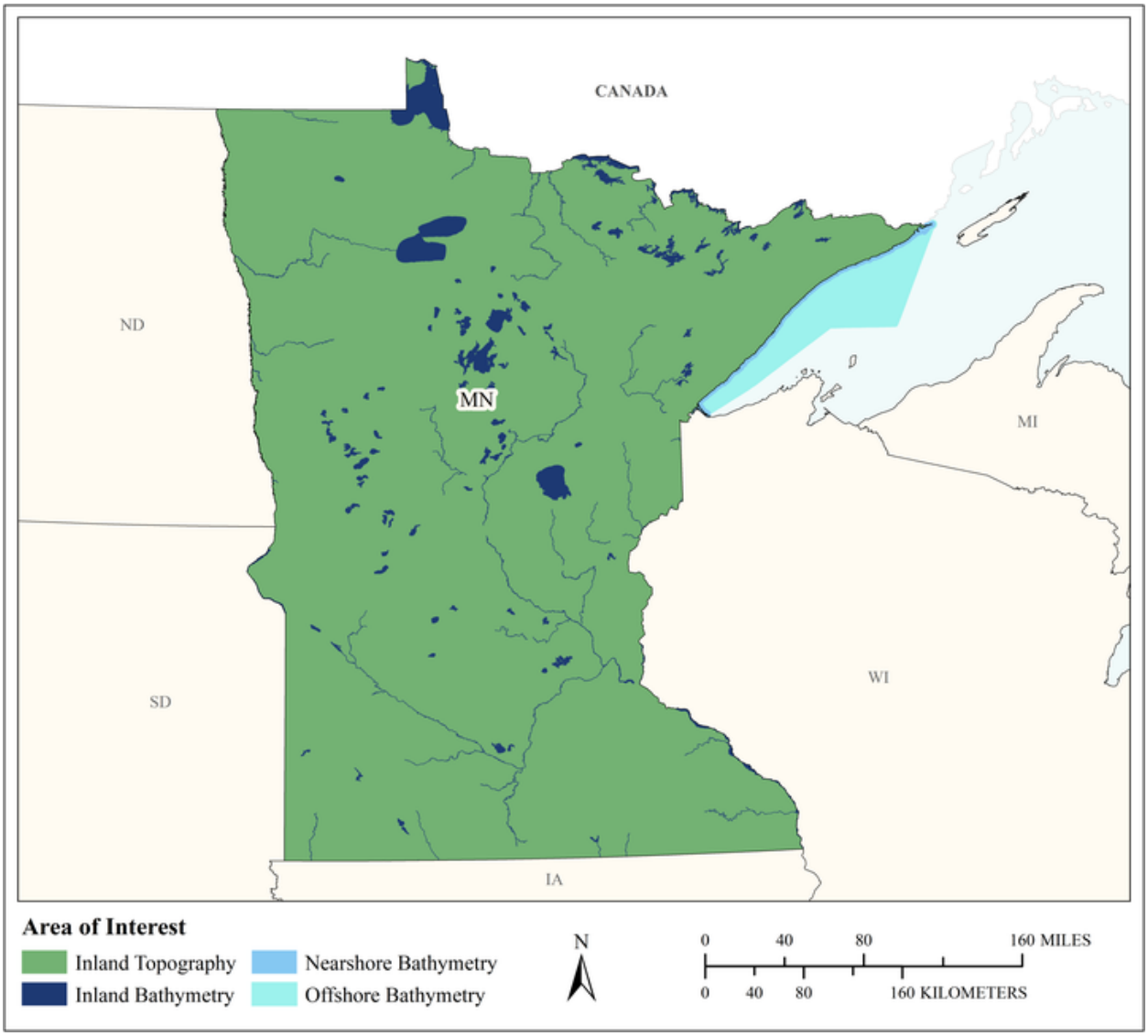
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	None	None	None	
Mission-driven performance improvements	Moderate	I don't know	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	I don't know	I don't know	
Improved response or timeliness	Minor	I don't know	I don't know	
Improved customer experience	Minor	I don't know	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	I don't know	I don't know	
Environmental	Moderate	I don't know	Minor	
Public safety, including life and property	Minor	I don't know	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Time savings description	Better information on field conditions impacting public health. Better hydrologic models.			Better understanding of potential sediment buildup impacts on public health.			Better understanding of sediment buildup impacts on public health.					
Cost savings/cost reduction	Minor	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost savings/cost reduction description	We likely would not be able to afford such data on our own.											
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Increased revenues	None			None			None					
Mission-driven performance improvements	Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements description	Better information on field conditions impacting public health.			Better understanding of potential sediment buildup impacts on public health.			Better understanding of sediment buildup impacts on public health.					
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide				
Value added to products or services description	Improved estimations of sub-surface aquifers and geologic formations.			Better understanding of potential sediment buildup impacts on public health.								
Improved response or timeliness	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Improved response or timeliness description	Better estimates of how floods might impact wells. Potentially better response to a spill threatening a surface water drinking inlet.			Better understanding of potential flood impacts on wells.			Better estimation of potential flood impacts on wells.					
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			I don't know			I don't know					
Education or outreach description	Potential education on harmful algal blooms											
Environmental	Moderate			Minor			Minor					
Environmental description	Potential increased safety of drinking water			Better understanding of potential sediment buildup impacts on public health			Better understanding of sediment buildup impacts on public health					
Public safety, including life and property	None			Minor			Minor					
Public safety, including life and property description				Better understanding of potential flood impacts on wells			Better estimation of potential flood impacts on wells					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Riverine Ecosystem Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Stream channel analysis and mapping. Stream bank erosion analysis. Aquatic and terrestrial species habitat management. Environmental management.
MCA Title	Riverine Ecosystem Management
MCA ID	60605
Organization Type	State or U.S. Territorial government
Organization Name	State of Minnesota
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B	QL0B	I don't know
Update Frequency	6-10 years	4-5 years	2-3 years	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable	I don't know	Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Required	I don't know	Highly desirable	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	I don't know	Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Required	Required	I don't know	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	I don't know
DTM	Required	Highly desirable	Required	I don't know
DEM	Required	Required	Required	I don't know
Raw point cloud data	Nice to have	Nice to have	Nice to have	I don't know
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Not required	Nice to have	I don't know
Full waveform	Nice to have	Nice to have	Highly desirable	I don't know
Bathymetric Attributed Grid (BAG)		Not required	Nice to have	I don't know
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	I don't know
Tide Predictions			Not required	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			Not required	I don't know
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Nice to have	I don't know
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	I don't know
Nautical and/or navigation charts			Not required	I don't know
Acoustic imagery of the seafloor			Highly desirable	I don't know
Aerial and/or satellite imagery	Required	Highly desirable	Required	I don't know
Underwater videography			Not required	I don't know
Bottom texture			Highly desirable	I don't know
Bottom type			Required	I don't know
Submerged features			Highly desirable	I don't know
Subbottom characteristics			Highly desirable	I don't know
Geologic and seismic data	Nice to have	Nice to have	Not required	I don't know
Water column properties - Physical			Nice to have	I don't know
Water column properties - Chemical			Nice to have	I don't know
Water column properties - Biological			Nice to have	I don't know
Currents			Nice to have	I don't know
Tide/wave heights			Not required	I don't know
Sea ice conditions			Not required	I don't know
Habitat distribution and classification			Nice to have	I don't know
Boundaries			Not required	I don't know
Routes			Not required	I don't know
Offshore cadastral			Not required	I don't know
Lease areas			Not required	I don't know
Fixed obstructions			Not required	I don't know
Floating observation/navigation systems			Not required	I don't know
Shorelines – current, historic, change rates	Nice to have	Nice to have	Highly desirable	
Land use/land cover	Highly desirable	Nice to have	Required	I don't know
Wetlands	Highly desirable	Highly desirable	Required	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	I don't know
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have	Not required	
Cultural resources	Nice to have	Nice to have	Not required	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	I don't know
Cost savings/cost reduction	Moderate	Minor	Moderate	I don't know
Cost avoidance	Moderate	None	None	I don't know
Increased revenues	None	None	None	I don't know
Mission-driven performance improvements	Major	None	Minor	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Minor	I don't know

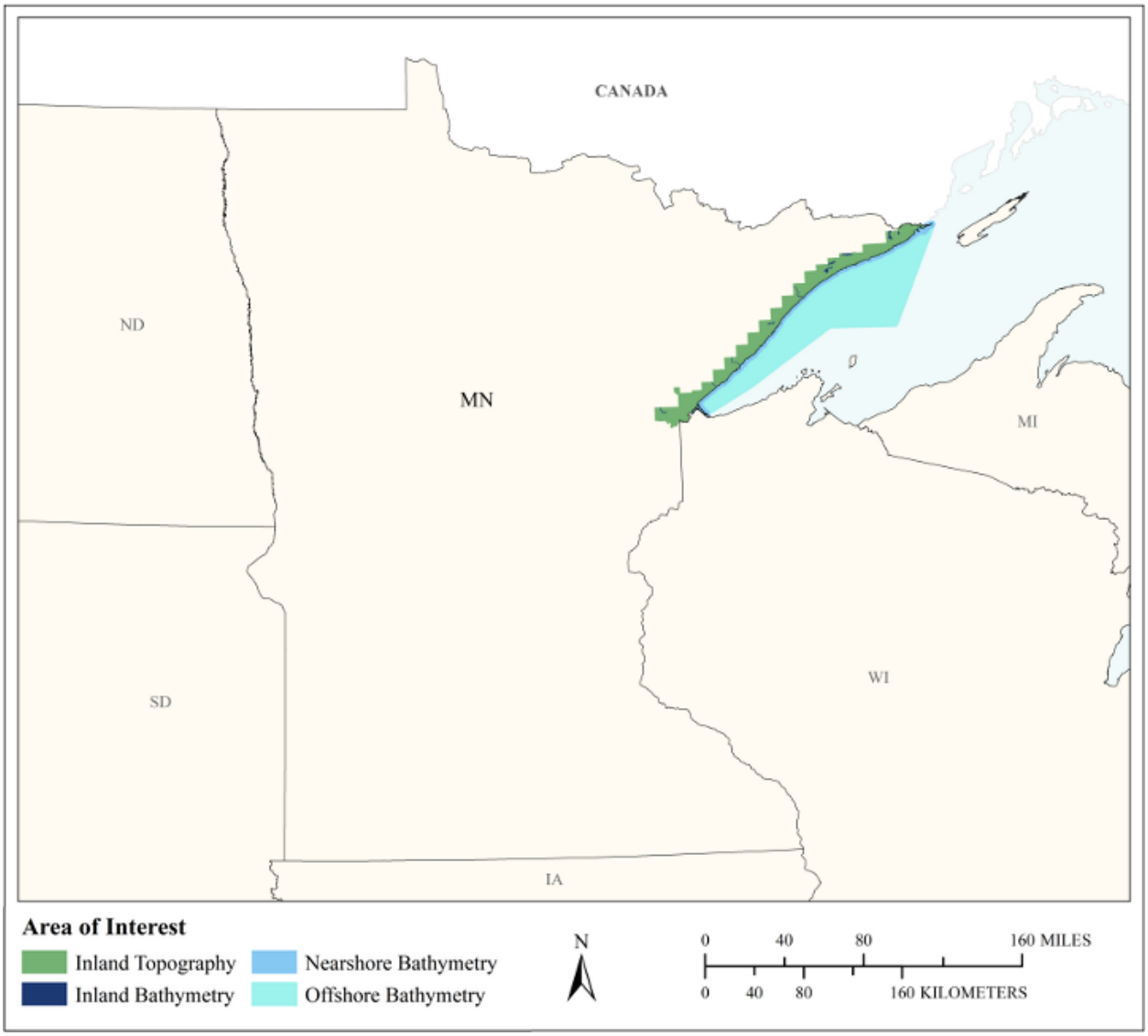
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Moderate	Minor	I don't know
Improved customer experience	Major	Minor	Minor	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Minor	I don't know
Environmental	Major	Major	Moderate	I don't know
Public safety, including life and property	Major	Moderate	Moderate	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$129,150		Annual dollars saved/ realized	$68,750		Annual dollars saved/ realized	$5,436			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$12,900		Annual dollars saved/ realized	$4,847		Annual dollars saved/ realized	$4,154			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate			I don't know		
Environmental	Major			Major			Moderate			I don't know		
Public safety, including life and property	Major			Major			Moderate			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps			Yes	
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints			Yes	
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Coastal Hazard Mitigation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Respondent provided own shapefile, KML, or geodatabase	Respondent provided own shapefile, KML, or geodatabase	Respondent provided own shapefile, KML, or geodatabase	Respondent provided own shapefile, KML, or geodatabase
Sub Area Requirements	Minnesota Lake Superior Coastal Program	Minnesota Lake Superior Coastal Program	Minnesota Lake Superior Coastal Program	Minnesota Lake Superior Coastal Program

MCA Description	Response
Mission Critical Activity	Coastal hazard mitigation. Elevation data are needed to identify shoreline/bluff recession due to erosion and prevent new building with setbacks. The current data is from the 1980s, and DNR is working to update and modernize the data. The data were previously derived from stereo imagery. Lidar and high resolution imagery are needed for 3D modeling. NOAA bathy lidar from 2010 (29.3cm RMSE, 3m horizontal accuracy) and 2009 Park Point JALBTCX QL3 data are currently used for enforcement, but these data are no longer sufficient. Bathymetry is needed for navigation use (Safe Harbors). BU 20 - Marine and Riverine Navigation and Safety is an additional Business Use for this activity.
MCA Title	Coastal Hazard Mitigation
MCA ID	21691
Organization Type	State or U.S. Territorial government
Organization Name	Minnesota Department of Natural Resources
Sub-Agency or Division	
Organization Mission	Minnesota's Lake Superior Program's goal is to preserve, protect, develop, and where possible, restore or enhance coastal resources along Minnesota's North Shore of Lake Superior.
Program Name	Minnesota's Lake Superior Coastal Program and the North Shore Management Board
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Artificial coastal structures (e.g. docks, shoreline stabilization, erosion control structures and infrastructure at risk) Natural coastal features (e.g. vegetation, geologic features)

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required

Inland Bathy Feature Size Requirements	Response
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL1B	QL0B	I don't know
Update Frequency	4-5 years	4-5 years	6-10 years	Event driven only – Data need to coincide with a specific event.
Event type(s)				New project funding.
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Up to 2 meters	Up to 1 meter	I don't know
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 20 cm	I don't know
How far onshore needed			Minnesota's Lake Superior Coastal Program Boundary	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			No requirement for tide correction	No requirement for tide correction
Cross sections and/or transects meet needs	Partial		Partial	Partial

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross section/transect requirement	Cross sections should meet FEMA's standards used in the Great Lakes Coastal Flood Study. Forgive me for not having the standards as the data are not published at the time of the survey. Updating existing FEMA cross section data created in this study will be desirable for our program and LGUs as they develop individual climate adaptation strategies related to coastal storms.		It should build off the existing work of FEMA in the Great Lakes Coastal Flood Study. Revisiting the existing transects in 10 years. (with input from Federal and State partners)	We have access to basically nothing. I have an old ESRI grid with no metadata. So anything is better than what we have access to. I'm not going to be picky.

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Nice to have	Highly desirable	Not required	Highly desirable	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Nice to have	Highly desirable	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Nice to have	Nice to have	Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Required	Required	Nice to have	Nice to have	Required	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Nice to have	Not required
DTM	Required	Highly desirable	Nice to have	Not required
DEM	Required	Required	Required	Highly desirable
Raw point cloud data	Required	Nice to have	Required	Highly desirable
Classified point cloud	Required	Highly desirable	Required	
Edited/cube XYZ		Nice to have	Highly desirable	Nice to have
Full waveform	Highly desirable	Not required	Highly desirable	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	Highly desirable
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Required	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Nice to have
Nautical and/or navigation charts			Highly desirable	Nice to have
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Underwater videography			Nice to have	Nice to have
Bottom texture			Required	Highly desirable
Bottom type			Required	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Highly desirable	Highly desirable
Water column properties - Chemical			Highly desirable	Highly desirable
Water column properties - Biological			Highly desirable	Highly desirable
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Not required	Nice to have
Routes			Highly desirable	Highly desirable
Offshore cadastral			Highly desirable	Highly desirable
Lease areas			Nice to have	Highly desirable
Fixed obstructions			Highly desirable	Nice to have
Floating observation/navigation systems			Highly desirable	Nice to have
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Highly desirable	Highly desirable	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have	Highly desirable	
Cultural resources	Highly desirable	Nice to have	Highly desirable	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	2010 GLRI Bathymetric Lidar: Lake Superior Coastline (MI, MN, WI) NOAA, EPA. Vertical Accuracy (cm): 20 - Tested to meet vertical root mean square error (RMSEz) Horizontal Accuracy (cm): 300 - Collected to meet Horizontal Accuracy at 1 sigma (1 Standard Deviation) Data classes available: Unclassified, Ground Tide controlled: Yes 2011 MN DNR Lidar: Statewide Vertical Accuracy (cm): 5 - Tested vertical root mean square error (RMSEz) Horizontal Accuracy (cm): 100 - Data tested to meet accuracy Data classes available: Created - never classified, Unclassified, Ground, Low Vegetation, Medium Vegetation, High Vegetation, Building, Low Point (noise),Model Key Point, Water, Ignored Ground (near breakline), Reserved Tide controlled: No		2010 EPA Great Lakes Restoration Initiative (GLRI) Bathymetric Lidar: Lake Superior (MI, MN, WI)	2010 EPA Great Lakes Restoration Initiative (GLRI) Bathymetric Lidar: Lake Superior (MI, MN, WI) ArcGrid of unknown origin and no metadata 1995 University of Minnesota Duluth Natural Resources Research Institute - Marine Micro Systems, named RoxAnn data.
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes		Yes	Yes
NCEI				

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	LiDAR Elevation Data for Minnesota and MnTopo			
Other			Yes	
Other description			NOAA Great Lakes Lake Level Viewer	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Major	I don't know
Cost savings/cost reduction	I don't know	Moderate	I don't know	Moderate
Cost avoidance	I don't know	Minor	I don't know	Moderate
Increased revenues	I don't know	None	I don't know	I don't know
Mission-driven performance improvements	Major	Moderate	Moderate	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Moderate	Moderate
Improved response or timeliness	Major	Minor	Moderate	Moderate
Improved customer experience	Major	Moderate	Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	I don't know	Minor
Environmental	Major	Moderate	I don't know	Moderate
Public safety, including life and property	Moderate	Moderate	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Time savings description	We don't have permitting authority. We're rarely consulted in boundary determinations. We pass Coastal Zone Management funds through to grantees. Project planning is typically performed by LGUs and consultants. Our staff prefer to use 3D data in consultation and prefer field visits/inspections. We typically use derived products stored on a central server. Hard to estimate. We're typically end users at this stage.						Where data are missing, survey crews collect data in the winter using GPS and ice augers. Current data have been used in habitat restoration efforts. This is currently done under contract with vendors. I'm not part of that process. We do not have permitting authority and rarely perform boundary determinations. Support staff feel that field visits are crucial. Existing data are used to inform the process.			We don't have permitting authority and rarely perform boundary determinations. Not applicable.		
Cost savings/cost reduction	Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction description	Our project engineers require ground survey work for beach/dune restoration and building/construction. Our program passes Federal funding through to local projects in the form of grants. Existing 3D would be a resource to those projects and would reduce the amount of funding requests, resulting in more work done on the ground.									Not applicable.		
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance description	Our goal is to avoid future development within natural hazard areas. We're end users of published data derived from 3D data. This outside of my area of expertise.						We have access to very little data to support this. Local planning and zoning / variance requests need to be improved to leverage available data. Tax dollars are a higher incentive than avoiding property loss.			Not applicable.		
Increased revenues	I don't know	Unable to provide		None			I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues description	This is outside of my area of expertise.						Low extraction activity in Minnesota's portion of Lake Superior.			Perhaps vessel tracking systems, spill response along with NOAA's Great Lakes lake Level Viewer. Not applicable, resource extraction on Minnesota's portion of Lake Superior is small. Fish and Water. Water intake and net locations may benefit. Not applicable.		
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements description	Source data do derive slope and shoreline recession rates needed in support management activities. Increased ability to avoid development in areas prone to flooding and coastal erosion. Improved data to support riparian area and coastal zone land use decisions.						Data could be used in variance requests and permitting for private well permits. Also to identify water intake lines and unmapped stormwater outfalls. (many homeowners draw drinking water from Lake Superior). We're able to meet most of our goals using existing data and tools. Higher resolution data help out program partners better identify navigation hazards at small craft facilities. Aid in coastal hazard mapping. (e.g. coastal erosion and rip current channels).			Most of our activity is focused on terrestrial uses. New data and tools may inspire planning efforts to include Lake Superior. Could be used to support future marine planning efforts. Hard to tell. There's some interest but most of our energy is focused on terrestrial issues.		
Other operational benefits	Major	Unable to provide										

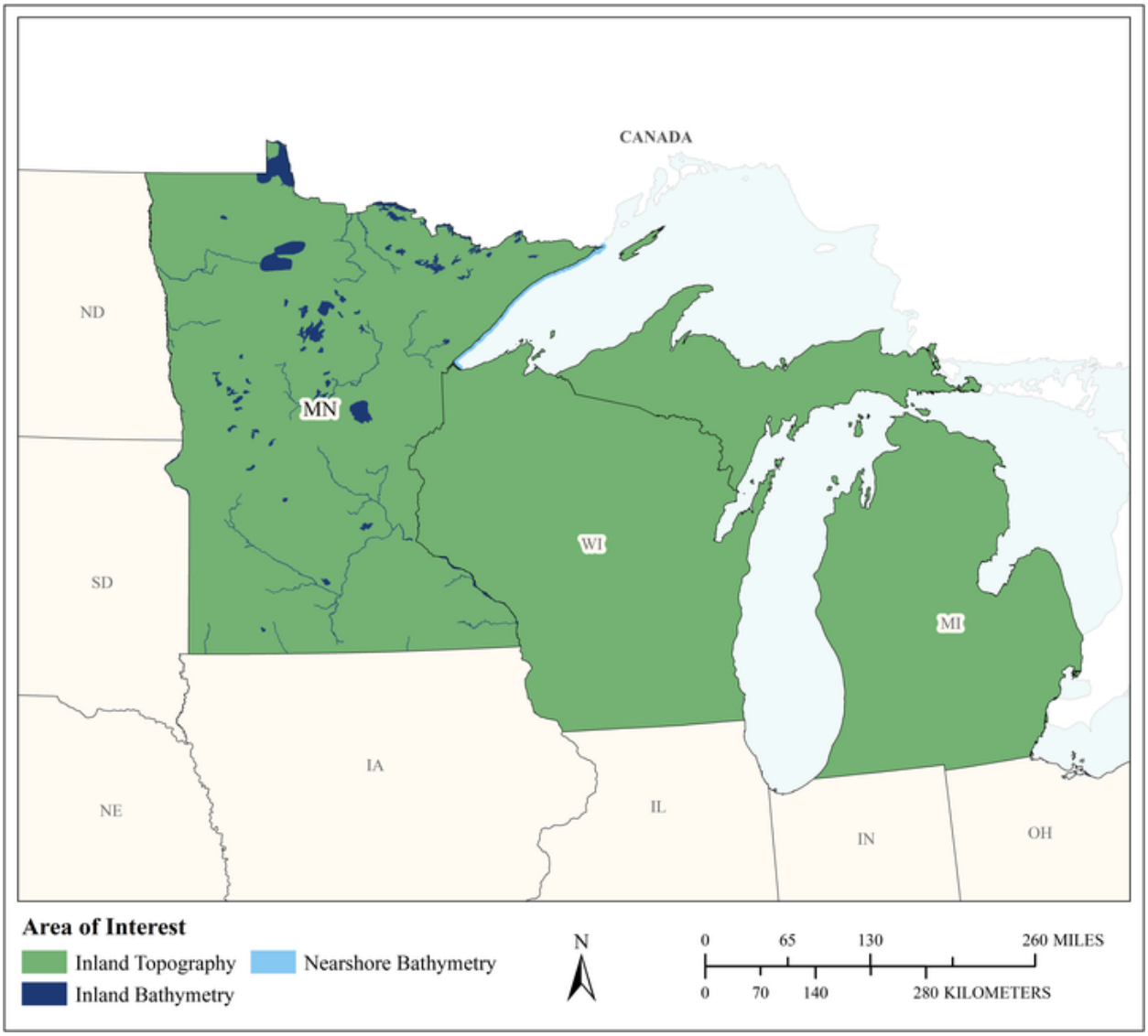
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Other operational benefits description	Minnesota does not have current data on Lake Superior erosion rates. The North Shore Management Board sets Erosion Hazard Areas at one foot per year. With no data to support this ordinance, poor land use decisions are being made. This has resulted in a high number of landowner requests for technical and financial assistance requests. Creation of slope and shoreline recession rate data.											
Future annual operational benefits added during validation		Annual dollars saved/ realized	$59,535		Annual dollars saved/ realized	$255,748		Annual dollars saved/ realized	$12,171		Annual dollars saved/ realized	$184,910
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide	
Value added to products or services description	Improved charts at Minnesota's safe harbors and marinas would provide a benefit to vessel operators. Flood hazard maps and shoreline delineation are priority data but we have not performed economic analysis of the benefits of this data. We're data poor and most of our communities are struggling to simply manage the demand for technical assistance with no supporting data. A perceived new product would be bluff and shore recession rates and updated flood plain data. This data would be a huge product for our program area but I'm not able to give values or hours saved to this.						Improved near shore navigation for small crafts.			Perhaps improve GPS navigation on Lake Superior. Better bathymetric data could improve wave models.		
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness description	Unfamiliar with the customer assistance side of things. We have statewide LiDAR data (2011) and yet to have at-risk locations mapped within our program boundary. We're rarely involved in incident response. Having reviewed local Hazard Mitigation Plans, 3D data would be extremely helpful. Structure identification and Base Flood information would very valuable as Minnesota and Wisconsin are experiencing a higher number of 500 yr flood events. What we have for flood hazard maps were created in the 1970's. We do not have flood hazard maps for Lake and Cook Counties. We do not have permitting authority. We provide some support in creating EIS through our grant program and rarely perform boundary determinations.						We typically don't receive incident request. Data are often sought in recovery efforts. We typical lean on NOAA's Great Lakes Lake Level Viewer for these activities. With an increase in 500 year events in Minnesota and Wisconsin, flood hazard maps are the highest need. We don't have permitting authority and rarely perform boundary determinations. We would typically use the terrestrial LiDAR derived products here.			Useful for smaller crafts sailing on Lake Superior. ?. Vessel tracking apps. We don't have permitting authority and rarely provide boundary determinations. Perhaps provide better wave run up models?.		
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved customer experience description	We have a pretty informed customer base. It's easy to lose confidence if they know more about the data you're using than you do. Tools and apps developed on the ESRI side have a short shelf life and are rarely backwards compatible. Services are nice but you can't access them in the field here. (yet). Work data into existing infrastructure. (e.g. MN Geospatial Commons GDRS manager) Doesn't replace FTP downloads.						We have many customers who know more about the products and services than we do. We have effective tools and apps, let's build on existing efforts. It's hard to keep track of them all. Central locations are great. We still need access to data downloads.			Central data repository (Digital Coast) include FTP options. Improve existing apps. Coordinate at the Federal Level.		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$10,407		Annual dollars saved/ realized	$149,931		Annual dollars saved/ realized	$20,589		Annual dollars saved/ realized	$36,917
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Minor			Major			I don't know		
Education or outreach description	Ability to show land owners areas of risk to flooding and coastal erosion						Being able to demonstrate the impact of record high lake levels with the NOAA Great Lake Level Viewer has made an impact in assisting Lake Superior landowners.					
Environmental	Moderate			Moderate			I don't know			I don't know		
Environmental description	Improved data for managing coastal forests, streams and shoreline. Allowing for improved coastal wetland and function mapping, hydrologic feature mapping and analysis of our coastal area in ways we have yet to approach.						I would need more research from our habitat managers					
Public safety, including life and property	Moderate			Moderate			Moderate			I don't know		
Public safety, including life and property description	Coastal hazard and flood prone area mapping. (e.g. recession rates, structures at risk and potential wetland restoration/function identification)						We can demonstrate risk with existing data but Planning and Zoning issues still need to be addressed. Property tax funds have priority.					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes		Yes	Yes
Aspect maps	Yes		Yes	
Curvature maps				
Cross sections			Yes	
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Natural Resources and Forest Resources Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	To conserve and manage the state's natural resources and to provide for sustainable commercial uses of those natural resources. Elevation data are used to estimate aboveground biomass, for land cover typing and land cover change analysis, to model standing volume and basal area, for site indexes of forest resources, to map risks of invasive species, for habitat mapping, and fire activities. Understory data are needed to estimate ground bulk density, fire fuel loading, and proximity to property. For ecosystem and wildlife management, data on wetlands, submerged aquatics, and aquatic invasive species are needed. BU 17 - Wildfire Management, Planning, and Response is an additional Business Use for this activity.
MCA Title	Natural Resources and Forest Resources Management
MCA ID	11471
Organization Type	State or U.S. Territorial government
Organization Name	Minnesota Department of Natural Resources
Sub-Agency or Division	
Organization Mission	To work with citizens to conserve and manage the state's natural resources, to provide outdoor recreation opportunities, and to provide for commercial uses of natural resources in a way that creates a sustainable quality of life.
Program Name	The Resource Assessment Program
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	BU 02 - Riverine Ecosystem Management
Tertiary Business Use	BU 07 - Wildlife and Habitat Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Individual trees, shrubs, submerged aquatic vegetation

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required

Inland Bathy Feature Size Requirements	Response
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL2B	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 30 cm	Up to 2 meters	Up to 5 meters	
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 40 cm	
How far onshore needed				
How far down the beach profile needed	To MHW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Not required		Highly desirable	Nice to have
Entire AOI under same environmental conditions	Required	Required	Highly desirable		Required	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Not required	Not required	
DTM	Required	Not required	Not required	
DEM	Required	Required	Required	
Raw point cloud data	Required	Highly desirable	Required	
Classified point cloud	Required	Highly desirable	Required	
Edited/cube XYZ		Not required	Not required	
Full waveform	Nice to have	Nice to have	Not required	
Bathymetric Attributed Grid (BAG)		Nice to have	Not required	
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Not required	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Required	Highly desirable	Not required	
Ground control/ground truthing	Required	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Not required	
Subbottom characteristics			Not required	
Geologic and seismic data	Nice to have	Not required	Not required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Not required	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Required	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates	Nice to have	Required	Required	
Land use/land cover	Required	Required	Required	
Wetlands	Highly desirable	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Highly desirable	Required	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Nice to have	Not required	
Cultural resources	Highly desirable	Nice to have	Not required	
Coastal and riverine structures	Nice to have	Required	Not required	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL1 lidar point cloud, digital elevation model (both unconditioned and conditioned), and digital surface model (both normalized, i.e. canopy height model, and not normalized); dates of data acquisition vary, but most are acquired leaf-off and some leaf-on. Other sources of 3D data include stereo photography, acquired in spring and fall (QL varies, but mostly QL1). QL2 - QL3 patchwork, with some QL1. Raw data not available everywhere.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	MNTopo (http://arcgis.dnr.state.mn.us/maps/mntopo/)			
Other	Yes			
Other description	HDs and data stored on local servers			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Major	I don't know	
Cost savings/cost reduction	Moderate	Major	I don't know	
Cost avoidance	Moderate	Major	I don't know	
Increased revenues	Minor	Moderate	I don't know	
Mission-driven performance improvements	Major	Major	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	I don't know	
Improved response or timeliness	Moderate	Major	I don't know	
Improved customer experience	Moderate	Major	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Major	Major	
Environmental	Major	Major	Major	
Public safety, including life and property	Minor	Major	I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Time savings description	High resolution elevation data becomes the authoritative dataset to tie multiple other datasets to the earth more effectively/accurately. Thorough site pre-planning at a desktop, without the need to figure it all out while in the field, can be realized. Clear specifications and accuracies builds confidence, making processes more efficient. Fewer field visits would be required in many disciplines, and field visits that are required would be accomplished more efficiently/quickly. Could perform more accurate and efficient modeling and mapping can be done with higher resolution and with greater precision.											
Cost savings/cost reduction	Major	Annual dollars saved/realized	$87,500	Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction description	It is possible that higher resolution/precision data can save on material costs. When more people/programs help pay for the data, because they now rely and swear by it, and the costs of acquisition are going down simultaneously, it becomes more feasible for all to budget for the recurring data. $1.75 million annual savings at 20-year refresh cycle, less per year at 5-year refresh for forest inventory, but better analysis.											
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost avoidance description	When the vendor delivers a fully classified product, we can quickly start analyses. When the vendor performs quality control, we can more quickly post and disseminate the data. With 3D data acquired more regularly and with higher density/resolution, high precision assessments can avoid the subjective human error. With 3D data acquired more regularly and with higher density/resolution, we can assess damage in both the 2D (historical presence/absence of change) and 3D (potential volume/biomass lost).											
Increased revenues	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues description	Higher precision/density datasets are very valuable. Heights of trees are one of the most time consuming and inaccurate datasets you can collect in the field; high precision digital 3D datasets will undoubtedly improve those estimates and help us prioritize harvest. 3D data is used by internal and external clients for a number of services, however they don't always have the technological resources or know-how to work with the data. Having the best and most frequently collected information possible will enable us to support those clients in ways they have come to expect regardless of the age/availability of the data.											

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Mission-driven performance improvements description	Mapping, monitoring, modeling; all of these concepts are further enabled, elevated, and enhanced by high precision/density 3D data. When our leadership have the best available data, paired with estimates of accuracy, they are able to make high profile decisions with confidence.											
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,662,500									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Value added to products or services description	Higher precision improves accuracy, which in turn will undoubtedly improve the confidence in the decisions that are made in addressing in minor-to-challenging low-to-high profile cases. With new and frequent 3D data comes new ways of assessing our resources and the enhanced information paired with advancements in technology means our challenges can be brought into light in new and interesting ways and our strategies for dealing with them can be more tactical.											
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				

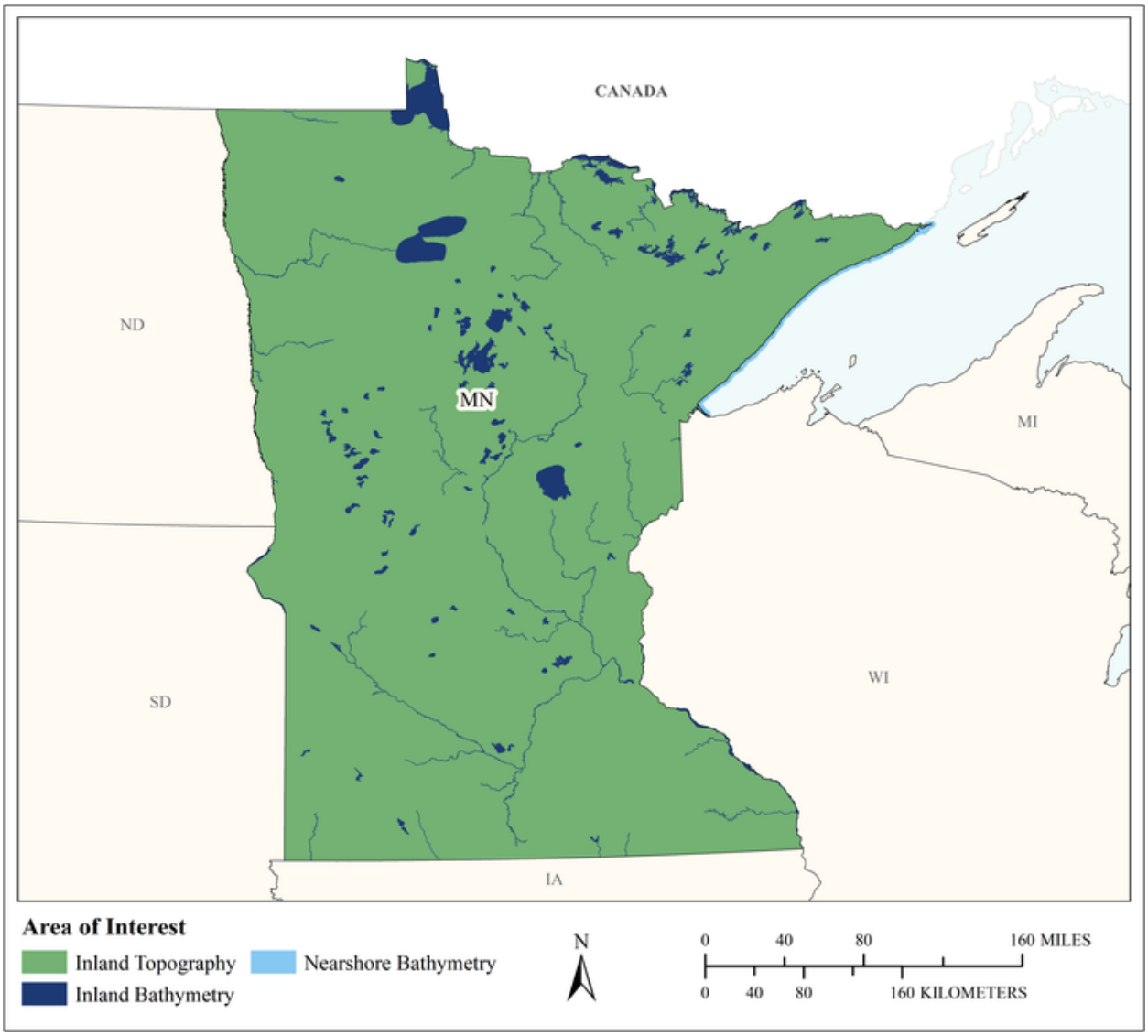
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Improved response or timeliness description	High resolution information is expected and necessary, often times required, and new and frequently updated 3D information is key. Mapping, monitoring, modeling; all of these concepts are further enabled, elevated, and enhanced by high precision/density 3D data. Having this information in hand and updated frequently will undoubtedly improve our understanding and mitigate for impending hazards. 3D information can be leveraged to understand the changes that have occurred due to natural and anthropogenic activities, having high quality data that is updated regularly is extremely important, considering we don't always know when, whether, or where these changes occur. We know that internal and external clients love seeing their resources mapped with high precision in 3D, not only as a visual and aesthetic quality, but also in terms of getting the most information out of remotely sensed data as possible, and matching as closely as possible to what the human eye/brain can resolve. With new and frequent 3D data comes new ways of assessing our resources and the enhanced information paired with advancements in technology means our challenges can be brought into light in new and interesting ways and our strategies for dealing with them can be more tactical. 3D information can be leveraged to be prepared to analyze the changes that may occur due to natural and/or anthropogenic activities, having high quality data that is updated regularly is extremely important, considering we don't always know when, whether, or where these changes occur.											
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience description	With new and frequent 3D data comes new ways of assessing our resources and the enhanced information paired with advancements in technology means our challenges can be brought into light in new and interesting ways and our strategies for dealing with them can be more tactical. Mapping, monitoring, modeling; all of these concepts are further enabled, elevated, and enhanced by high precision/density 3D data. Data consistency is very important to us, in terms of acquisition and quality, and also management. Having better and more frequently collected 3D information and being able to point our users to one place to find everything they need is extremely important. With new and frequent 3D data comes new ways of assessing our resources and the enhanced information paired with advancements in technology means our challenges can be brought into light in new and interesting ways and our strategies for dealing with them can be more tactical, improving our client's confidence in what we know and what we're capable of doing about it.											

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$483,609									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major					
Environmental	Major			Major			Major					
Public safety, including life and property	Major			Major			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes		Yes	
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Environmental Analysis and Decision Making



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Highly desirable	Highly desirable	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Environmental Analysis and Decision Making. The University is research oriented; its needs are project based and may vary. Projects could be anywhere. Needs for smaller islands would be project dependent. The data are needed for land cover mapping, tree canopy analysis, H&H analysis, and water clarity evaluations.
MCA Title	Environmental Analysis and Decision Making
MCA ID	22184
Organization Type	Academic or Not-for-Profit
Organization Name	University of Minnesota
Sub-Agency or Division	
Organization Mission	The University of Minnesota (University), founded in the belief that all people are enriched by understanding, is dedicated to the advancement of learning and the search for truth; to the sharing of this knowledge through education for a diverse community; and to the application of this knowledge to benefit the people of the state, the nation, and the world.
Program Name	Environmental Analysis and Decision Making
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	BU 02 - Riverine Ecosystem Management
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required
Other	Required
Other description	Vegetation Structure

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Sub-meter features

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL1B	QL1B	
Update Frequency	Annually	4-5 years	Event driven only – Data need to coincide with a specific event.	
Event type(s)			Floods, drought, drainage, other events that change the landscape	
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	
Acceptable Vertical Error	Up to 10 cm	Up to 20 cm	Less than 10 cm	
How far onshore needed			10 kilometers inland	
How far down the beach profile needed	To MHW		None	
Tide correction requirement			No requirement for tide correction	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Nice to have		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Required	Required		Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Required		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know		I don't know	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Not required	Not required	
DTM	Highly desirable	Not required	Not required	
DEM	Highly desirable	Required	Required	
Raw point cloud data	Required	Highly desirable	Required	
Classified point cloud	Required	Highly desirable	Required	
Edited/cube XYZ		Not required	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Required	Highly desirable	Nice to have	
Ground control/ground truthing	Highly desirable	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Nice to have	
Subbottom characteristics			Not required	
Geologic and seismic data	Not required	Not required	Not required	
Water column properties - Physical			Highly desirable	
Water column properties - Chemical			Highly desirable	
Water column properties - Biological			Highly desirable	
Currents			Not required	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Required	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have	Required	Required	
Land use/land cover	Required	Required	Required	
Wetlands	Required	Required	Required	
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Highly desirable	Required		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Nice to have	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Best available where project is located	5 meter resolution for inland Minnesota lakes	Best available where project is located	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	MNGEO, others	MNGEO, others		
Other	Yes	Yes	Yes	
Other description	International	International	International	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	I don't know	

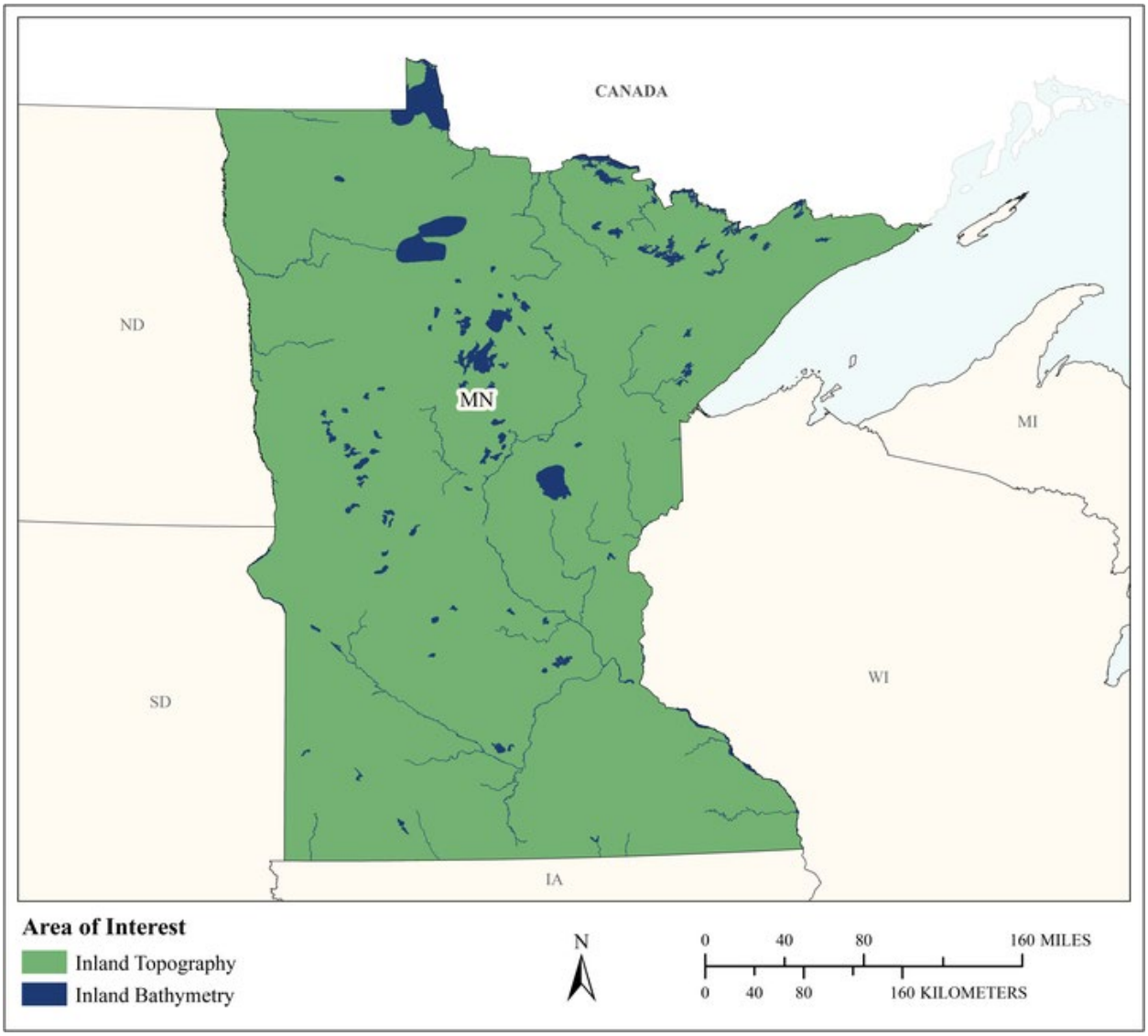
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Cost savings/cost reduction	Major	Major	I don't know	
Cost avoidance	Major	Major	I don't know	
Increased revenues	Major	Moderate	I don't know	
Mission-driven performance improvements	Major	Major	I don't know	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	I don't know	
Improved response or timeliness	I don't know	Major	I don't know	
Improved customer experience	I don't know	Major	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major	I don't know	
Environmental	Major	Major	I don't know	
Public safety, including life and property	Major	Major	I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	I don't know	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major					
Environmental	Major			Major			Major					
Public safety, including life and property	Major			Major			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Rangeland Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Assessment of rangeland health. Mapping for soil erosion potential due to grazing.
MCA Title	Rangeland Management
MCA ID	60606
Organization Type	State or U.S. Territorial government
Organization Name	State of Minnesota
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 05 - Rangeland Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	I don't know
Rivers and Streams	
Less than 10 ft	I don't know
10 - 50 ft	I don't know
51 - 100 ft	I don't know
101 - 500 ft	I don't know
501 - 2,500 ft	I don't know
Greater than 2,500 ft	I don't know
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	I don't know
½ - 1 acre	I don't know
1.1 – 2 acres	I don't know
2.1 – 5 acres	I don't know
5.1 – 10 acres	I don't know
Greater than 10 acres	I don't know

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	I don't know		
Update Frequency	Annually	I don't know		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	I don't know		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					I don't know	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	I don't know			I don't know	
Entire AOI under same environmental conditions	Required	I don't know			I don't know	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	I don't know			I don't know	
DEM for entire AOI needs to be seamless	Highly desirable	I don't know			I don't know	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	I don't know		
DTM	Highly desirable	I don't know		
DEM	Highly desirable	I don't know		
Raw point cloud data	Nice to have	I don't know		
Classified point cloud	Nice to have	I don't know		
Edited/cube XYZ		I don't know		
Full waveform	Not required	I don't know		
Bathymetric Attributed Grid (BAG)		I don't know		
Breaklines required for standard hydro-flattening	Not required	I don't know		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	I don't know		
Ground control/ground truthing	Required	I don't know		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	I don't know		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	I don't know		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	I don't know		
Land use/land cover	Required	I don't know		
Wetlands	Required	I don't know		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	I don't know		
Bridges/culverts	Not required	I don't know		
Landmark features	Highly desirable	I don't know		
Cultural resources	Highly desirable	I don't know		
Coastal and riverine structures	Not required	I don't know		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None	I don't know		
Cost savings/cost reduction	None	I don't know		
Cost avoidance	None	I don't know		
Increased revenues	None	I don't know		
Mission-driven performance improvements	None	I don't know		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None	I don't know		

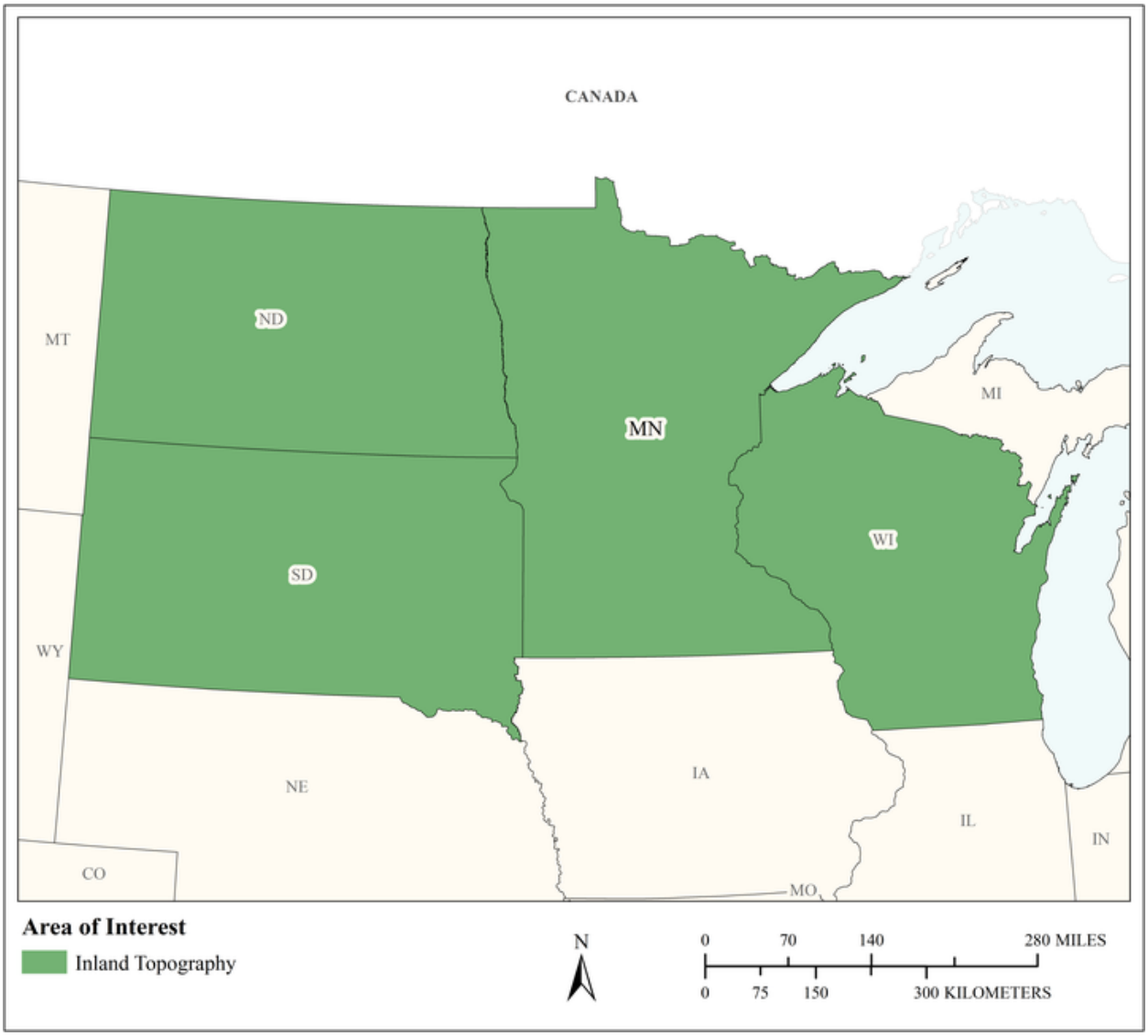
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	None	I don't know		
Improved customer experience	None	I don't know		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Major		
Environmental	Major	Major		
Public safety, including life and property	Minor	Major		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction	None			I don't know	Unable to provide							
Cost avoidance	Minor	Unable to provide		I don't know	Unable to provide							
Increased revenues	Moderate	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	Major	Unable to provide		I don't know	Unable to provide							
Improved customer experience	Minor	Unable to provide		I don't know	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			I don't know								
Environmental	Major			I don't know								
Public safety, including life and property	I don't know			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps	Yes	Yes		
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Water Quality and Erosion Control



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Water quality and erosion control. Elevation data are needed as input into Agricultural Conservation Planning Framework (ACPF) tools, for terrain analysis, to develop 3-power index, and to identify critical source areas for surface water, highly erosive features, etc,
MCA Title	Water Quality and Erosion Control
MCA ID	1237
Organization Type	Academic or Not-for-Profit
Organization Name	University of Minnesota
Sub-Agency or Division	
Organization Mission	Subd. 1. Mission. The University of Minnesota (University), founded in the belief that all people are enriched by understanding, is dedicated to the advancement of learning and the search for truth; to the sharing of this knowledge through education for a diverse community; and to the application of this knowledge to benefit the people of the state, the nation, and the world. The University's mission, carried out on multiple campuses and throughout the state, is threefold: • Research and Discovery - To generate and preserve knowledge, understanding, and creativity by conducting high-quality research, scholarship, and artistic activity that benefit students, scholars, and communities across the state, and the world. • Teaching and Learning - To share that knowledge, and creativity by providing a broad range of educational programs in a strong and diverse community of learners and teachers, and prepare graduate, professional, and undergraduate students, as well as nondegree seeking students interested in continuing education and lifelong learning, for active roles in a multiracial and multicultural world. • Outreach and Public Service - To extend, apply, and exchange knowledge between the University and society by applying scholarly expertise to community problems, by helping organizations and individuals respond to their changing environments, and by making the knowledge and resources created and preserved at the University accessible to the citizens of the state, and the world. Subd. 2. Guiding Principles. In all of its activities, the University strives to sustain an open exchange of ideas in an environment that: • embodies the values of academic freedom, responsibility, integrity, and cooperation; • provides an atmosphere of mutual respect, free from racism, sexism, and other forms of prejudice and intolerance; • assists individuals, institutions, and communities in responding to a continuously changing world; • is conscious of and responsive to the needs of the many communities it is committed to serving; • creates and supports partnerships within the University, with other educational systems and institutions, and with communities to achieve common goals; and • inspires, sets high expectations for, and empowers the individuals within its community.
Program Name	University of Minnesota
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	BU 01 - Water Supply and Quality
Tertiary Business Use	BU 26 - Education K12 and Beyond, Basic Research

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have

What Needs to be Measured in 3D	Response
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required
Other	Highly desirable
Other description	Contours

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Small water side-inlets along ditch systems, water control features, abatement structures, etc.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			
Other	Required			
Other description	Hydro Conditioned DEM			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Land use/land cover	Nice to have			
Wetlands	Nice to have			
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Best available			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	MN TOPO State Site - WI County Sites			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	None			

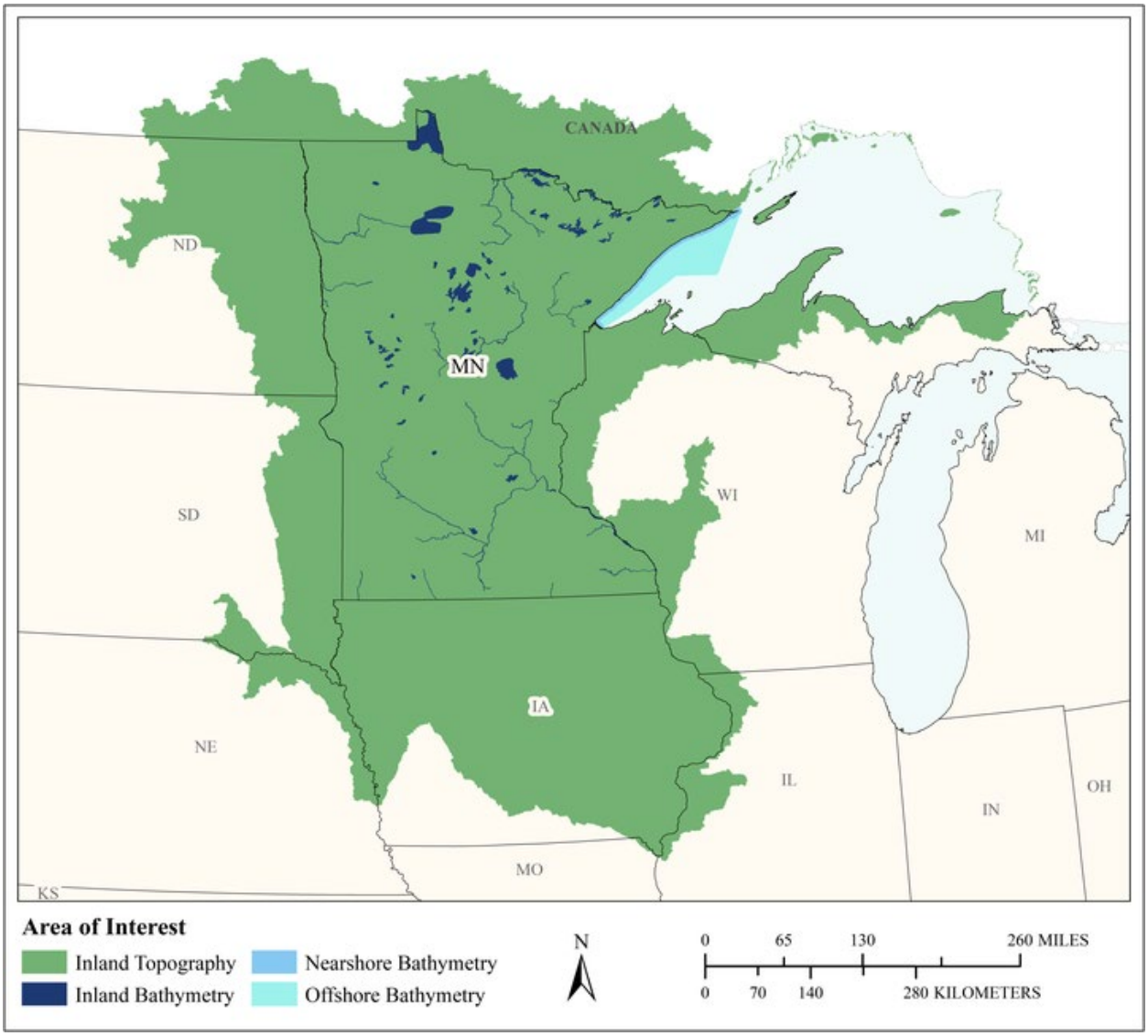
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			
Improved response or timeliness	Major			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$3,256									
Cost savings/cost reduction	I don't know	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Moderate	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide										
Improved response or timeliness	I don't know	Unable to provide										
Improved customer experience	Moderate	Annual dollars saved/realized	$2,171									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Moderate											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Restore and Protect Surface and Groundwater Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Highly desirable	Highly desirable	Required
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Restore and protect surface and groundwater resources through pollution prevention and mitigation efforts. Utilize technology to help prioritize ag and urban conservation practices that are targeted in the best places on the landscape for water quality purposes. Practices must be have a measurable outcome that meets water quality goals. Hydro-conditioned DEMs are needed as input to tools for watershed planning using the Agricultural Conservation Planning Framework (ACPF) tools and the Prioritize, Target, Measure (PTM) app. Statewide DEMs are needed for work on the daily erosion project. Terrain analysis is done in conjunction with local conservation offices. BU 27 – Recreation is an additional Business Use for this activity.
MCA Title	Restore and Protect Surface and Groundwater Resources
MCA ID	21542
Organization Type	State or U.S. Territorial government
Organization Name	Minnesota Board of Water and Soil Resources
Sub-Agency or Division	
Organization Mission	BWSR Mission: Improve and protect Minnesota's water and soil resources by working in partnership with local organizations and private landowners. BWSR is the state soil and water conservation agency, and it administers programs that prevent sediment and nutrients from entering our lakes, rivers, and streams; enhance fish and wildlife habitat; and protect wetlands. The 20-member board consists of representatives of local and state government agencies and citizens.
Program Name	See the PTMApp software program: https://ptmapp.bwsr.state.mn.us/User/Documentation Also, see the Tillage and Erosion Survey project: http://www.bwsr.state.mn.us/soils/current_projects/tillage_and_erosion_survey_project_factsheet.pdf
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	BU 01 - Water Supply and Quality
Tertiary Business Use	BU 08 - Agriculture and Precision Farming

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)

General Geographic Area and Size	
Description of smallest 3D features	Need to identify areas for agricultural best management practices. Hence, gullies where repair is needed or storage basins where wetland restoration can occur.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	Cross sections and/or transects meet needs	Cross sections and/or transects meet needs	Cross sections and/or transects meet needs
Update Frequency	6-10 years	6-10 years	6-10 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	I don't know	I don't know	I don't know
Acceptable Vertical Error	Up to 10 cm	I don't know	I don't know	I don't know
How far onshore needed			I don't know	
How far down the beach profile needed	Not applicable		I don't know	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs	Partial	Yes	Yes	Yes
Cross section/transect requirement	I don't know	I don't know	I don't know	

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable	Highly desirable	Required	Required	Highly desirable
Entire AOI under same environmental conditions	Required	Required	Required	Required	Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Highly desirable	Highly desirable	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Required	Required	Required	Required
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				Highly desirable
Tide Predictions				Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)				Highly desirable
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Highly desirable
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Required
Nautical and/or navigation charts			Nice to have	Required
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Highly desirable	Required	Required	Highly desirable
Underwater videography			Nice to have	Highly desirable
Bottom texture			Nice to have	Highly desirable
Bottom type			Nice to have	Highly desirable
Submerged features			Nice to have	Highly desirable
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Highly desirable
Sea ice conditions			Nice to have	Highly desirable
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Highly desirable
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates	Required	Required	Nice to have	
Land use/land cover		Required	Highly desirable	Nice to have
Wetlands	Required	Required	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Nice to have	Highly desirable
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Required	Required	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Highly desirable	Required	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	State lidar data hydro conditioned and DEMs, 2008-2010, QL3 and QL2	None	USACE Hydro survey for navigation channels	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts			Yes	
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	MN			
Other			Yes	
Other description			USACE hydro survey web site navigation.usace.army.mil	
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	I don't know	I don't know	Major
Cost savings/cost reduction	Moderate	I don't know	I don't know	Major

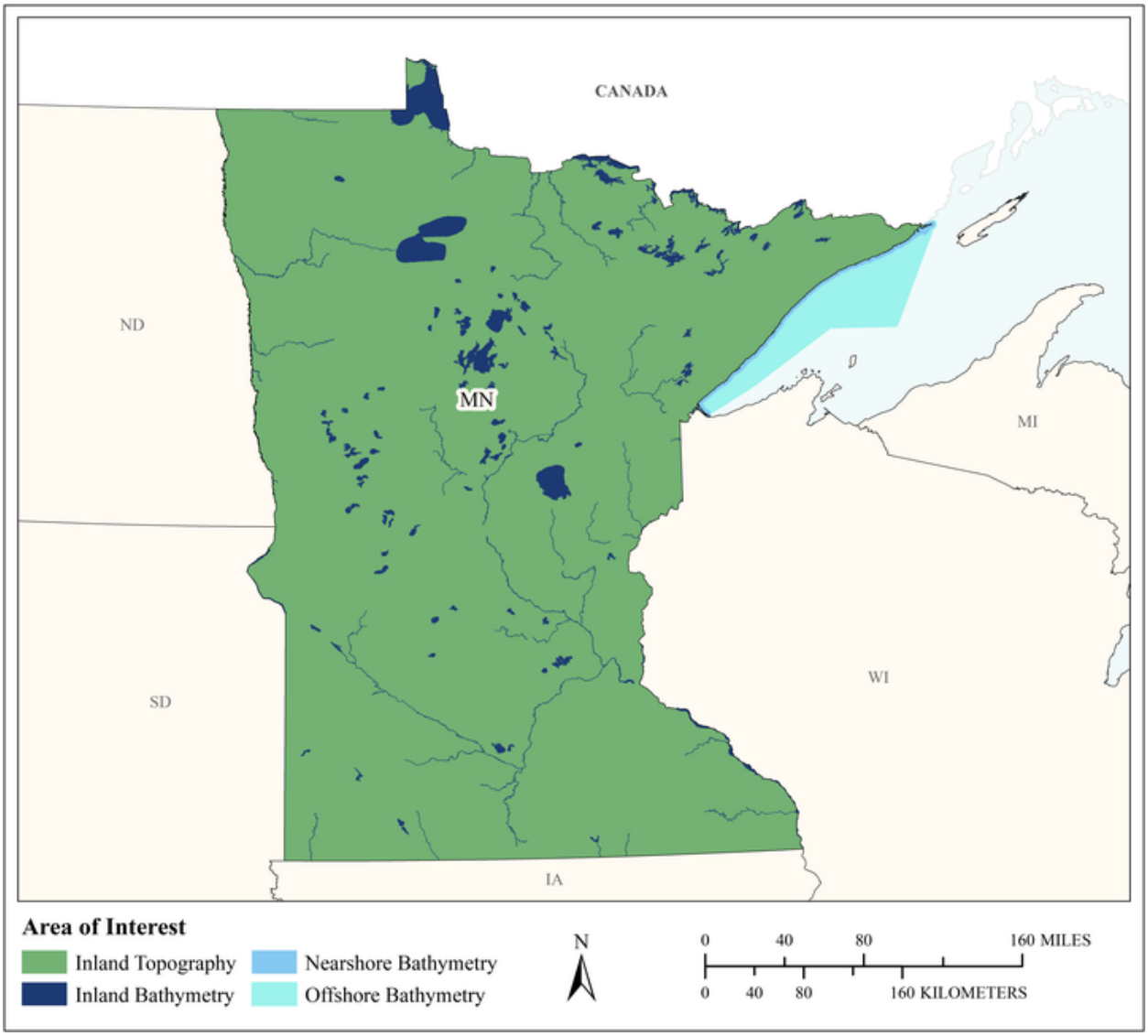
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost avoidance	Moderate	I don't know	I don't know	I don't know
Increased revenues	I don't know	I don't know	I don't know	I don't know
Mission-driven performance improvements	I don't know	I don't know	I don't know	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	I don't know	I don't know	Major
Improved response or timeliness	Moderate	I don't know	I don't know	Major
Improved customer experience	Moderate	I don't know	I don't know	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	I don't know	I don't know	Major
Environmental	Major	I don't know	I don't know	Major
Public safety, including life and property	Moderate	I don't know	I don't know	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		Minor	Unable to provide	
Cost avoidance	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$3,309,520		Annual dollars saved/ realized	$448,568						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide	
Improved response or timeliness	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$12,153,567		Annual dollars saved/ realized	$20,193						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			I don't know			Moderate		
Environmental	Major			Major			I don't know			Major		
Public safety, including life and property	I don't know			I don't know			I don't know			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			Yes
Slope maps				
Aspect maps				
Curvature maps				
Cross sections	Yes			Yes
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Wildlife and Habitat Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation planning for wildlife refuges and marine sanctuaries. Conservation of critical habitats. Management of diverse migratory bird habitats, coral reef and coral communities, marine mammals, protected fish species, and trust resources.
MCA Title	Wildlife and Habitat Management
MCA ID	60607
Organization Type	State or U.S. Territorial government
Organization Name	State of Minnesota
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B	QL0B	Special Order
Update Frequency	4-5 years	4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 2 meters	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DTM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Nice to have	Nice to have	Highly desirable
Classified point cloud	Highly desirable	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Highly desirable
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Highly desirable	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Not required	Nice to have
Lease areas			Not required	Nice to have
Fixed obstructions			Nice to have	Highly desirable
Floating observation/navigation systems			Nice to have	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Nice to have
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Highly desirable	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Nice to have	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Minor	Moderate
Cost savings/cost reduction	Major	Minor	Minor	Minor
Cost avoidance	Major	Minor	Moderate	Major
Increased revenues	None	Minor	None	None
Mission-driven performance improvements	Moderate	Moderate	Moderate	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate	Minor	Minor

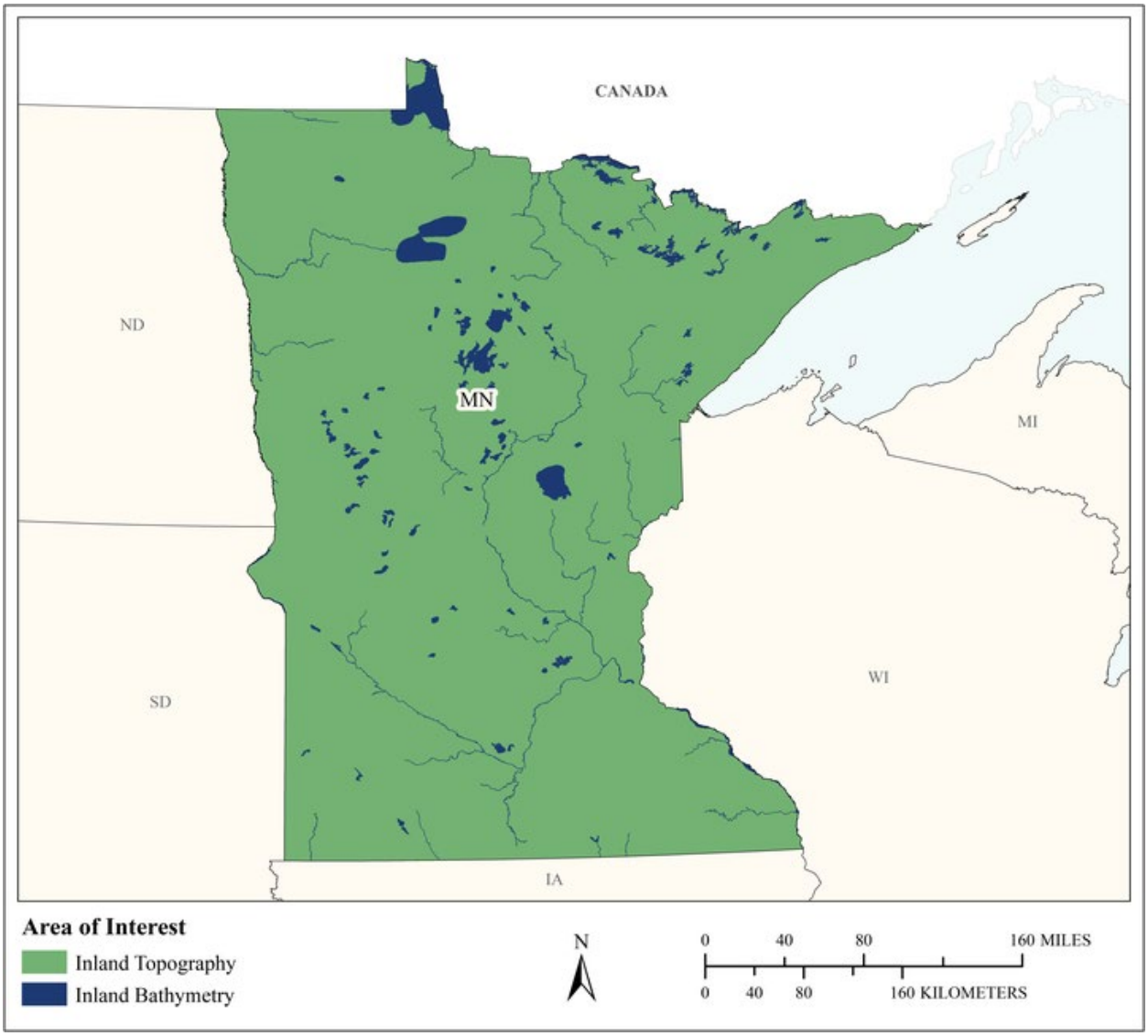
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Minor	Minor	Minor	Minor
Improved customer experience	Minor	Moderate	Minor	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Moderate	Minor	Minor
Environmental	Major	Major	Major	Major
Public safety, including life and property	Minor	Minor	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$20,099		Annual dollars saved/ realized	$161,078		Annual dollars saved/ realized	$53		Annual dollars saved/ realized	$2,329
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$58,052		Annual dollars saved/ realized	$97,362		Annual dollars saved/ realized	$3		Annual dollars saved/ realized	$162
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate			Moderate		
Environmental	Major			Moderate			Major			Major		
Public safety, including life and property	Moderate			Moderate			Moderate			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes			Yes
Curvature maps				
Cross sections	Yes			Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Agriculture and Precision Farming



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Agriculture and Precision Farming. We use LIDAR for digital terrain analysis to allow farmers to manage their fields on a finer scale than was previously possible. Flood Risk Management. Flood preparedness is important for our agency response, allowing us to plan staging areas outside the flood risk zone and protecting assets.
MCA Title	Agriculture and Precision Farming
MCA ID	32950
Organization Type	State or U.S. Territorial government
Organization Name	Minnesota Department of Agriculture
Sub-Agency or Division	
Organization Mission	Our mission is to enhance Minnesotans' quality of life by ensuring the integrity of our food supply, the health of our environment, and the strength of our agricultural economy.
Program Name	Digital Terrain Analysis
Total Annual Program Budget	
Primary Business Use	BU 08 - Agriculture and Precision Farming
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	We are interested in agricultural fields and in some cases subplots.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Nice to have
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL4B		
Update Frequency	2-3 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	Up to 10 meters		
Acceptable Vertical Error	Up to 10 cm	Up to 50 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Not required			Not required	
Entire AOI under same environmental conditions	Nice to have	Highly desirable			Nice to have	
Other	Nice to have					
Other description						
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Not required	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Not required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Up to double the required TVU at the 95% confidence level			Up to double the required TVU at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Nice to have		
Classified point cloud	Nice to have	Nice to have		
Edited/cube XYZ		Highly desirable		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Full waveform	Nice to have	Highly desirable		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Highly desirable		
Land use/land cover	Highly desirable	Required		
Wetlands	Highly desirable	Required		
Estuaries				
Inland surface water features	Highly desirable	Required		
Bridges/culverts		Required		
Landmark features	Highly desirable	Required		
Cultural resources	Nice to have	Highly desirable		
Coastal and riverine structures	Highly desirable	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We have various scales of DEMs, but for the LIDAR grade topographic data we have it only in some areas, some flown for a specific purpose some that we use that was flown for a city or county for their own purposes and for which they are willing to share. Overall it ranges from 30m to sub-meter resolution.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				

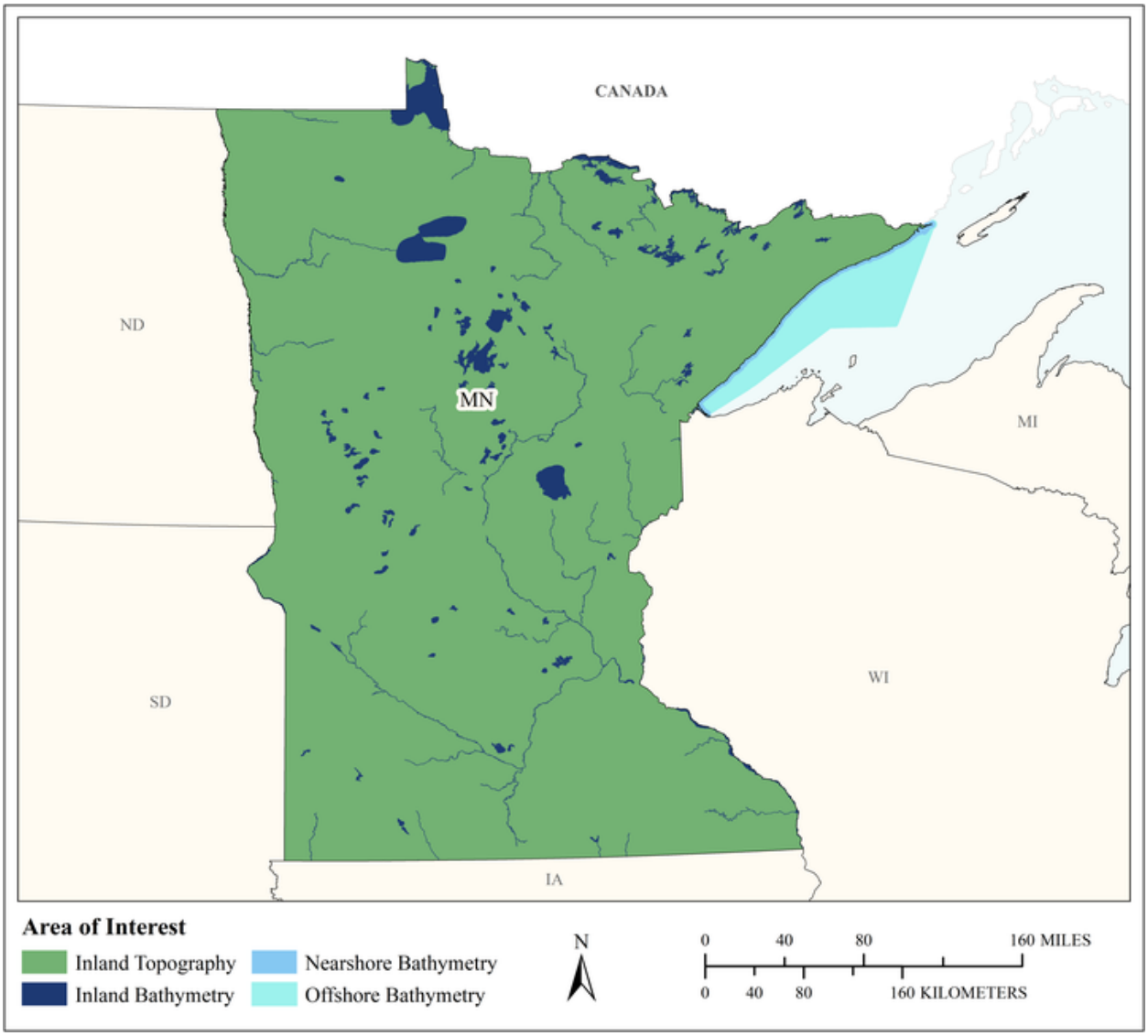
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Minnesota			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	None		
Cost savings/cost reduction	Moderate	I don't know		
Cost avoidance	I don't know	Moderate		
Increased revenues	I don't know	I don't know		
Mission-driven performance improvements	Major	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None		
Improved response or timeliness	Moderate	None		
Improved customer experience	Moderate	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	None		
Environmental	Major	I don't know		
Public safety, including life and property	Major	I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide							
Increased revenues	Moderate	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Other operational benefits	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$97,690		Annual dollars saved/ realized	$171,155						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Other customer service benefits	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$77,445		Annual dollars saved/ realized	$77,445						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate								
Environmental	Major			Major								
Public safety, including life and property	Minor			Major								
Other												
Other benefits	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps				
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps		Yes		
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Fisheries Management and Aquaculture



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Management of fisheries. Sustainable aquaculture.
MCA Title	Fisheries Management and Aquaculture
MCA ID	60608
Organization Type	State or U.S. Territorial government
Organization Name	State of Minnesota
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	Special Order
Update Frequency	2-3 years	6-10 years	6-10 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Nice to have	Nice to have	Required	Nice to have
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Required	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Required
DTM	Required	Highly desirable	Highly desirable	Nice to have
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Nice to have	Highly desirable	Nice to have
Classified point cloud	Highly desirable	Nice to have	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Nice to have
Tide Predictions			Not required	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Highly desirable	Required
Ground control/ground truthing	Required	Highly desirable	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Nice to have	Required
Acoustic imagery of the seafloor			Highly desirable	Required
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Required
Underwater videography			Nice to have	Highly desirable
Bottom texture			Nice to have	Required
Bottom type			Highly desirable	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Highly desirable	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Required
Floating observation/navigation systems			Nice to have	Required
Shorelines – current, historic, change rates	Required	Highly desirable	Highly desirable	
Land use/land cover	Required	Highly desirable	Nice to have	Nice to have
Wetlands	Required	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Highly desirable
Inland surface water features	Required	Required	Nice to have	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Not required	
Coastal and riverine structures	Required	Highly desirable	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	Moderate
Cost savings/cost reduction	Major	Moderate	Major	Minor
Cost avoidance	Moderate	Moderate	Minor	Minor
Increased revenues	Moderate	Moderate	Minor	None
Mission-driven performance improvements	Major	Major	Moderate	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Minor	Moderate

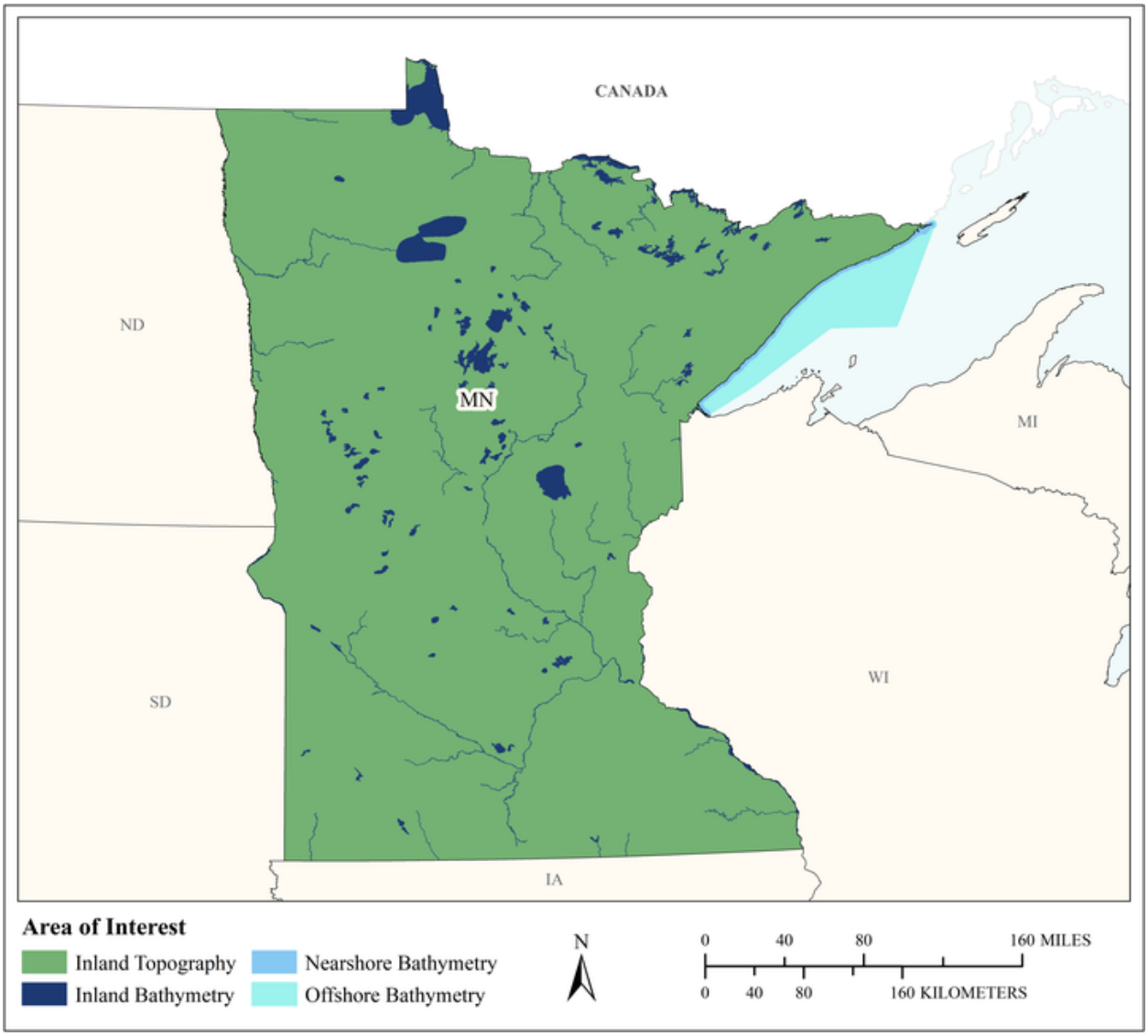
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major	Moderate	Minor
Improved customer experience	Moderate	Major	Minor	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor	Moderate	Moderate
Environmental	Major	Major	Major	Moderate
Public safety, including life and property	Major	Minor	Moderate	None

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		None		
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		None		
Increased revenues	Minor	Unable to provide		None			Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$86,250		Annual dollars saved/ realized	$168,830		Annual dollars saved/ realized	$8,538			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$187,343		Annual dollars saved/ realized	$76,841		Annual dollars saved/ realized	$627			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Moderate			Moderate		
Environmental	Moderate			Major			Major			Moderate		
Public safety, including life and property	Moderate			Moderate			Minor			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes		Yes	Yes
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic Assessment and Hazard Mitigation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Geologic mapping and analysis. Sinkhole and steephead mapping, monitoring, and analysis. Identification of geomorphologic units. Landslide hazard mapping and assessment. Karst mapping, including springs and caves. Aquifer recharge.
MCA Title	Geologic Assessment and Hazard Mitigation
MCA ID	60609
Organization Type	State or U.S. Territorial government
Organization Name	State of Minnesota
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL1B	Special Order
Update Frequency	4-5 years	6-10 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable	Nice to have	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Required	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Required	Highly desirable	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Nice to have	Nice to have	Highly desirable
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Required	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Required	Highly desirable	Required
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Required	Required	Required	Required
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Highly desirable
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Nice to have	Highly desirable
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have	Highly desirable	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Minor	Moderate
Cost savings/cost reduction	Major	Minor	Minor	Minor
Cost avoidance	Major	Minor	Minor	Minor
Increased revenues	None	None	None	None
Mission-driven performance improvements	Major	Minor	Moderate	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Moderate	Major

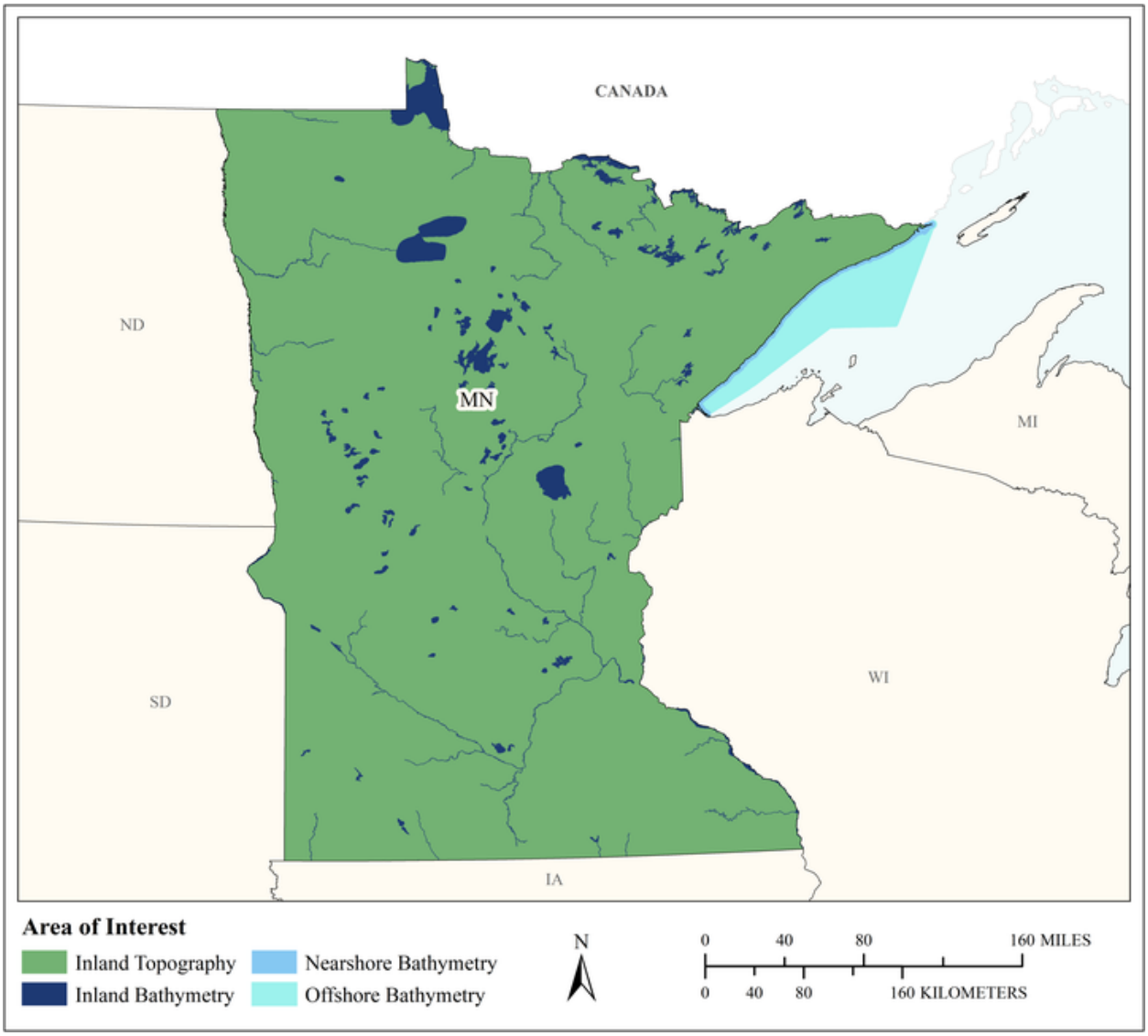
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	Moderate	Moderate
Improved customer experience	Major	Moderate	Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Moderate	Major
Environmental	Major	Minor	Minor	Moderate
Public safety, including life and property	Major	Major	Major	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Cost avoidance	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		None			None			Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$17,811,181		Annual dollars saved/ realized	$235,767		Annual dollars saved/ realized	$4,191		Annual dollars saved/ realized	$3,528,044
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$312,675		Annual dollars saved/ realized	$259,070		Annual dollars saved/ realized	$6,744			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate			Major			Major		
Environmental	Major			Moderate			Moderate			Moderate		
Public safety, including life and property	Major			Major			Major			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic Resource Mining and Extraction



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Onshore or offshore mineral extraction. Monitoring sand as a local resource. Seabed resources. Open mine volume computations. Stockpile analysis. Environmental impact assessment and site restoration.
MCA Title	Geologic Resource Mining and Extraction
MCA ID	60610
Organization Type	State or U.S. Territorial government
Organization Name	State of Minnesota
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 11 - Geologic Resource Mining and Extraction
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL1B	QL1B	Order 1b
Update Frequency	2-3 years	4-5 years	I don't know	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 50 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Nice to have	Nice to have	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Nice to have	Highly desirable	Highly desirable	Nice to have	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Nice to have	Highly desirable	Highly desirable	Nice to have	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Nice to have	Nice to have
DTM	Required	Highly desirable	Nice to have	Nice to have
DEM	Required	Highly desirable	Nice to have	Nice to have
Raw point cloud data	Nice to have	Highly desirable	Highly desirable	Highly desirable
Classified point cloud	Highly desirable	Nice to have	Nice to have	
Edited/cube XYZ		Not required	Not required	Not required
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Nice to have	Nice to have
Ground control/ground truthing	Nice to have	Highly desirable	Nice to have	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Highly desirable	Not required	Not required
Underwater videography			Not required	Not required
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Not required	Not required
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Not required	Not required
Tide/wave heights			Not required	Not required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Not required	Not required
Fixed obstructions			Not required	Not required
Floating observation/navigation systems			Not required	Not required
Shorelines – current, historic, change rates	Not required	Highly desirable	Nice to have	
Land use/land cover	Nice to have	Not required	Nice to have	Nice to have
Wetlands	Nice to have	Highly desirable	Not required	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Nice to have	Nice to have
Inland surface water features	Highly desirable	Nice to have	Nice to have	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Nice to have	Nice to have	Not required	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	I don't know	I don't know
Cost savings/cost reduction	Moderate	Moderate	I don't know	I don't know
Cost avoidance	Moderate	Moderate	I don't know	I don't know
Increased revenues	None	None	I don't know	I don't know
Mission-driven performance improvements	Moderate	Moderate	I don't know	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	None	I don't know	I don't know

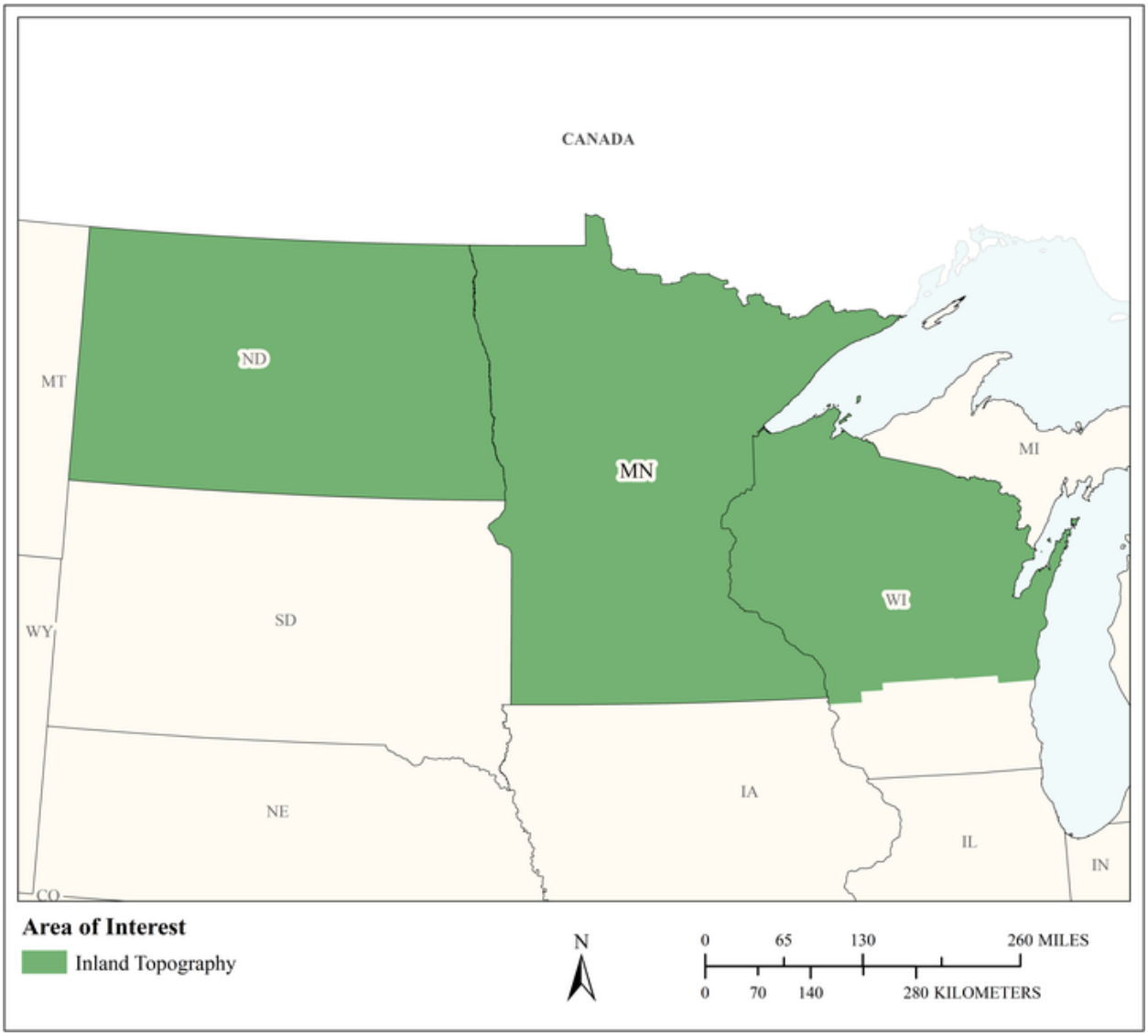
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	None	I don't know	I don't know
Improved customer experience	Moderate	None	I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	I don't know	I don't know
Environmental	Major	Major	I don't know	I don't know
Public safety, including life and property	Major	Moderate	I don't know	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Minor	Unable to provide		Minor	Unable to provide		None			I don't know	Unable to provide	
Cost avoidance	Minor	Unable to provide		Moderate	Unable to provide		None			I don't know	Unable to provide	
Increased revenues	None			None			None			I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide		None			I don't know	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$20,610									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide		None			None			I don't know	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$13,672		Annual dollars saved/ realized	$1,409						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			None			I don't know			I don't know		
Environmental	Major			Minor			Moderate			I don't know		
Public safety, including life and property	Major			Minor			I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Project Planning and Infrastructure Maintenance Including Vegetation Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Custom description			
Sub Area Requirements	Minnesota, North Dakota, and the northern half of Wisconsin			

MCA Description	Response
Mission Critical Activity	EnergyForward is how we're doing our part to provide safe, reliable and clean energy while helping to transform the way energy is produced, delivered and used. We're strengthening the electric grid that delivers energy to homes, businesses and industry. We're generating more power from renewable sources like the wind, water and sun. And we're helping customers find ways to understand, manage and reduce their energy use. Minnesota Power supports state efforts and manages the utility corridors. Currently Minnesota Power flies yearly lidar, but with better data, flights could be reduced to only every 3-5 years, thus saving money. The data are also used for wind and solar siting.
MCA Title	Project Planning and Infrastructure Maintenance Including Vegetation Management
MCA ID	1086
Organization Type	Private or Commercial
Organization Name	Minnesota Power
Sub-Agency or Division	
Organization Mission	To provide safe and reliable energy to our customers.
Program Name	EnergyForward
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	BU 04 - Forest Resources Management
Tertiary Business Use	BU 22 - Infrastructure and Construction Management

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Single tree

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Horizontal Error	Up to 50 cm			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Highly desirable			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Statewide data, small in-house lidar collection			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Minnesota MnTOPO http://arcgis.dnr.state.mn.us/maps/mntopo/			
Other	Yes			
Other description	In-house collection			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			

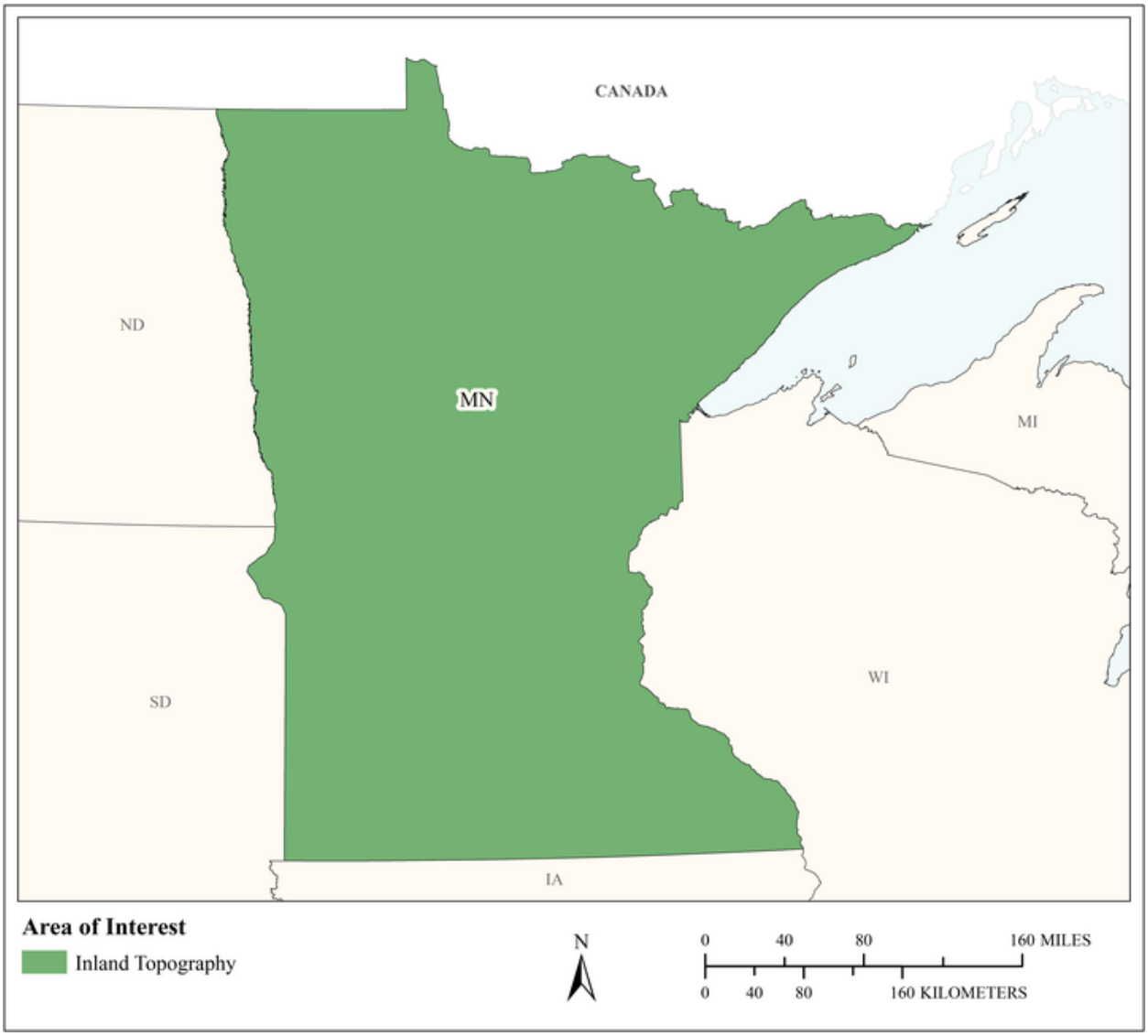
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	None			
Mission-driven performance improvements	Minor			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor			
Improved response or timeliness	Minor			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost savings/cost reduction description	Could reduce in-house collection frequency.											
Cost avoidance	Major	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Mission-driven performance improvements	Moderate	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Minor											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Oil and Gas Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Oil and gas exploration and production. Pipeline and route selection. Facility siting to mitigate geologic hazards. Construction planning. Environmental impact assessment and mitigation. Regulatory compliance.
MCA Title	Oil and Gas Resources
MCA ID	60611
Organization Type	State or U.S. Territorial government
Organization Name	State of Minnesota
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 13 - Oil and Gas Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to triple the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Nice to have			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Minor			
Cost avoidance	Minor			
Increased revenues	None			
Mission-driven performance improvements	Minor			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

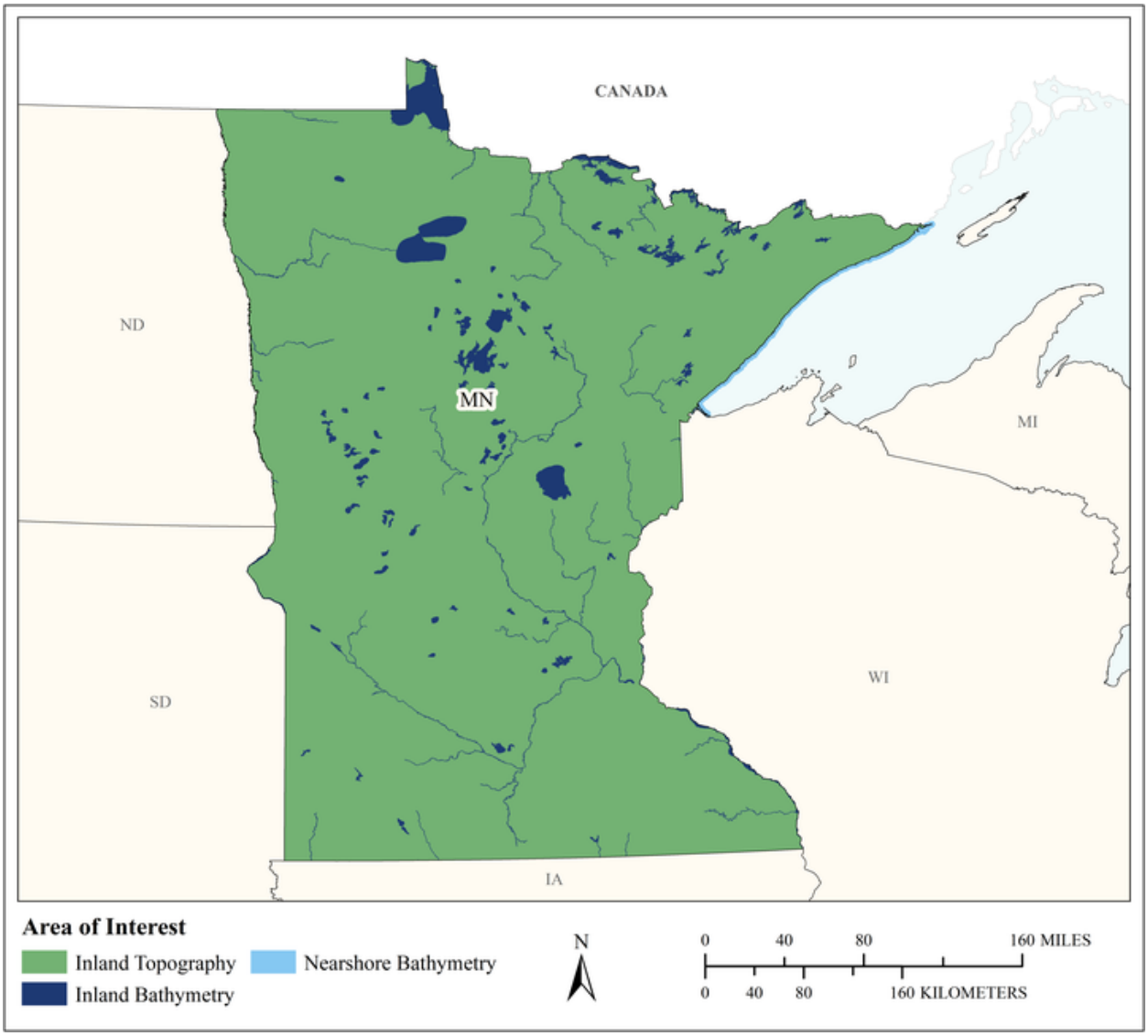
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$37,034									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Cultural Resources Preservation and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Discovery and analysis of underwater archaeological and historical cultural sites. Site protection and preservation planning. Discovery and analysis of Native American and other historical cultural sites and subsistence activities.
MCA Title	Cultural Resources Preservation and Management
MCA ID	60612
Organization Type	State or U.S. Territorial government
Organization Name	State of Minnesota
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	
Update Frequency	4-5 years	6-10 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Not required	Nice to have		Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	
DTM	Required	Highly desirable	Nice to have	
DEM	Required	Required	Required	
Raw point cloud data	Not required	Not required	Not required	
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Not required	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Nice to have	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	
Ground control/ground truthing	Nice to have	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Required	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Highly desirable	Highly desirable	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Highly desirable	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Highly desirable	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Required	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Required	
Land use/land cover	Nice to have	Highly desirable	Nice to have	
Wetlands	Nice to have	Highly desirable	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Nice to have	Highly desirable	Nice to have	
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Nice to have	Highly desirable	Highly desirable	
Cultural resources	Required	Highly desirable	Required	
Coastal and riverine structures	Nice to have	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	
Cost savings/cost reduction	Moderate	Minor	Minor	
Cost avoidance	Minor	Minor	Minor	
Increased revenues	None	Minor	None	
Mission-driven performance improvements	Moderate	Moderate	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor	None	

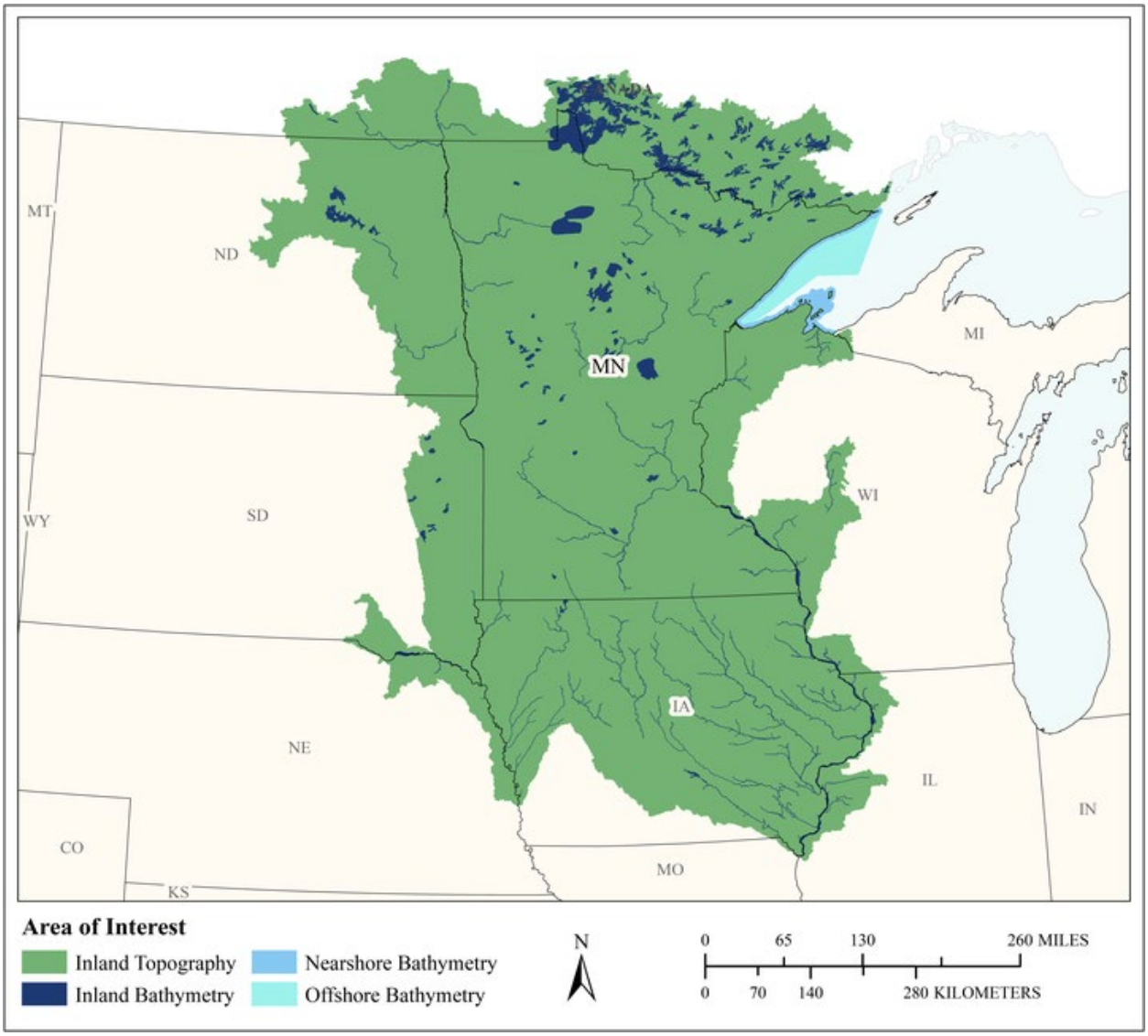
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major	Minor	
Improved customer experience	Moderate	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	Minor	
Environmental	Moderate	Moderate	Minor	
Public safety, including life and property	Minor	Moderate	None	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Increased revenues	None			None			None					
Mission-driven performance improvements	Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$15,465		Annual dollars saved/ realized	$37,087		Annual dollars saved/ realized	$155			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$13,521									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Moderate			Minor					
Environmental	Minor			Minor			Moderate					
Public safety, including life and property	Minor			Minor			Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes	Yes	
Hillshades	Yes		Yes	
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Support of Water Resource Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)	One or more Hydrologic Units (HUC4s)	Custom description	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements			Minnesota and Wisconsin shorelines of Lake Superior	

MCA Description	Response
Mission Critical Activity	Stream channel analysis and mapping including stream bank erosion. Aquatic and terrestrial species habitat management. Analysis of Lake Superior coastal erosion and coastal hazard modeling. Forest health assessment including forest fuel supply and fire susceptibility. Wetland mapping and characterization. Modeling biological and ecological units. Planning and management of Wildlife Management Areas and Scientific and Natural Areas. Management of fisheries. Geologic mapping including water quality, landslide, springs, karst, aquifer recharge, groundwater and surface water pumping, geomorphologic metrics. Flood risk modeling and mapping. Dam safety analysis and emergency operations. Stream and wetland restorations. Planning, development and operation of parks, campgrounds, hiking and skiing trails, OHV and horse trails, and supporting infrastructure such as bridges, roads, etc.
MCA Title	Support of Water Resource Management
MCA ID	21506
Organization Type	State or U.S. Territorial government
Organization Name	Minnesota DNR
Sub-Agency or Division	Division of Ecological and Water Resources
Organization Mission	"Work with citizens to conserve and manage the state's natural resources, to provide outdoor recreational opportunities, and to provide for commercial uses of natural resources in a way that creates a sustainable quality of life."
Program Name	There are many programs supporting these activities. Ecological and Water Resources
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 02 - Riverine Ecosystem Management
Tertiary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Need information on bridges, culverts, docks, cabins, also submerged vegetation.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required

Inland Bathy Feature Size Requirements	Response
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B	Cross sections and/or transects meet needs	Special Order
Update Frequency	6-10 years	>10 years	>10 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI			More detailed info near areas with wave run up concerns, i.e. Lake Superior.	
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter	Up to 2 meters	Up to 2 meters
Acceptable Vertical Error	Up to 10 cm	Up to 40 cm	Up to 40 cm	Less than 1 meter
How far onshore needed			1 kilometer inland	
How far down the beach profile needed	To MLLW		To MLLW	
Tide correction requirement			No requirement for tide correction	
Cross sections and/or transects meet needs		Partial	Yes	
Cross section/transect requirement		It is dependent on the size of the water body. In general 2 m should be okay	100 meters	

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required	Not required	Required	Not required	Not required
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Not required	Required	Nice to have	Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Nice to have	Nice to have	Required	Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Nice to have	Nice to have	Required	Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to triple the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Required	Required	Highly desirable
DEM	Required	Required	Highly desirable	Required
Raw point cloud data	Required	Required	Highly desirable	Nice to have
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Highly desirable	Nice to have
Full waveform	Nice to have	Highly desirable	Highly desirable	Nice to have
Bathymetric Attributed Grid (BAG)		Required	Required	Nice to have
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Not required	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Nice to have
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Nice to have	Highly desirable
Ground control/ground truthing	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Not required	Nice to have
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Nice to have	Required
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Nice to have	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Nice to have
Geologic and seismic data	Highly desirable	Highly desirable	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Nice to have	Highly desirable
Tide/wave heights			Not required	Required
Sea ice conditions			Highly desirable	Nice to have
Habitat distribution and classification			Highly desirable	Required
Boundaries			Nice to have	Nice to have
Routes			Highly desirable	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Not required	Nice to have
Fixed obstructions			Not required	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Required	Not required	Nice to have
Wetlands	Highly desirable	Required	Not required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Highly desirable	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Data was collected over flights from November 2008 to April 2012 at a height of 640-2400 meters. Horizontal accuracy 0.4-0.6 m and nominal spacing 1-1.5 m; Vertical RMSE 0.051-0.356 m	We have bathymetric data for some lakes but not all lakes and few rivers	Data collected for FEMA's Great Lakes wave run up study	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	Minnesota GeoCommons	Mn GEOCommons		
Other			Yes	
Other description			FEMA (prelim only) not yet in MIP or FRiSEL	

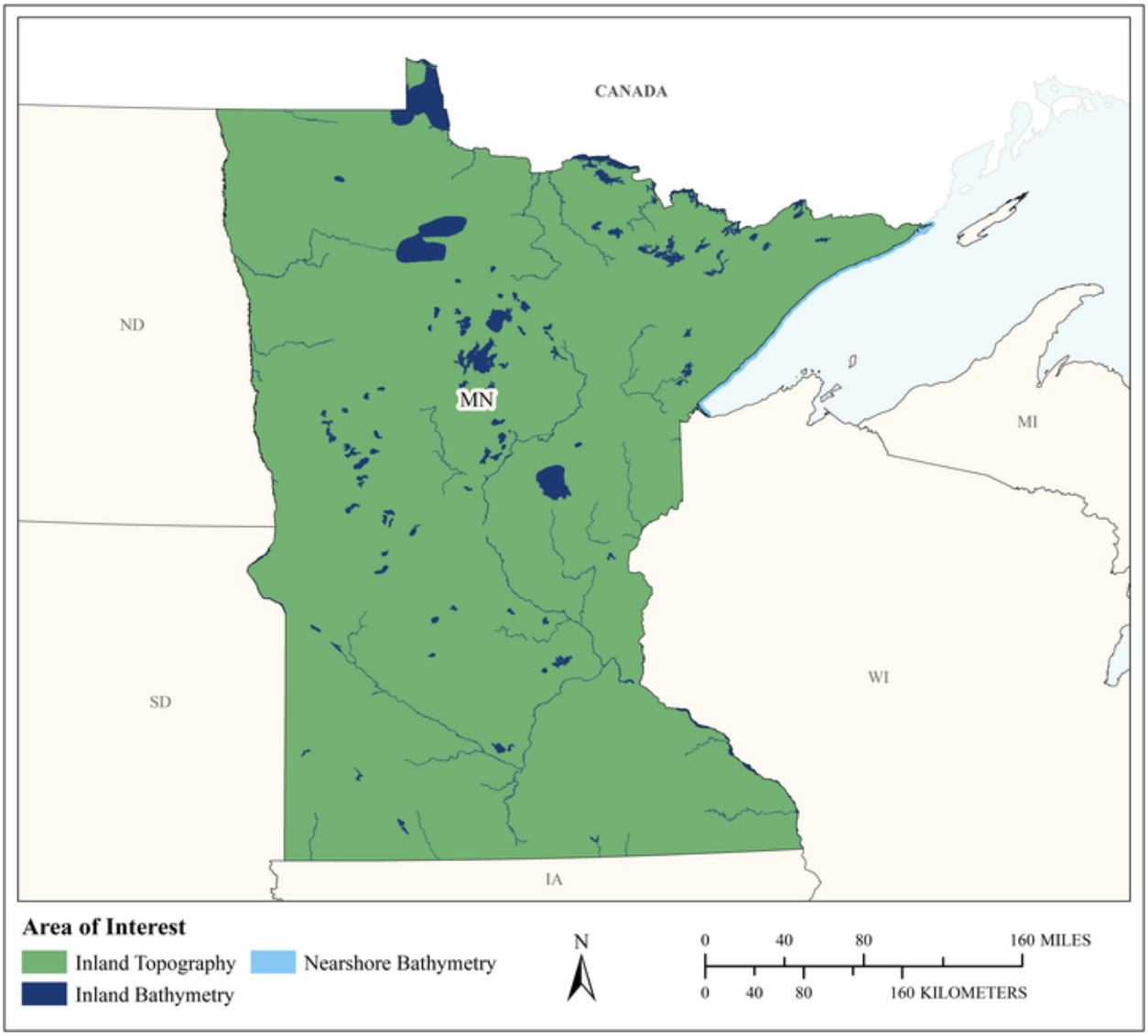
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	None	Moderate	Minor
Cost savings/cost reduction	Major	None	Moderate	Minor
Cost avoidance	Major	None	Major	Moderate
Increased revenues	I don't know	None	None	Minor
Mission-driven performance improvements	Major	None	Moderate	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None	Moderate	Moderate
Improved response or timeliness	Major	None	Moderate	Major
Improved customer experience	Major	None	Major	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	None	Moderate	Minor
Environmental	Major	None	Moderate	Moderate
Public safety, including life and property	Major	None	Moderate	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	I don't know	Unable to provide		Minor	Unable to provide		None			Moderate	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Other operational benefits	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$11,842,813		Annual dollars saved/ realized	$822,683		Annual dollars saved/ realized	$10,290			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Value added to products or services description	The first good Zone VE mapping is now possible in the Great Lakes because of good data.						The first good Zone VE mapping is now possible in the Great Lakes because of good data.					
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Other customer service benefits	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$2,072,121		Annual dollars saved/ realized	$923,663		Annual dollars saved/ realized	$7,626			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major			Major		
Education or outreach description	Easier to display risk on websites with better topographic data			Improved lake data for recreation and fishing			Ability to digitally show what is the lake looks like where people can't see					
Environmental	Moderate			Major			Moderate			Major		
Environmental description	Greater efficiency in developing stream and wetland restoration			Ability to use flood hazard models for environmental purposes			Ability to identify how to handle high erosion areas					
Public safety, including life and property	Moderate			Minor			Major			Major		
Public safety, including life and property description	Ability to determine rates of bank erosion progression											
Other	Increase efficiency in developing flood hazard models and mapping											
Other benefits	Major											
Other description	Increase efficiency in developing flood hazard models and mapping											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes		Yes
Hillshades	Yes			Yes
Slope maps				
Aspect maps				
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			Yes
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Sea Level Rise and Subsidence



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Modeling and mapping the effects of sea level rise or subsidence. Population and economic vulnerability assessments. Coastal inundation and infrastructure assessment.
MCA Title	Sea Level Rise and Subsidence
MCA ID	60613
Organization Type	State or U.S. Territorial government
Organization Name	State of Minnesota
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 16 - Sea Level Rise and Subsidence
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL1B	QL2B	
Update Frequency	4-5 years	4-5 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Required	Required		Highly desirable	Required
Entire AOI under same environmental conditions	Highly desirable	Required	Required		Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Required		Highly desirable	Required
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have	Highly desirable	
DTM	Required	Required	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Highly desirable	Nice to have	
Classified point cloud	Required	Nice to have	Highly desirable	
Edited/cube XYZ		Not required	Not required	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Not required	Not required	
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Highly desirable	
Ground control/ground truthing	Required	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Required	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Required	Required	Highly desirable	
Wetlands	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Required	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes	Yes	Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Major	
Cost savings/cost reduction	Major	Major	Major	
Cost avoidance	Major	Major	Major	
Increased revenues	None	Minor	Minor	
Mission-driven performance improvements	Major	Major	Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	

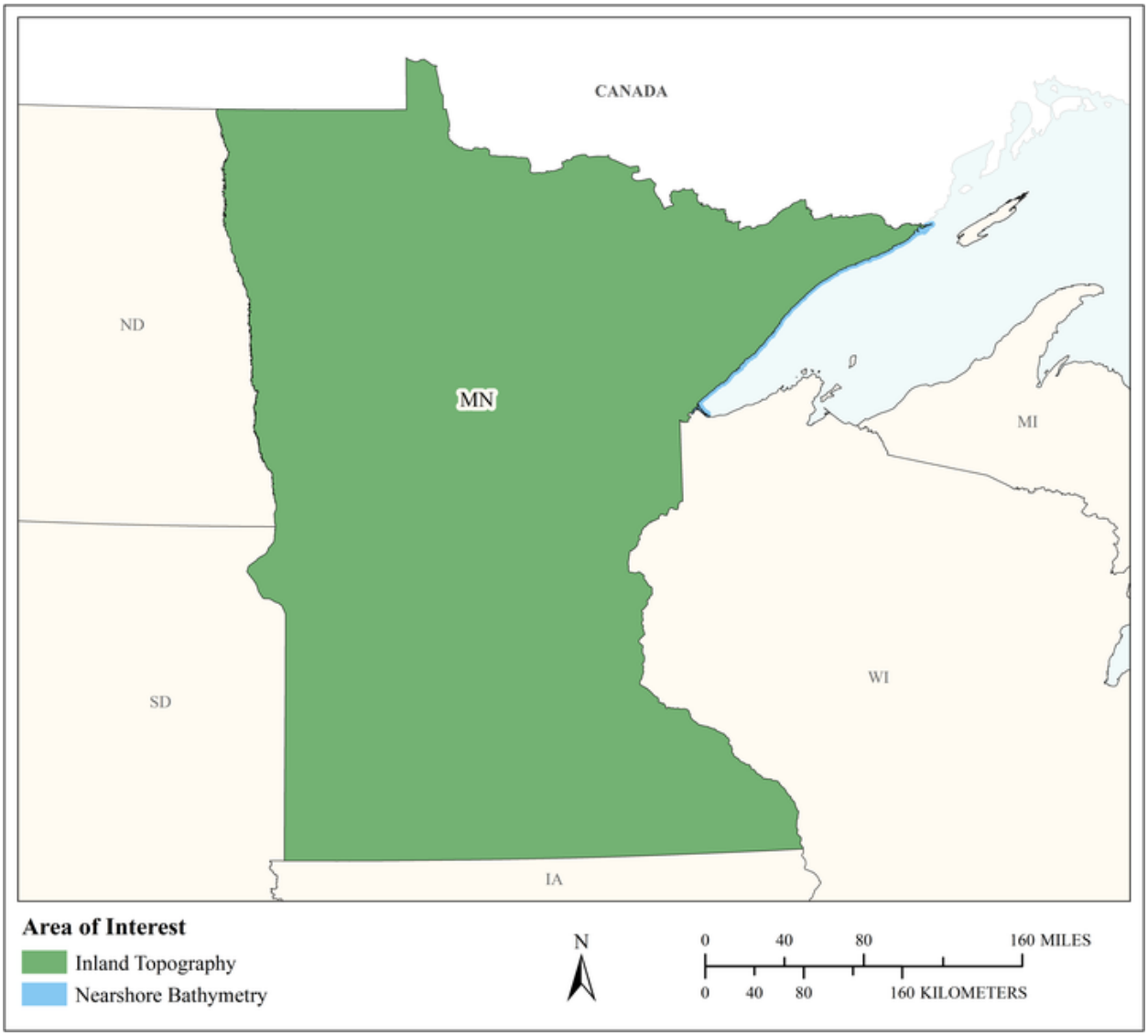
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Minor	Major	
Improved customer experience	Moderate	Moderate	Major	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Moderate	
Environmental	Major	Moderate	Major	
Public safety, including life and property	Major	Moderate	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Increased revenues	Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$4,442,244									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Major					
Environmental	Moderate			Major			Major					
Public safety, including life and property	Moderate			Major			Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Wildfire Management, Planning, and Response



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of forest fuel and fire susceptibility. Fire behavior modeling to support wildfire suppression activities. Wildland/urban interface building identification. Post fire analysis to determine landslide prone areas.
MCA Title	Wildfire Management, Planning, and Response
MCA ID	60614
Organization Type	State or U.S. Territorial government
Organization Name	State of Minnesota
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 17 - Wildfire Management, Planning, and Response
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1		I don't know	
Update Frequency	4-5 years		I don't know	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter		I don't know	
Acceptable Vertical Error	Up to 20 cm		I don't know	
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable		I don't know			I don't know
Entire AOI under same environmental conditions	Required		I don't know			I don't know
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		I don't know			I don't know
DEM for entire AOI needs to be seamless	Required		I don't know			I don't know
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		I don't know			I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required		I don't know	
DTM	Required		I don't know	
DEM	Required		I don't know	
Raw point cloud data	Nice to have		I don't know	
Classified point cloud	Highly desirable		I don't know	
Edited/cube XYZ			I don't know	
Full waveform	Not required		I don't know	
Bathymetric Attributed Grid (BAG)			I don't know	
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			I don't know	
Tide Predictions			I don't know	
Tidal Constituent And Residual Interpolation (TCARI)			I don't know	
Intensity imagery/sidescan imagery	Highly desirable		I don't know	
Ground control/ground truthing	Highly desirable		I don't know	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			I don't know	
Nautical and/or navigation charts			I don't know	
Acoustic imagery of the seafloor			I don't know	
Aerial and/or satellite imagery	Required		I don't know	
Underwater videography			I don't know	
Bottom texture			I don't know	
Bottom type			I don't know	
Submerged features			I don't know	
Subbottom characteristics			I don't know	
Geologic and seismic data	Nice to have		I don't know	
Water column properties - Physical			I don't know	
Water column properties - Chemical			I don't know	
Water column properties - Biological			I don't know	
Currents			I don't know	
Tide/wave heights			I don't know	
Sea ice conditions			I don't know	
Habitat distribution and classification			I don't know	
Boundaries			I don't know	
Routes			I don't know	
Offshore cadastral			I don't know	
Lease areas			I don't know	
Fixed obstructions			I don't know	
Floating observation/navigation systems			I don't know	
Shorelines – current, historic, change rates	Not required		I don't know	
Land use/land cover	Highly desirable		I don't know	
Wetlands	Nice to have		I don't know	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			I don't know	
Inland surface water features	Highly desirable		I don't know	
Bridges/culverts	Nice to have			
Landmark features	Nice to have		I don't know	
Cultural resources	Nice to have		I don't know	
Coastal and riverine structures	Nice to have		I don't know	
Overhead structures			I don't know	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate		I don't know	
Cost savings/cost reduction	Major		I don't know	
Cost avoidance	Major		I don't know	
Increased revenues	Minor		I don't know	
Mission-driven performance improvements	Major		I don't know	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		I don't know	

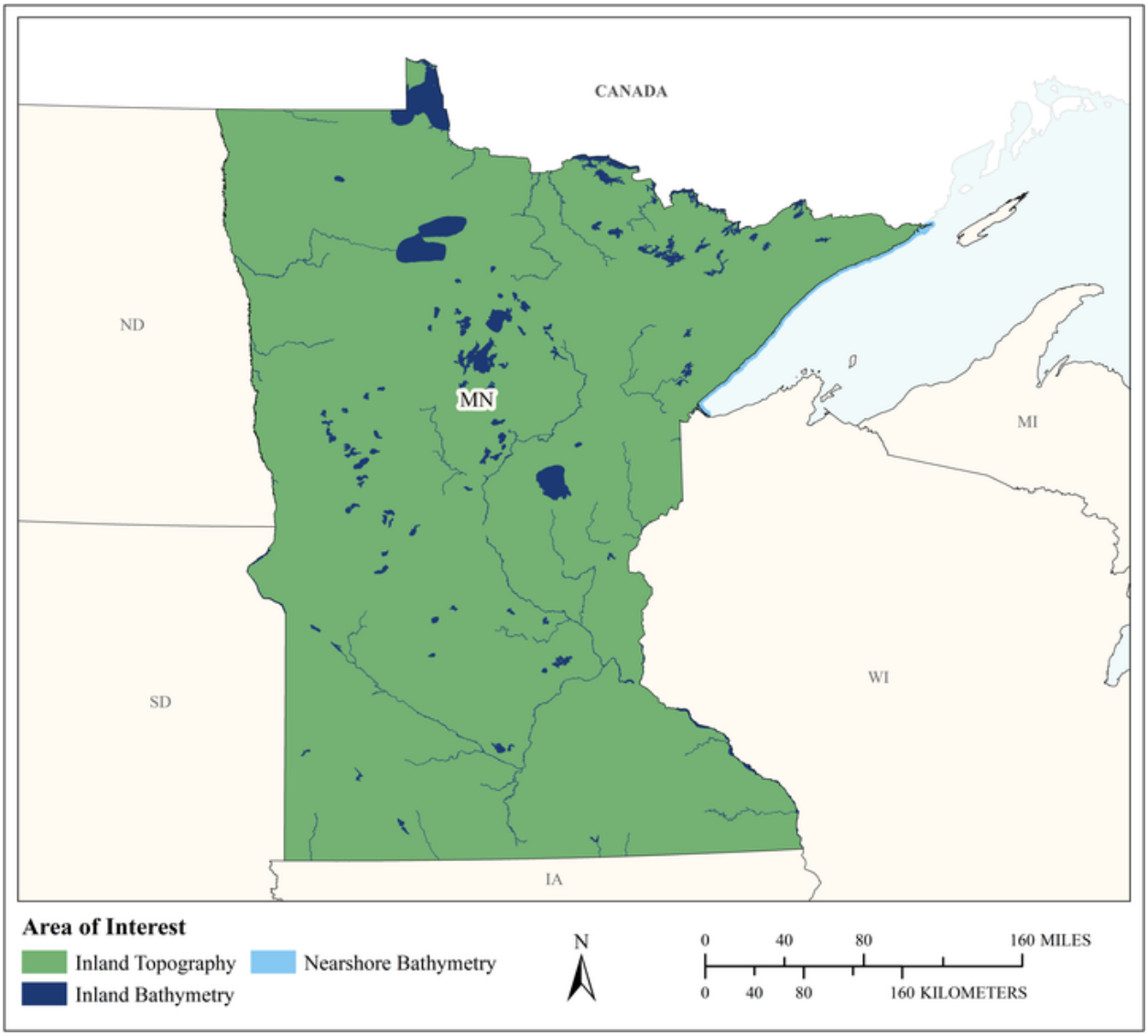
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major		I don't know	
Improved customer experience	Major		I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major		I don't know	
Environmental	Major		I don't know	
Public safety, including life and property	Major		I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					I don't know	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide					I don't know	Unable to provide				
Cost avoidance	Major	Unable to provide					I don't know	Unable to provide				
Increased revenues	Minor	Unable to provide					I don't know	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide					I don't know	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					I don't know	Unable to provide				
Improved response or timeliness	Major	Unable to provide					I don't know	Unable to provide				
Improved customer experience	Major	Unable to provide					I don't know	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major						I don't know					
Environmental	Major						I don't know					
Public safety, including life and property	Major						I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Homeland Security, Law Enforcement, Disaster Response, and Emergency Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Infrastructure and border protection. Coastal search and rescue. Population dynamics. Emergency fuel supply and movement. Line of sight analysis in urban areas. Disaster response. Flood risk analysis resulting from acts of terrorism.
MCA Title	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
MCA ID	60615
Organization Type	State or U.S. Territorial government
Organization Name	State of Minnesota
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL1B	
Update Frequency	4-5 years	4-5 years	6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable		Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Required	
DTM	Required	Highly desirable	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Highly desirable	Highly desirable	
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Highly desirable	Highly desirable	
Full waveform	Nice to have	Nice to have	Highly desirable	
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Highly desirable	
Ground control/ground truthing	Required	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Required	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Highly desirable	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Nice to have	
Boundaries			Highly desirable	
Routes			Highly desirable	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	
Cost savings/cost reduction	Major	Major	Major	
Cost avoidance	Major	Moderate	Moderate	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	Moderate	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Minor	

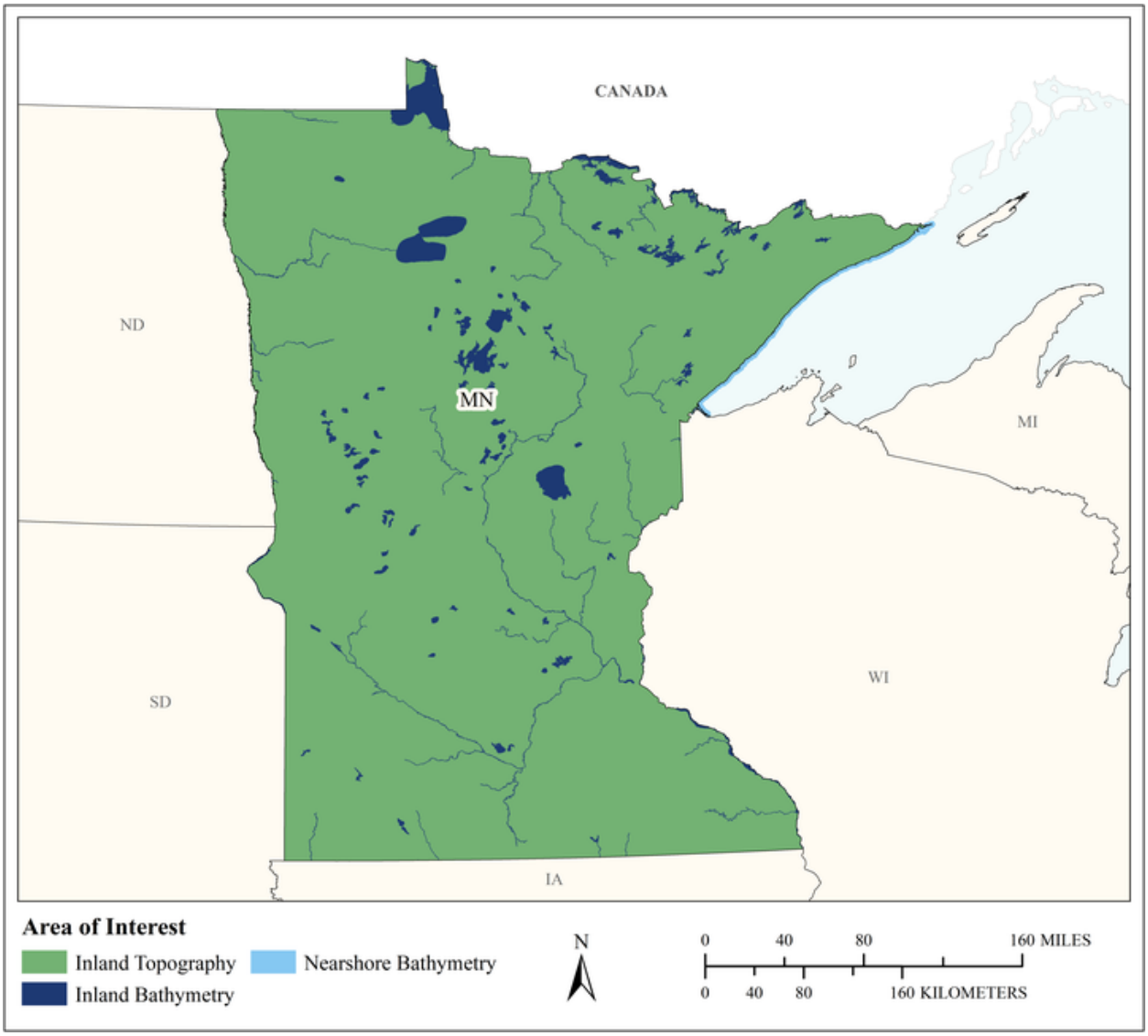
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major	Minor	
Improved customer experience	Major	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Moderate	Minor	
Environmental	Minor	Moderate	Minor	
Public safety, including life and property	Major	Major	Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate					
Environmental	Moderate			Moderate			Moderate					
Public safety, including life and property	Major			Major			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Land Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Road and railroad route selection and maintenance. Slope analysis for autonomous cars. GPS navigation visualization. BU 29 – Military and BU 30 - Maritime and Land Boundary Management are additional Business Uses for this activity.
MCA Title	Land Navigation and Safety
MCA ID	60616
Organization Type	State or U.S. Territorial government
Organization Name	State of Minnesota
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 19 - Land Navigation and Safety
Secondary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Tertiary Business Use	BU 21 - Aviation Navigation and Safety

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required

Inland Bathy Feature Size Requirements	Response
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL0B	QL0B	
Update Frequency	2-3 years	2-3 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable		Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Highly desirable	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	
Classified point cloud	Highly desirable	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Highly desirable	
Full waveform	Nice to have	Nice to have	Highly desirable	
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	
Ground control/ground truthing	Required	Required	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Highly desirable	Highly desirable	Highly desirable	
Water column properties - Physical			Highly desirable	
Water column properties - Chemical			Highly desirable	
Water column properties - Biological			Highly desirable	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Highly desirable	
Boundaries			Highly desirable	
Routes			Highly desirable	
Offshore cadastral			Highly desirable	
Lease areas			Highly desirable	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Nice to have	Required	Highly desirable	
Land use/land cover	Highly desirable	Required	Highly desirable	
Wetlands	Required	Required	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Highly desirable	Highly desirable	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Minor	
Cost savings/cost reduction	Major	Minor	Minor	
Cost avoidance	Moderate	Minor	Minor	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	None	

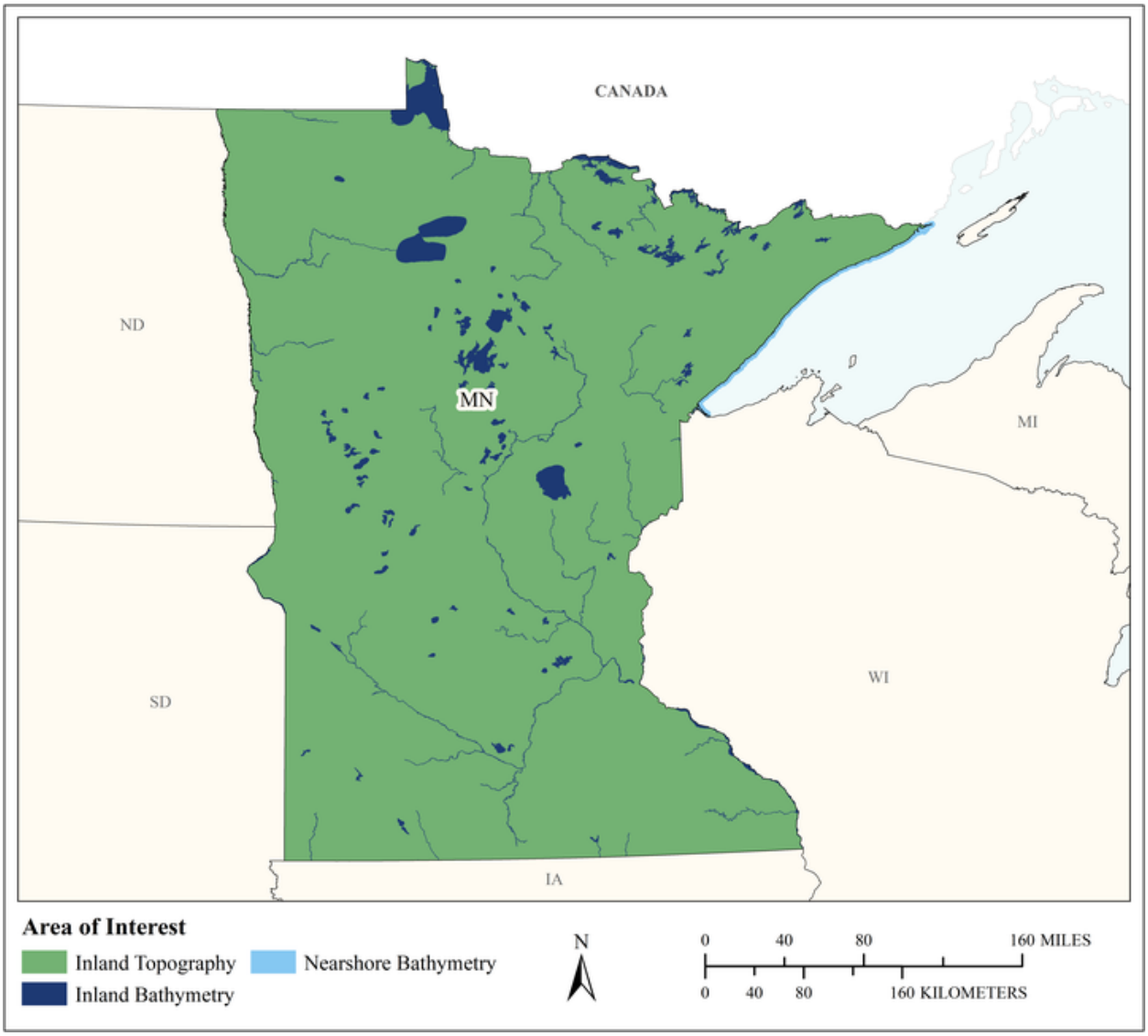
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	None	
Improved customer experience	Major	Minor	None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	None	
Environmental	Moderate	Moderate	Moderate	
Public safety, including life and property	Major	Minor	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		None					
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,093,054		Annual dollars saved/ realized	$46,623						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$88,269		Annual dollars saved/ realized	$482						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			None					
Environmental	Major			Moderate			Moderate					
Public safety, including life and property	Major			Moderate			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps	Yes		Yes	
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes		Yes	
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Marine and Riverine Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Nautical charting. Bathymetric measurements of nearshore submerged coastal topography. Identification of hazards to navigation. Sediment management at coastal navigation projects. Precision marine navigation. Movement of goods and fishing vessels.
MCA Title	Marine and Riverine Navigation and Safety
MCA ID	60617
Organization Type	State or U.S. Territorial government
Organization Name	State of Minnesota
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Nice to have
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B	QL0B	
Update Frequency	2-3 years	2-3 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Nice to have	Nice to have		Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required		Required	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Required	
DTM	Required	Highly desirable	Required	
DEM	Required	Required	Required	
Raw point cloud data	Required	Nice to have	Required	
Classified point cloud	Required	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Highly desirable	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	
Breaklines required for standard hydro-flattening	Highly desirable	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Highly desirable	
Ground control/ground truthing	Required	Nice to have	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Required	Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Not required	Not required	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Highly desirable	
Boundaries			Nice to have	
Routes			Required	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Required	
Floating observation/navigation systems			Required	
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Nice to have	Nice to have	Nice to have	
Wetlands	Highly desirable	Required	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Highly desirable	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Required	Nice to have	Nice to have	
Cultural resources	Highly desirable	Highly desirable	Nice to have	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts		Yes	Yes	
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	
Cost savings/cost reduction	Major	I don't know	Minor	
Cost avoidance	Moderate	Major	Minor	
Increased revenues	Moderate	None	Minor	
Mission-driven performance improvements	Moderate	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	None	Minor	

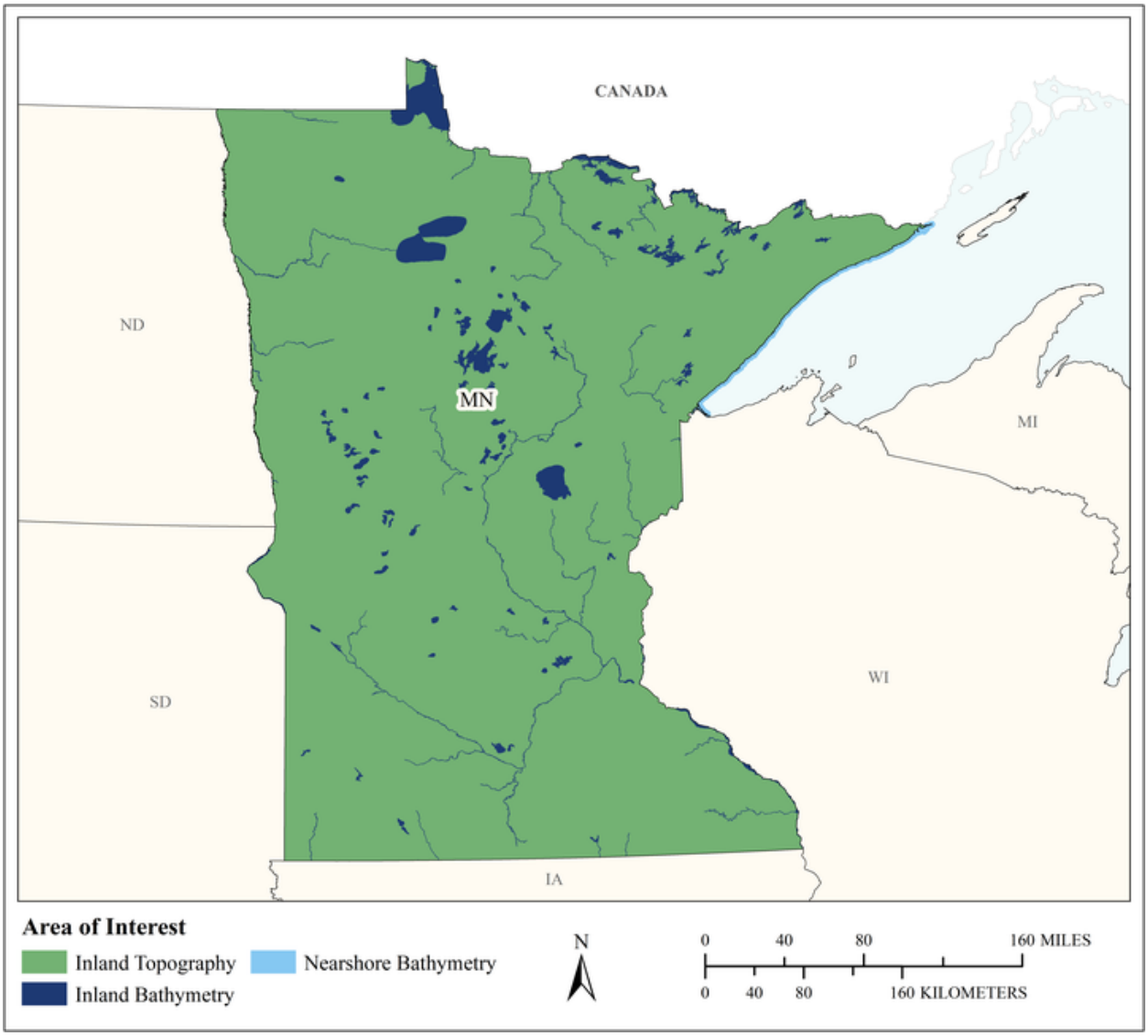
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Minor	None	Minor	
Improved customer experience	Moderate	None	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Moderate	Moderate	
Environmental	Major	Moderate	Major	
Public safety, including life and property	Major	Major	Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Increased revenues	None			Moderate	Unable to provide		Major	Unable to provide				
Mission-driven performance improvements	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			Moderate			Minor					
Environmental	None			Moderate			Major					
Public safety, including life and property	Minor			Moderate			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps				
Aspect maps				
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Aviation Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of in-flight hazards and path obstructions. Aeronautical charting. Runway construction and repair.
MCA Title	Aviation Navigation and Safety
MCA ID	60618
Organization Type	State or U.S. Territorial government
Organization Name	State of Minnesota
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 21 - Aviation Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Nice to have
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B	I don't know	
Update Frequency	Annually	Annually	Annually	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	I don't know	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 50 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Nice to have		Highly desirable	Nice to have
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Highly desirable	
DTM	Required	Required	Highly desirable	
DEM	Required	Required	Highly desirable	
Raw point cloud data	Highly desirable	Highly desirable	Nice to have	
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Nice to have	
Full waveform	Highly desirable	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Nice to have	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Nice to have	
Submerged features			Not required	
Subbottom characteristics			Not required	
Geologic and seismic data	Nice to have	Nice to have	Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Highly desirable	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Not required	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Required	Required	Required	
Wetlands	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Required	Highly desirable	Not required	
Cultural resources	Required	Highly desirable	Nice to have	
Coastal and riverine structures	Highly desirable	Nice to have	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	
Cost savings/cost reduction	Major	Major	Moderate	
Cost avoidance	Major	Major	Moderate	
Increased revenues	Major	None	None	
Mission-driven performance improvements	Major	Major	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Moderate	

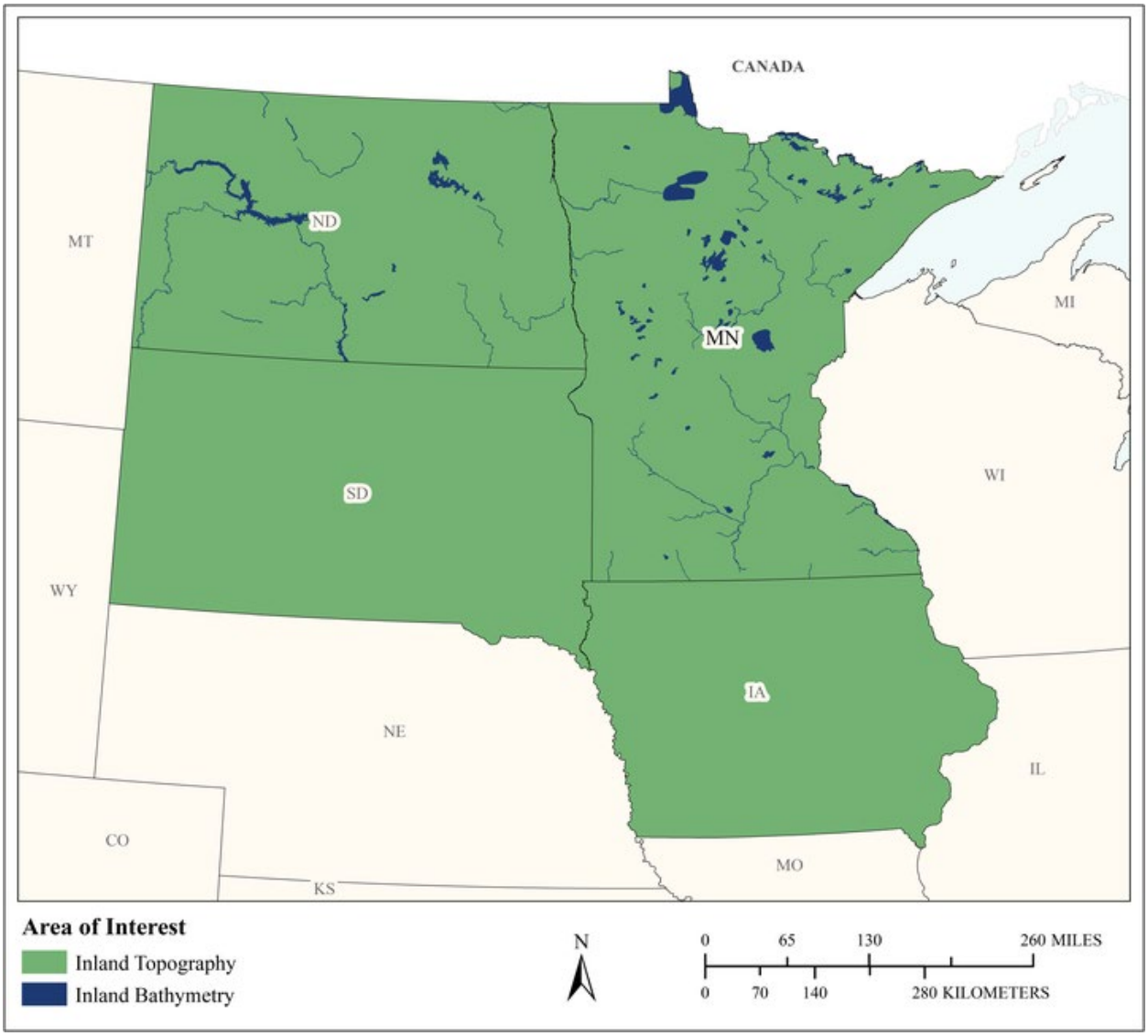
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major	Minor	
Improved customer experience	Major	Major	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	Minor	None	
Environmental	Major	Moderate	None	
Public safety, including life and property	Major	Moderate	None	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Increased revenues	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Moderate			I don't know					
Environmental	Moderate			Major			I don't know					
Public safety, including life and property	Moderate			Major			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes	Yes	Yes	
Curvature maps	Yes			
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Civil Engineering and Water Resource Modeling



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Nice to have		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Runoff and sedimentation analyses. Point- or non-point source pollution modeling. Flood risk modeling and mapping of riverine and coastal areas. Dam/dike/levee safety analysis. Flood forecasts. Bridge design and construction. Engineering and construction of dams, levees, dikes, reservoirs, and coastal structures. Pump, drain, and well placement. Stormwater modeling. Cut and fill analysis for earth-moving. Road infrastructure. H&H studies
MCA Title	Civil Engineering and Water Resource Modeling
MCA ID	21731
Organization Type	Private or Commercial
Organization Name	Houston Engineering, Inc.
Sub-Agency or Division	
Organization Mission	Multiple Discipline Consulting firm focusing on civil engineering, environmental, survey and geospatial services.
Program Name	We are a private for profit consulting firm.
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 01 - Water Supply and Quality

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Survey-level features

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required

Inland Bathy Feature Size Requirements	Response
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Not required
5.1 – 10 acres	Not required
Greater than 10 acres	Not required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	Cross sections and/or transects meet needs		
Update Frequency	6-10 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI	Depends on engineering projects.			
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need		
Acceptable Vertical Error	Up to 10 cm	I don't know		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial	Yes		
Cross section/transect requirement	Depends on study.	Depends on study. For H&H modeling, depends on whether a detailed or BLE study is needed. Also dredging projects on lakes/reservoirs need cross sections.		

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Not required			Not required	
Entire AOI under same environmental conditions	Nice to have	Nice to have			Not required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Nice to have			Nice to have	
DEM for entire AOI needs to be seamless	Nice to have	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Not required		
DTM	Not required	Not required		
DEM	Not required	Not required		
Raw point cloud data	Nice to have	Not required		
Classified point cloud	Required	Required		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Not required		
Ground control/ground truthing	Nice to have	Not required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Nice to have	Nice to have		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required	Not required		
Land use/land cover	Not required	Not required		
Wetlands	Not required	Not required		
Estuaries				
Inland surface water features	Nice to have	Not required		
Bridges/culverts	Nice to have	Not required		
Landmark features	Not required	Not required		
Cultural resources	Not required	Not required		
Coastal and riverine structures	Not required	Not required		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Minnesota Statewide Lidar collect, Iowa Statewide Lidar Collect. Various local County / City collects in MN.	Boat-based data acquisition – project-based sonar or lead line, boat drone		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Minnesota, Iowa and North Dakota			
Other	Yes	Yes		
Other description	Local govt source	In house survey data only		

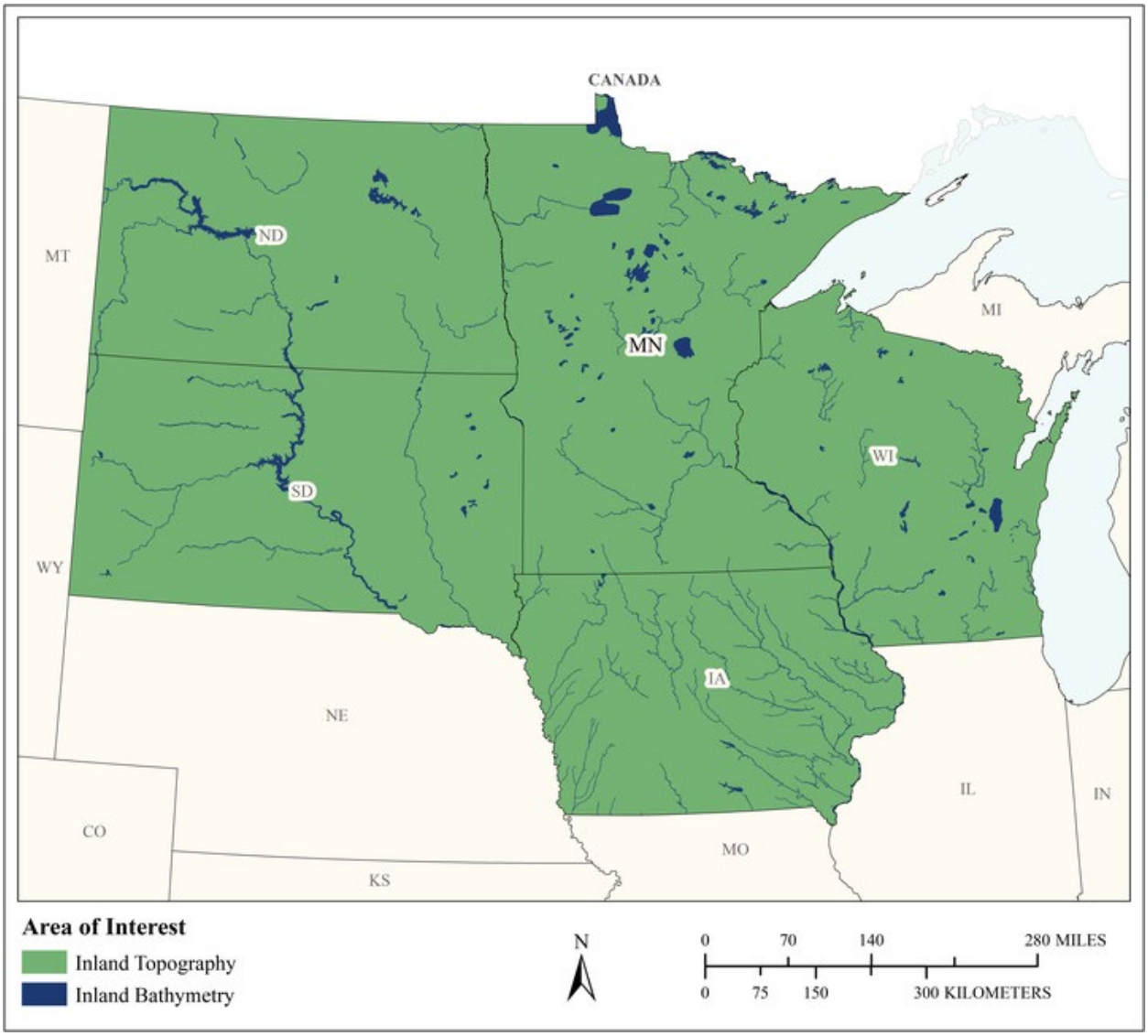
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Moderate	Minor		
Cost avoidance	Moderate	Inland bathy data not available		
Increased revenues	None	Inland bathy data not available		
Mission-driven performance improvements	None	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	Inland bathy data not available		
Improved response or timeliness	None	Inland bathy data not available		
Improved customer experience	None	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	Inland bathy data not available		
Environmental	None	Inland bathy data not available		
Public safety, including life and property	None	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction	None			I don't know	Unable to provide							
Cost avoidance	Minor	Unable to provide		I don't know	Unable to provide							
Increased revenues	Minor	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Moderate	Unable to provide		I don't know	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	Minor	Unable to provide		Minor	Unable to provide							
Improved customer experience	Minor	Unable to provide		I don't know	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			None								
Environmental	None			None								
Public safety, including life and property	None			None								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Engineering, Architecture, Survey, Environmental, and Geospatial Services Consulting



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Highly desirable		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Hydrologic modeling for environmental and engineering services. LiDAR acquisition services for clientele. Elevation data are needed for the following: Hydrologic modeling. Runoff and sedimentation analyses. Engineering design/construction: roads, bridges, utilities, etc. Stormwater modeling/design. Cut and fill analysis for cost estimation. Land Use mapping. Visualization studies. Cell tower microwave interference studies.
MCA Title	Engineering, Architecture, Survey, Environmental, and Geospatial Services Consulting
MCA ID	22150
Organization Type	Private or Commercial
Organization Name	Widseth Smith Nolting & Associates
Sub-Agency or Division	
Organization Mission	Engineering, Architecture, Survey, Environmental, Water Resources, Aerial Imagery/LiDAR Acquisition, GIS
Program Name	Engineering Services
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 06 - Natural Resources Conservation
Tertiary Business Use	BU 28 - Telecommunications

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Asset management for Cities/Counties. Utilities, signs, sidewalks, ramps, etc.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B		
Update Frequency	6-10 years	>10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI	Higher QL for urban and roadway corridors. Agricultural and forested areas can be QL1, but would prefer QL2. Project based			
Acceptable Horizontal Error	Up to 30 cm	The best horizontal accuracy achievable for the vertical accuracy I need		
Acceptable Vertical Error	Up to 10 cm	Up to 20 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Required
No Treatment	Required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Required	Highly desirable			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Nice to have		
DTM	Nice to have	Nice to have		
DEM	Required	Required		
Raw point cloud data	Not required	Nice to have		
Classified point cloud	Required	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Nice to have		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Highly desirable	Nice to have		
Wetlands	Highly desirable	Nice to have		
Estuaries				
Inland surface water features	Highly desirable	Highly desirable		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Nice to have	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL1 from the Red River collect (2009-2011) and MN Statewide collect (2012-2015).	From our own surveyed data		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	MnGEO			
Other		Yes		
Other description		Self-collected		
Data that meet my needs are not available		Yes		

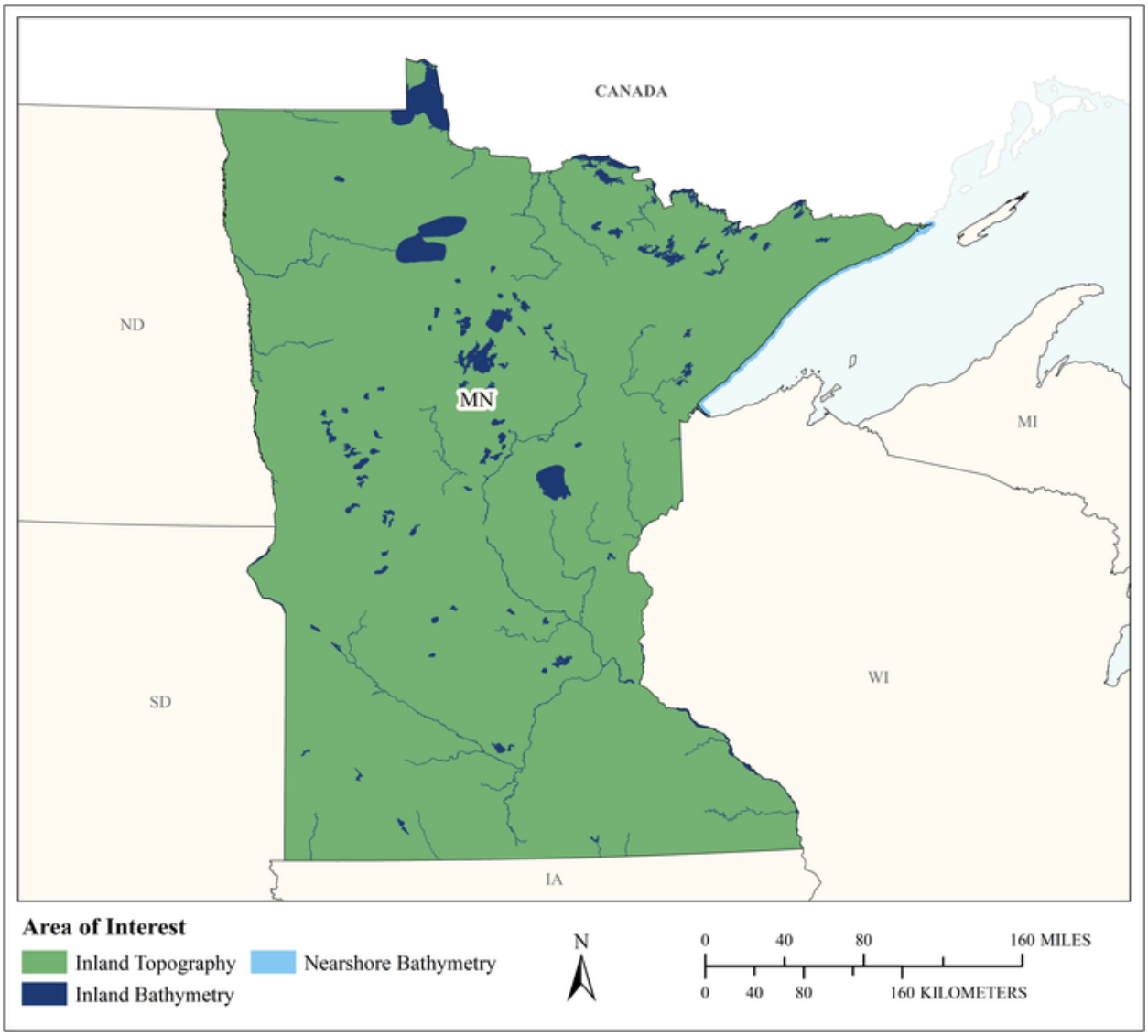
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Moderate	Moderate		
Increased revenues	Moderate	Major		
Mission-driven performance improvements	Major	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Major		
Improved response or timeliness	Major	Major		
Improved customer experience	Major	Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate		
Environmental	Major	Major		
Public safety, including life and property	Moderate	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Moderate	Unable to provide		Moderate	Unable to provide							
Increased revenues description				Sediment removal.								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Minor								
Environmental	Major			Major								
Public safety, including life and property	Moderate			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Minnesota Multimodal Transportation Planning and Design



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Transportation planning and road/bridge infrastructure. Existing lidar have been used for planning but not design and construction. The agency spends $400K (300 linear miles of highway corridor) annually to collect QL0 HD lidar for pre-construction survey instead of photogrammetry. The agency uses all forms of collection (aerial, drone, mobile). Lidar data are also used for geotech assessment and asset management. Mobile lidar is used for asset management and centerline mapping. QL3 lidar is sufficient for archaeological modeling of Indian burial mounds and other cultural resources. Bathymetry is needed for management of ports.
MCA Title	Minnesota Multimodal Transportation Planning and Design
MCA ID	22173
Organization Type	State or U.S. Territorial government
Organization Name	Minnesota DOT
Sub-Agency or Division	
Organization Mission	MnDOT plans for all the ways people and goods move throughout Minnesota — individually for each mode and together as a multimodal system.
Program Name	Minnesota's multimodal transportation system
Total Annual Program Budget	$3
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 19 - Land Navigation and Safety
Tertiary Business Use	BU 14 - Cultural Resources Preservation and Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Curb and gutter, road centerline/crown, pedestrian ramps for ADA. Bridge piers, dams, locks.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required

Inland Bathy Feature Size Requirements	Response
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	Varies by project	Varies by project	
Update Frequency	Event driven only – Data need to coincide with a specific event.	Varies by project	Varies by project	
Event type(s)	A new project. Urban areas are needed every 5 years, rural areas every 10 years.			
Quality Level and/or update frequency variability across AOI	QL0 HD is mission critical for any project requiring concrete quantity volumes due to cost of concrete. However, more projects outside of concrete are being asking for QL0 HD for the same reasons, cost savings in not having material overruns. QL1 for DEMs at current photogrammetric mapping specs.			
Acceptable Horizontal Error	Less than 20 cm	Varies by project	Varies by project	
Acceptable Vertical Error	Less than 5 cm	Varies by project	Varies by project	
How far onshore needed			Varies by project	
How far down the beach profile needed	Not applicable		Varies by project	
Tide correction requirement			Varies by project	
Cross sections and/or transects meet needs				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Nice to have
Entire AOI under same environmental conditions	Required	Required	Required		Required	Highly desirable
Other	Required					
Other description	Leaf-off					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	
DTM	Required	Required	Required	
DEM	Highly desirable	Highly desirable	Highly desirable	
Raw point cloud data	Required	Required	Highly desirable	
Classified point cloud	Required	Required	Highly desirable	
Edited/cube XYZ		Highly desirable	Highly desirable	
Full waveform	Not required	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Required	Highly desirable		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Required	Highly desirable	Nice to have	
Ground control/ground truthing	Required	Highly desirable	Required	
Other	Required			
Other description	Independent accuracy assessment adhering to ASPRS standards for spatial data. Would be done in-house by MN DOT on project basis.			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Required	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Required	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Not required	Not required	Not required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Highly desirable	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Routes			Highly desirable	
Offshore cadastral			Nice to have	
Lease areas			Not required	
Fixed obstructions			Required	
Floating observation/navigation systems			Required	
Shorelines – current, historic, change rates	Not required	Required	Required	
Land use/land cover	Not required	Not required	Nice to have	
Wetlands	Not required	Not required	Nice to have	
Estuaries			Nice to have	
Inland surface water features	Not required	Required	Nice to have	
Bridges/culverts	Required	Required		
Landmark features	Not required	Not required	Required	
Cultural resources	Not required	Not required	Not required	
Coastal and riverine structures	Not required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Metric camera digital aerial imagery/photogrammetry - 15cm @95% Drone small format digital aerial imagery/photogrammetry - 15cm @95% LEVELLED CONTROL Static lidar - 3cm @95% Mobile lidar - 3cm @95% Aerial lidar - 65cm @95% QL0 HD >30ppm Aerial lidar - 15cm RMSE - old statewide data becoming less and less useful for orthophoto production due to temporal resolution. GNSS CONTROLLED AERIAL LIDAR - The aerial LiDAR Digital Terrain Model (DTM) product must meet ASPRS Positional Accuracy Standards for Digital Geospatial Data (2014) for a 6 cm (0.20 feet) RMSEz Vertical Accuracy Class equating to Non-Vegetated Vertical Accuracy (NVA) =+/- 12 cm (0.4 feet) at 95% confidence level, and Vegetated Vertical Accuracy (VVA) of 30 cm (1 foot) RMSEz Vertical Accuracy Class equating to =+/- 30 cm (1 foot) at 95% confidence level.	Best available and self-collected	Best available and self-collected	

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	
NCEI			Yes	
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts		Yes	Yes	
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	http://arcgis.dnr.state.mn.us/maps/mntopo/			
Other	Yes	Yes	Yes	
Other description	Event based consultant or in-house acquisition	Event based consultant or in-house acquisition	Event based consultant or in-house acquisition	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	I don't know	
Cost savings/cost reduction	Major	Moderate	I don't know	
Cost avoidance	Moderate	I don't know	I don't know	
Increased revenues	None	I don't know	I don't know	
Mission-driven performance improvements	I don't know	I don't know	I don't know	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	I don't know	I don't know	
Improved response or timeliness	Major	I don't know	I don't know	
Improved customer experience	Major	I don't know	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	I don't know	I don't know	
Environmental	Minor	I don't know	I don't know	
Public safety, including life and property	Major	I don't know	I don't know	

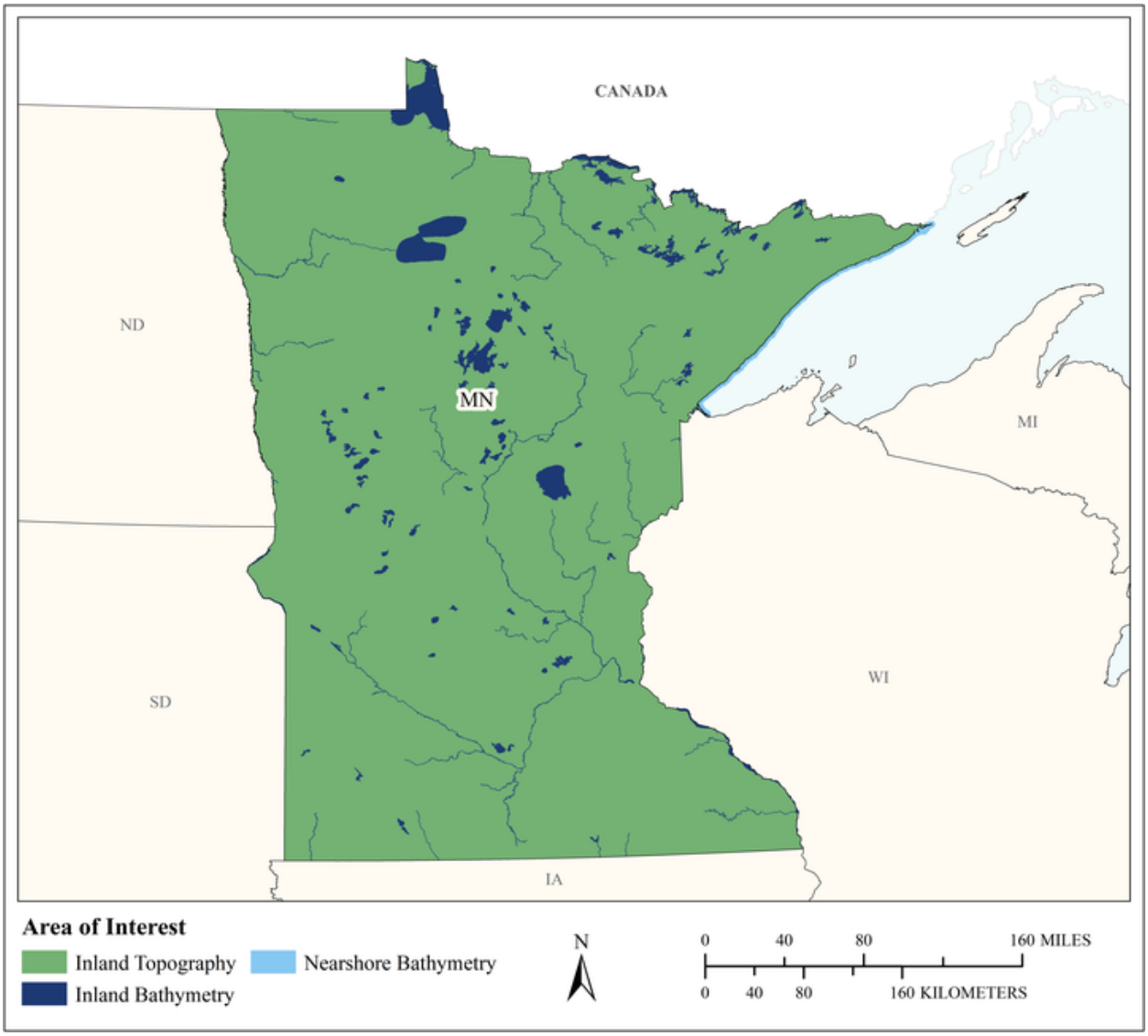
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Time savings description	We don't get feedback on quantity volume savings due to increased accuracy. Other than that, increases accuracy is saving money/time due to less material cost and less litigation with construction consultants. We work in local coordinate systems. This adds to the time budget.											
Cost savings/cost reduction	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost savings/cost reduction description	30-70% This assumes all elevation mapping projects are photogrammetric and otherwise are replaced. Range is a factor of urban vs rural mapping complexity. We don't get feedback on quantity volume savings due to increased accuracy. Other than that, increased accuracy is saving money/time due to less material cost and less litigation with construction consultants.											
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost avoidance description	Keep surveyors off the roads and out of potential traffic.											
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements description	Anecdotal evidence suggests that 3d models more easily convey info to stake holders and allow for planners to make more informed and accurate decisions.											
Other operational benefits	Major	Annual dollars saved/realized	$582,750									
Other operational benefits description	Ortho photo production time savings up to 60%. DTM compilation savings up to 75%. This assumes data is collected to meet the GNSS controlled specs listed in previous table. If statewide lidar is collected to meet base spec. 1.3, QL 2 the data would offer only a nominal value. Average current costs based on 1000' corridor mile. DTM = $750 Ortho = $450 Aerial collection = $500. Average of 700 miles per year. Temporal resolution good for 5 years on average.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Value added to products or services description	Some uses of data are unknown. Possibly autonomous vehicles.											
Improved response or timeliness	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Improved response or timeliness description	Mudslides and road washouts. Could provide comparison analysis before and after. Anecdotal evidence suggests that 3d models more easily convey info to stakeholders and allow for planners to make more informed and accurate decisions.											
Improved customer experience	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved customer experience description	Some uses of data are unknown. Possibly autonomous vehicles.											
Other customer service benefits	Major	Unable to provide										
Other customer service benefits description	30-70% This could replace a great majority of our elevation mapping projects if all acquisition/specs are met. Elevation mapping.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know			I don't know					
Environmental	I don't know			I don't know			I don't know					
Public safety, including life and property	I don't know			I don't know			I don't know					
Other	Less public dollars spent											
Other benefits	Moderate											
Other description	Less public dollars spent											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: County Government Services



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Nice to have	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Construction management for roads and bridges. Used heavily in Emergency Management and flood mitigation planning. We use elevation data for karst mapping and sand/gravel mining operation monitoring. Also for trail development for recreational use, flood modeling, extracting building footprints for 9-1-1, identifying sinkholes and burial mounds, and transportation pre-planning. Bathymetry are used for patrolling the St Croix River, identification of submerged sandbars, and locations where dams may be needed. Data are also used for solar capacity modeling for the installer community,
MCA Title	County Government Services
MCA ID	22222
Organization Type	Regional, County, City, or other local government
Organization Name	Combined response from representative counties
Sub-Agency or Division	
Organization Mission	Providing quality services through responsible leadership, innovation, and the cooperation of dedicated people
Program Name	Emergency Management
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	We need to identify individual buildings/structures.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL1B	
Update Frequency	6-10 years	4-5 years	6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	Less than 50 cm	Up to 1 meter	
Acceptable Vertical Error	Up to 20 cm	Up to 20 cm	Up to 20 cm	
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed	Not applicable		To MLLW	
Tide correction requirement			No requirement for tide correction	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Required	Required		Required	Required
Entire AOI under same environmental conditions	Required	Required	Required		Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Required	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Required	Nice to have	Nice to have	
Classified point cloud	Required	Nice to have	Nice to have	
Edited/cube XYZ		Highly desirable	Highly desirable	
Full waveform	Nice to have	Required	Highly desirable	
Bathymetric Attributed Grid (BAG)		Required	Highly desirable	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Highly desirable	
Ground control/ground truthing	Required	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Highly desirable	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Not required	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Highly desirable	Nice to have	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Not required	
Tide/wave heights			Nice to have	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Not required	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	

Combined response from representative counties – 277

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Required	Required	Not required	
Land use/land cover	Required	Highly desirable	Highly desirable	
Wetlands	Required	Required	Required	
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Not required	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Spring and fall of 2011 Mean Post Spacing = 1.5 meters (first return) <=15 centimeter RMSEz, 2-foot vertical accuracy (95% confidence) 1 meter horizontal accuracy Tiling scheme of 1:24,000 quarter-quarter quads (1/16 quad) – an area of 3.25 square miles Products livered included: Classified LAS format files Bare Earth Vegetation Buildings Water Edge-of-water breaklines for ponds and rivers One-meter raster DEM, hydro-flattened using breaklines 2-foot contours	None	None	

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	MN Geospatial Commons https://gisdata.mn.gov/dataset/elev-lidar-metro2011			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available	I don't know	
Cost savings/cost reduction	Major	Inland bathy data not available	I don't know	
Cost avoidance	Major	Inland bathy data not available	I don't know	
Increased revenues	None	Inland bathy data not available	I don't know	
Mission-driven performance improvements	Major	Inland bathy data not available	I don't know	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available	I don't know	
Improved response or timeliness	Major	Inland bathy data not available	I don't know	
Improved customer experience	Major	Inland bathy data not available	I don't know	

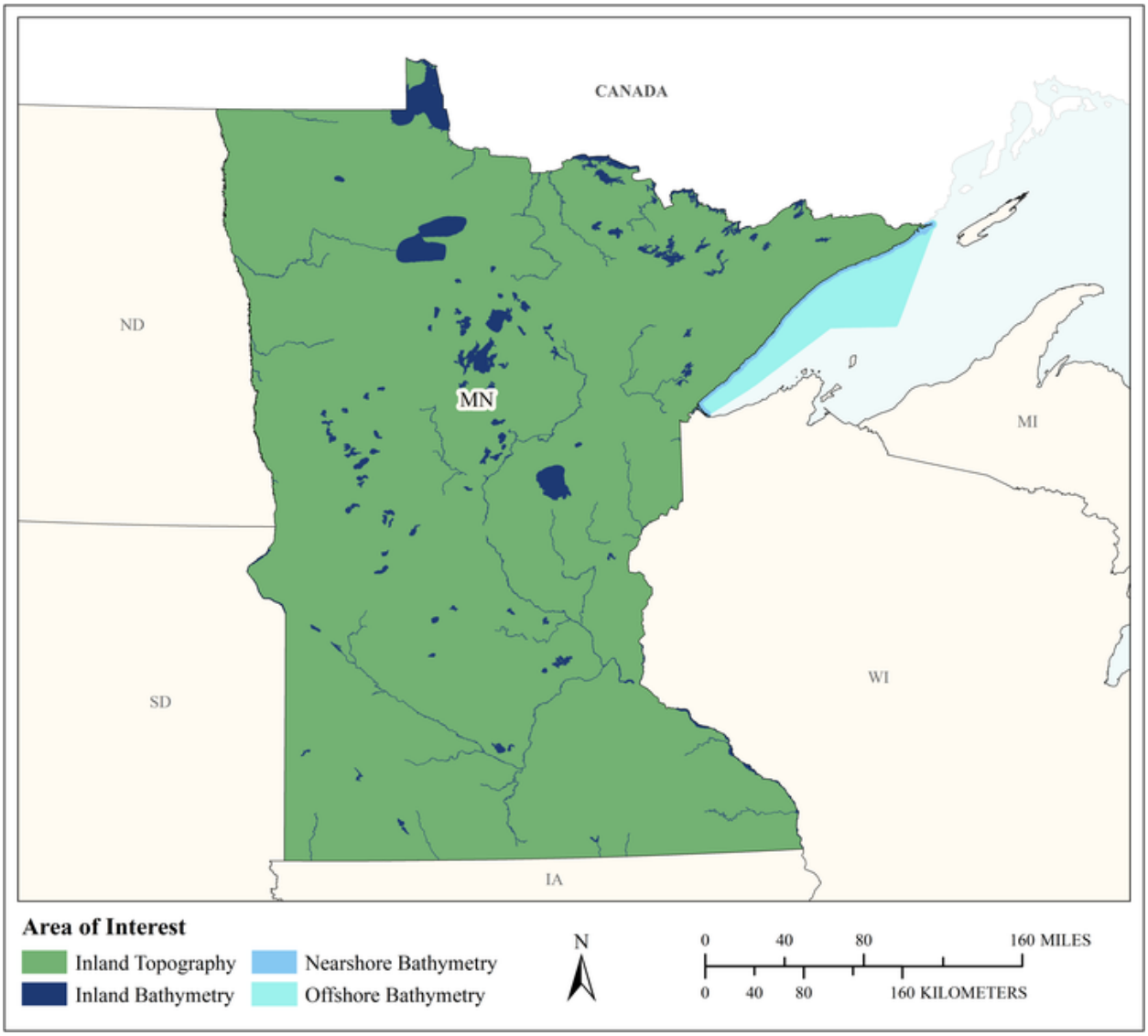
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Inland bathy data not available	I don't know	
Environmental	Major	Inland bathy data not available	I don't know	
Public safety, including life and property	Major	Inland bathy data not available	I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$6,633 to $7,538	I don't know	Unable to provide		I don't know	Unable to provide				
Time savings description	Data used for initial site analysis. Helps inform or avoid field inspections. Unknown.			Water patrol.								
Cost savings/cost reduction	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost savings/cost reduction description	We don't have a current quote, but figure 500 sq miles if contiguous lidar.											
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost avoidance description	We do not have the hardware, software or people to process lidar covering the entire county.											
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Mission-driven performance improvements description	Public Works/Highway departments save time and money on field work. Field workers are able to learn more about an area before visiting sites. Public Works/Highway departments save time and money on field work.			Useful for our water patrol, dive team and the fire dive rescue team. Improve safety of responders and improve recovery times.			Useful for our water patrol, dive team and the fire dive rescue team. Improve safety of responders and improve recovery times.					
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Value added to products or services description	Able to provide new products and better service to citizens.											
Improved response or timeliness	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness description	Better data improves the ability to analyze at risk areas. More up to date data means less errors in analysis.											
Improved customer experience	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved customer experience description	Property review for flood related activities with citizens.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			I don't know			I don't know					
Education or outreach description	We can create better visuals for decision makers that help with support for programs. Sharing 3D building modeling for planning and zoning. Smart cities.											
Environmental	Major			I don't know			I don't know					
Environmental description	I have done quite a bit of work with solar capacity modelling. Having this data helps to identify best location for solar and improves adoption of renewable energy. Ag conservation. Control point source pollution. Forest and vegetation management											
Public safety, including life and property	Major			Major			Major					
Public safety, including life and property description	In addition to flood modeling, we use updated structure location to aid our first responders			Useful for our water patrol, dive team and the fire dive rescue team			Useful for our water patrol, dive team and the fire dive rescue team					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Infrastructure and Construction Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Marine construction. Bridge design and construction. Engineering and construction of dams, levees, dikes, reservoirs, and coastal structures. Shipyard and port construction. Water, sewer, or power line planning and vegetation analysis. Pump, drain, and well placement. Stormwater modeling. Cut and fill analysis for earth-moving. Building site analysis. Road infrastructure. Infrastructure hardening or mitigation for climate change effects, e.g. sea level change.
MCA Title	Infrastructure and Construction Management
MCA ID	60619
Organization Type	State or U.S. Territorial government
Organization Name	State of Minnesota
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 28 - Telecommunications
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B	QL1B	Cross sections and/or transects meet needs
Update Frequency	4-5 years	4-5 years	4-5 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	Up to 2 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				Yes
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Highly desirable	Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Highly desirable	Highly desirable
DTM	Required	Required	Required	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Nice to have	Nice to have	Highly desirable
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Nice to have
Ground control/ground truthing	Required	Highly desirable	Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Highly desirable
Nautical and/or navigation charts			Nice to have	Nice to have
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required	Required	Highly desirable	Nice to have
Underwater videography			Not required	Nice to have
Bottom texture			Not required	Nice to have
Bottom type			Nice to have	Nice to have
Submerged features			Highly desirable	Nice to have
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Not required	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Nice to have	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Nice to have	Nice to have
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Highly desirable	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Highly desirable	Nice to have
Floating observation/navigation systems			Highly desirable	Nice to have
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Required	Highly desirable	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	Moderate
Cost savings/cost reduction	Major	Major	Minor	Moderate
Cost avoidance	Major	Moderate	Minor	Moderate
Increased revenues	Minor	None	None	Moderate
Mission-driven performance improvements	Moderate	Moderate	Minor	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate	Minor	Moderate

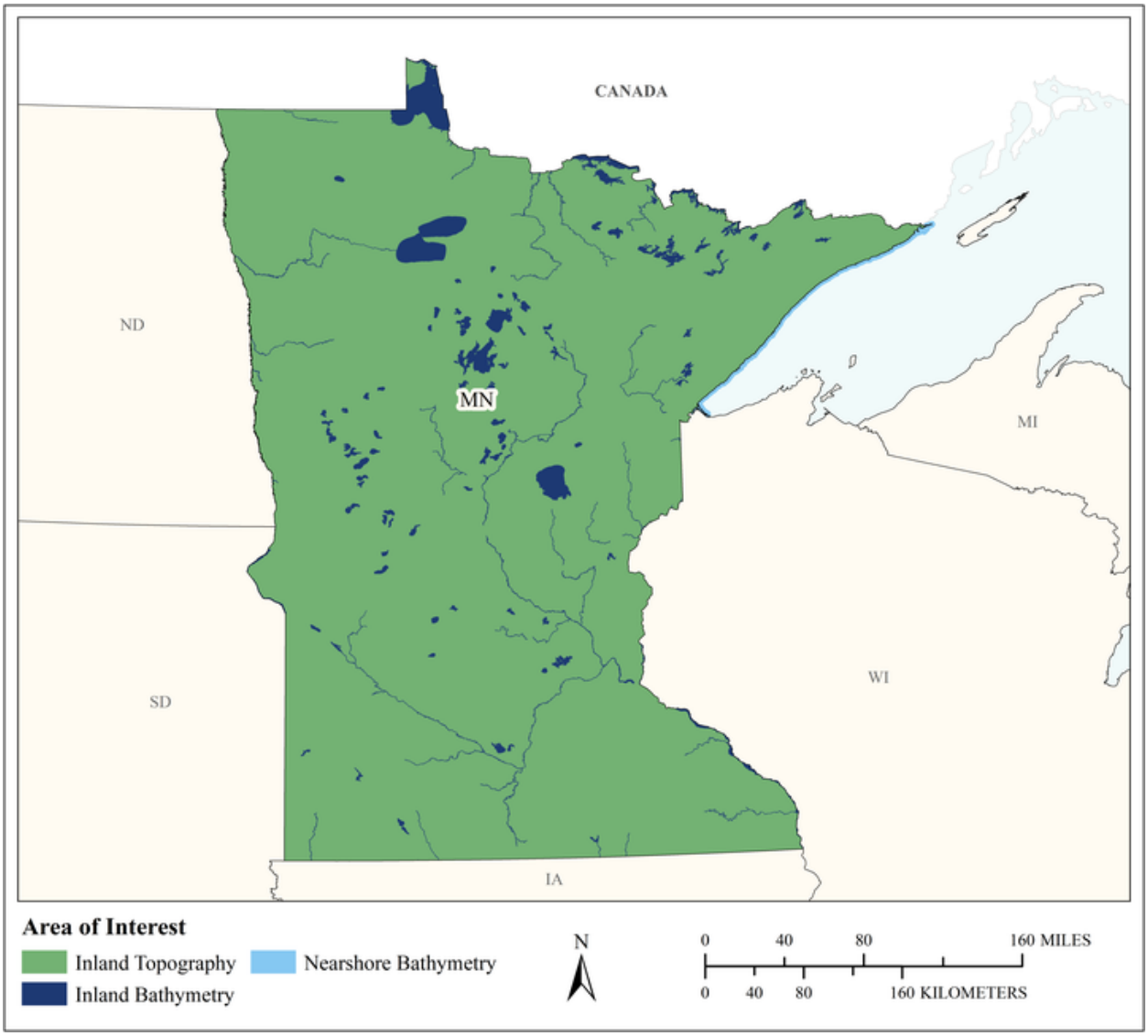
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major	Minor	Moderate
Improved customer experience	Moderate	Minor	Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	Minor	Moderate
Environmental	Moderate	Minor	Minor	Minor
Public safety, including life and property	Moderate	Moderate	Minor	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	None			None			Minor	Unable to provide		None		
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$3,791,890		Annual dollars saved/ realized	$1,277,548		Annual dollars saved/ realized	$1,135			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$11,158,769		Annual dollars saved/ realized	$132,658		Annual dollars saved/ realized	$156			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			Minor			Minor		
Environmental	Moderate			Moderate			Moderate			Major		
Public safety, including life and property	Major			Moderate			Major			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Urban and Regional Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Land development and zoning. Municipal mapping of building footprints and elevations. Port resilience planning. Parks and transportation planning. Virtual city creation. Urban ecology planning.
MCA Title	Urban and Regional Planning
MCA ID	60620
Organization Type	State or U.S. Territorial government
Organization Name	State of Minnesota
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL2B	
Update Frequency	4-5 years	6-10 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Required	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Required	Nice to have	Highly desirable	
Classified point cloud	Required	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Required	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Nice to have	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Minor	
Cost savings/cost reduction	Major	Minor	Minor	
Cost avoidance	Major	Minor	Minor	
Increased revenues	Minor	Minor	None	
Mission-driven performance improvements	Major	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Minor	

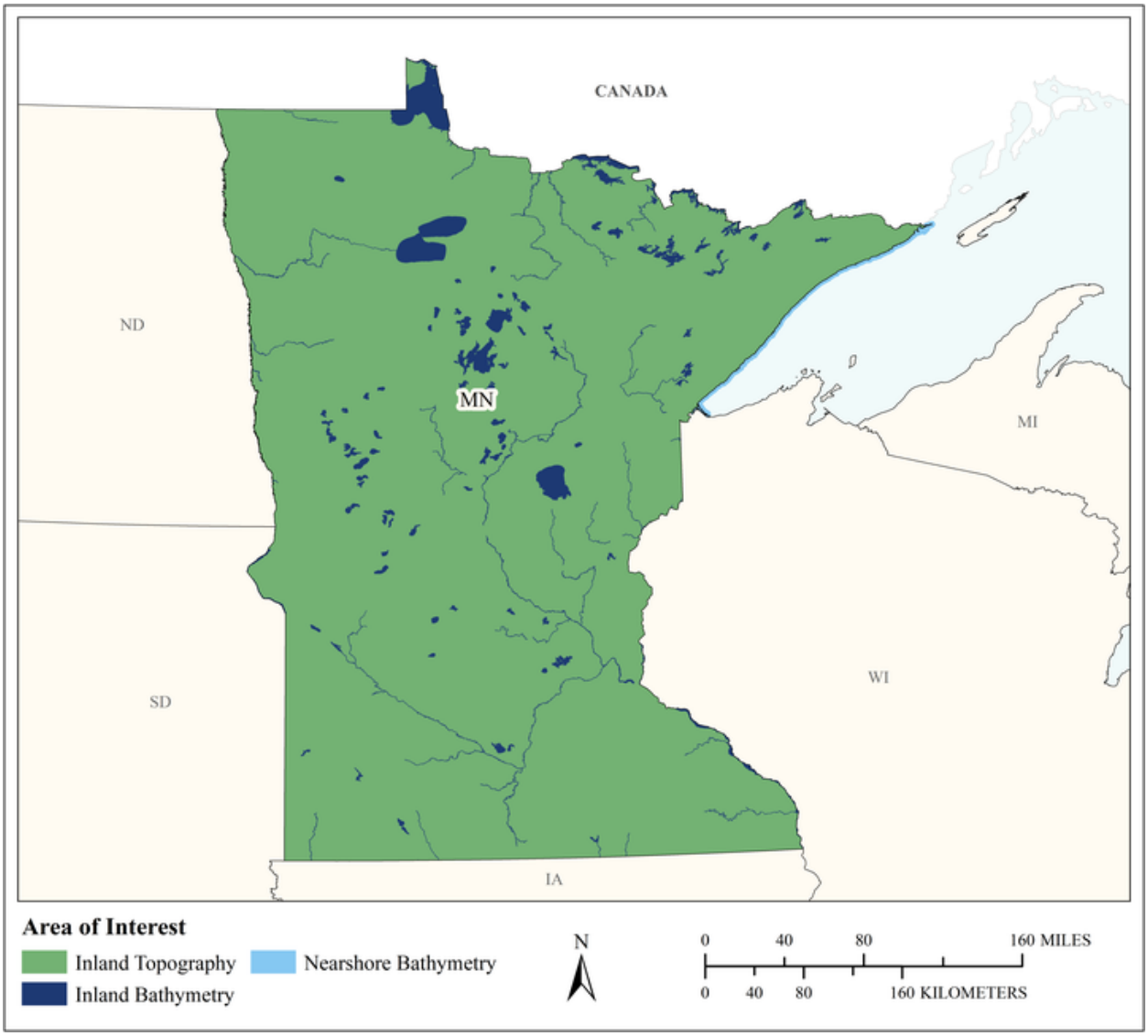
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	Minor	
Improved customer experience	Major	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	
Environmental	Major	Minor	Minor	
Public safety, including life and property	Major	Moderate	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$22,702,626		Annual dollars saved/ realized	$924,638		Annual dollars saved/ realized	$9,947			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$2,621,028		Annual dollars saved/ realized	$1,169,747		Annual dollars saved/ realized	$10,494			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate					
Environmental	Major			Moderate			Moderate					
Public safety, including life and property	Major			Major			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	
Hillshades	Yes		Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Health and Human Services



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Health emergency response. Habitat modeling and disease prevention. Defining boundaries for health advisories for swimming and fishing. Marine-based bioproducts and pharmaceuticals. Public health and safety. Prevention of waterborne diseases.
MCA Title	Health and Human Services
MCA ID	60621
Organization Type	State or U.S. Territorial government
Organization Name	State of Minnesota
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 24 - Health and Human Services
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	I don't know
Rivers and Streams	
Less than 10 ft	I don't know
10 - 50 ft	I don't know
51 - 100 ft	I don't know
101 - 500 ft	I don't know
501 - 2,500 ft	I don't know
Greater than 2,500 ft	I don't know
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	I don't know
½ - 1 acre	I don't know
1.1 – 2 acres	I don't know
2.1 – 5 acres	I don't know
5.1 – 10 acres	I don't know
Greater than 10 acres	I don't know

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	I don't know	I don't know	
Update Frequency	6-10 years	I don't know	I don't know	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	I don't know	I don't know	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					I don't know	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	I don't know	I don't know		I don't know	I don't know
Entire AOI under same environmental conditions	Not required	I don't know	I don't know		I don't know	I don't know
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	I don't know	I don't know		I don't know	I don't know
DEM for entire AOI needs to be seamless	Highly desirable	I don't know	I don't know		I don't know	I don't know
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	I don't know	I don't know	
DTM	Required	I don't know	I don't know	
DEM	Highly desirable	I don't know	I don't know	
Raw point cloud data	Highly desirable	I don't know	I don't know	
Classified point cloud	Highly desirable	I don't know	I don't know	
Edited/cube XYZ		I don't know	I don't know	
Full waveform	Highly desirable	I don't know	I don't know	
Bathymetric Attributed Grid (BAG)		I don't know	I don't know	
Breaklines required for standard hydro-flattening	Not required	I don't know		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			I don't know	
Tide Predictions			I don't know	
Tidal Constituent And Residual Interpolation (TCARI)			I don't know	
Intensity imagery/sidescan imagery	Nice to have	I don't know	I don't know	
Ground control/ground truthing	Nice to have	I don't know	I don't know	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			I don't know	
Nautical and/or navigation charts			I don't know	
Acoustic imagery of the seafloor			I don't know	
Aerial and/or satellite imagery	Highly desirable	I don't know	I don't know	
Underwater videography			I don't know	
Bottom texture			I don't know	
Bottom type			I don't know	
Submerged features			I don't know	
Subbottom characteristics			I don't know	
Geologic and seismic data	Nice to have	I don't know	I don't know	
Water column properties - Physical			I don't know	
Water column properties - Chemical			I don't know	
Water column properties - Biological			I don't know	
Currents			I don't know	
Tide/wave heights			I don't know	
Sea ice conditions			I don't know	
Habitat distribution and classification			I don't know	
Boundaries			I don't know	
Routes			I don't know	
Offshore cadastral			I don't know	
Lease areas			I don't know	
Fixed obstructions			I don't know	
Floating observation/navigation systems			I don't know	
Shorelines – current, historic, change rates	Not required	I don't know	I don't know	
Land use/land cover	Nice to have	I don't know	I don't know	
Wetlands	Not required	I don't know	I don't know	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			I don't know	
Inland surface water features	Not required	I don't know	I don't know	
Bridges/culverts	Nice to have	I don't know		
Landmark features	Nice to have	I don't know	I don't know	
Cultural resources	Nice to have	I don't know	I don't know	
Coastal and riverine structures	Not required	I don't know	I don't know	
Overhead structures			I don't know	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	I don't know	I don't know	
Cost savings/cost reduction	Major	I don't know	I don't know	
Cost avoidance	Major	I don't know	I don't know	
Increased revenues	None	I don't know	I don't know	
Mission-driven performance improvements	Major	I don't know	I don't know	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	I don't know	I don't know	

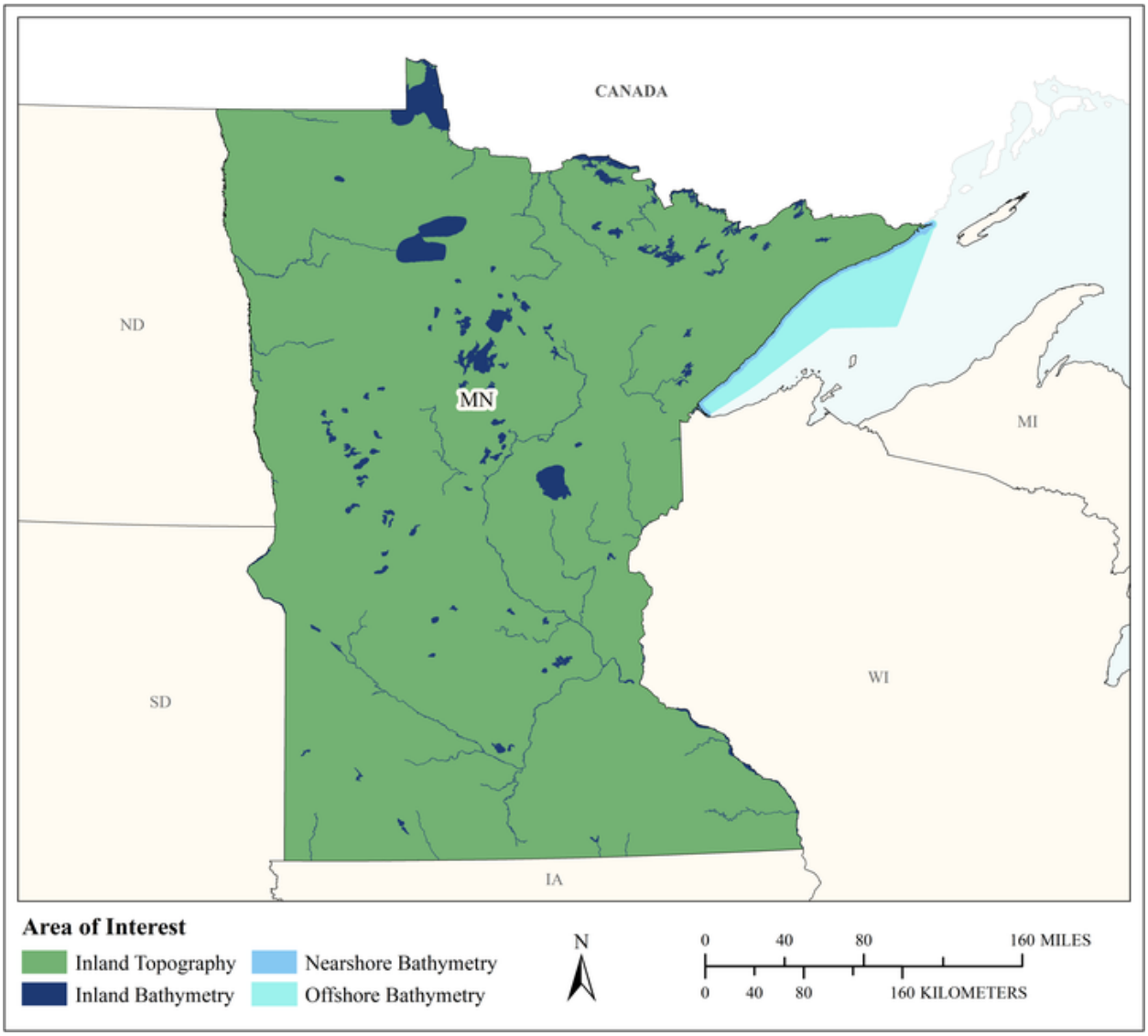
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor	I don't know	I don't know	
Improved customer experience	Minor	I don't know	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	Minor	
Environmental	Moderate	Moderate	Moderate	
Public safety, including life and property	Major	Major	Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost savings/cost reduction	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Increased revenues	None			I don't know	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$30,106									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness	Minor	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved customer experience	Minor	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$3									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			I don't know			I don't know					
Environmental	Moderate			I don't know			I don't know					
Public safety, including life and property	Major			I don't know			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Education K12 and Beyond, Basic Research



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Development of 3-D visualizations to help students understand the Earth they live on. Understanding of continental-scale climate change impacts. Ocean science. Ocean education. Scientific research. Data dissemination. Development of training simulators.
MCA Title	Education K12 and Beyond, Basic Research
MCA ID	60622
Organization Type	State or U.S. Territorial government
Organization Name	State of Minnesota
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 26 - Education K12 and Beyond, Basic Research
Secondary Business Use	BU 24 - Health and Human Services
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL1B	QL2B	Order 1a
Update Frequency	2-3 years	4-5 years	4-5 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Nice to have	Not required	Highly desirable	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Required	Nice to have	Not required	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required	Highly desirable	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Required	Required
DTM	Required	Highly desirable	Required	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Required	Required	Required	Required
Classified point cloud	Required	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Nice to have	Nice to have
Ground control/ground truthing	Highly desirable	Highly desirable	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Highly desirable
Underwater videography			Nice to have	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Highly desirable	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Highly desirable
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Required	Highly desirable	Highly desirable	Nice to have
Wetlands	Required	Highly desirable	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Nice to have	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Major	Minor
Cost savings/cost reduction	Major	Minor	Moderate	Minor
Cost avoidance	Major	Minor	Major	Moderate
Increased revenues	Minor	None	Minor	None
Mission-driven performance improvements	Major	Moderate	Major	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Major	Moderate

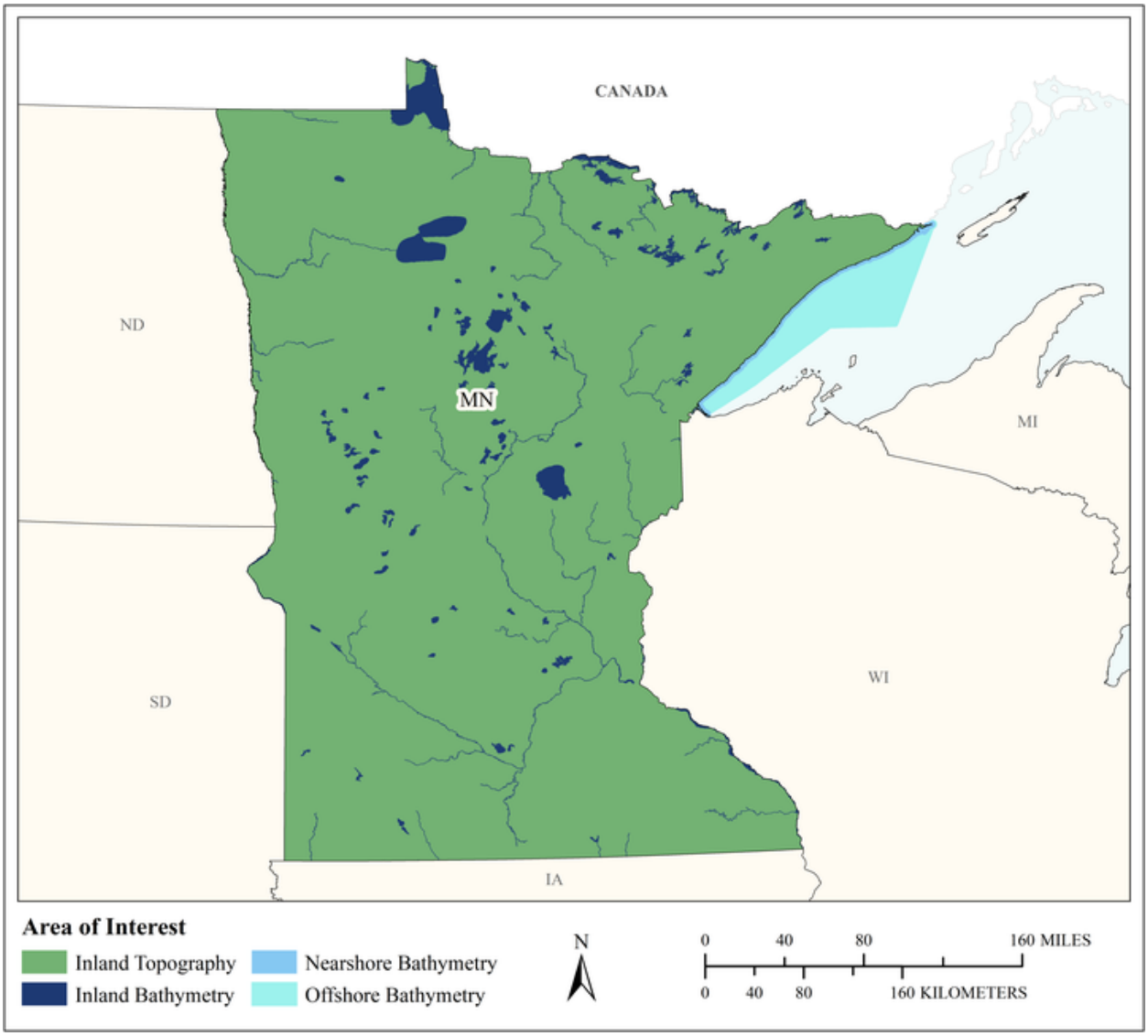
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	Minor	Minor
Improved customer experience	Major	Minor	Moderate	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major	Major	Major
Environmental	Major	Minor	Minor	Minor
Public safety, including life and property	Major	Moderate	Minor	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$443,412		Annual dollars saved/ realized	$115,957		Annual dollars saved/ realized	$356		Annual dollars saved/ realized	$4,580
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,059,884					Annual dollars saved/ realized	$14			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major			Major		
Environmental	Major			Major			Major			Minor		
Public safety, including life and property	Major			Major			Minor			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes			Yes
Aspect maps	Yes			Yes
Curvature maps	Yes			
Cross sections	Yes		Yes	Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Recreation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Planning and development of recreational facilities such as rafting, boating, swimming, diving, and fishing areas; ski slopes; and golf courses. Location- based products and services such as maps and guides. Tourism. Trail and vista site planning. Orienteering.
MCA Title	Recreation
MCA ID	60623
Organization Type	State or U.S. Territorial government
Organization Name	State of Minnesota
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 27 - Recreation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	I don't know
Update Frequency	4-5 years	4-5 years	4-5 years	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required	Highly desirable	I don't know	Not required	Not required
Entire AOI under same environmental conditions	Required	Not required	Highly desirable	I don't know	Not required	Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Nice to have	I don't know	Nice to have	Not required
DEM for entire AOI needs to be seamless	Required	Nice to have	Nice to have	I don't know	Nice to have	Not required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	I don't know
DTM	Nice to have	Highly desirable	Highly desirable	I don't know
DEM	Required	Required	Required	I don't know
Raw point cloud data	Nice to have	Nice to have	Not required	I don't know
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Nice to have	I don't know
Full waveform	Not required	Nice to have	Not required	I don't know
Bathymetric Attributed Grid (BAG)		Highly desirable	Nice to have	I don't know
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	I don't know
Tide Predictions			Nice to have	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	I don't know
Intensity imagery/sidescan imagery	Not required	Nice to have	Not required	I don't know
Ground control/ground truthing	Nice to have	Nice to have	Not required	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	I don't know
Nautical and/or navigation charts			Not required	I don't know
Acoustic imagery of the seafloor			Not required	I don't know
Aerial and/or satellite imagery	Required	Required	Not required	I don't know
Underwater videography			Not required	I don't know
Bottom texture			Nice to have	I don't know
Bottom type			Highly desirable	I don't know
Submerged features			Highly desirable	I don't know
Subbottom characteristics			Nice to have	I don't know
Geologic and seismic data	Not required	Highly desirable	Nice to have	I don't know
Water column properties - Physical			Nice to have	I don't know
Water column properties - Chemical			Nice to have	I don't know
Water column properties - Biological			Nice to have	I don't know
Currents			Nice to have	I don't know
Tide/wave heights			Nice to have	I don't know
Sea ice conditions			Not required	I don't know
Habitat distribution and classification			Highly desirable	I don't know
Boundaries			Not required	I don't know
Routes			Nice to have	I don't know
Offshore cadastral			Nice to have	I don't know
Lease areas			Nice to have	I don't know
Fixed obstructions			Highly desirable	I don't know
Floating observation/navigation systems			Highly desirable	I don't know
Shorelines – current, historic, change rates	Not required	Highly desirable	Highly desirable	
Land use/land cover	Nice to have	Highly desirable	Highly desirable	I don't know
Wetlands	Highly desirable	Highly desirable	Highly desirable	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	I don't know
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Not required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Minor	I don't know
Cost savings/cost reduction	Moderate	Minor	Minor	I don't know
Cost avoidance	Major	Minor	Minor	I don't know
Increased revenues	None	Minor	Minor	I don't know
Mission-driven performance improvements	Major	Minor	Minor	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor	Minor	I don't know

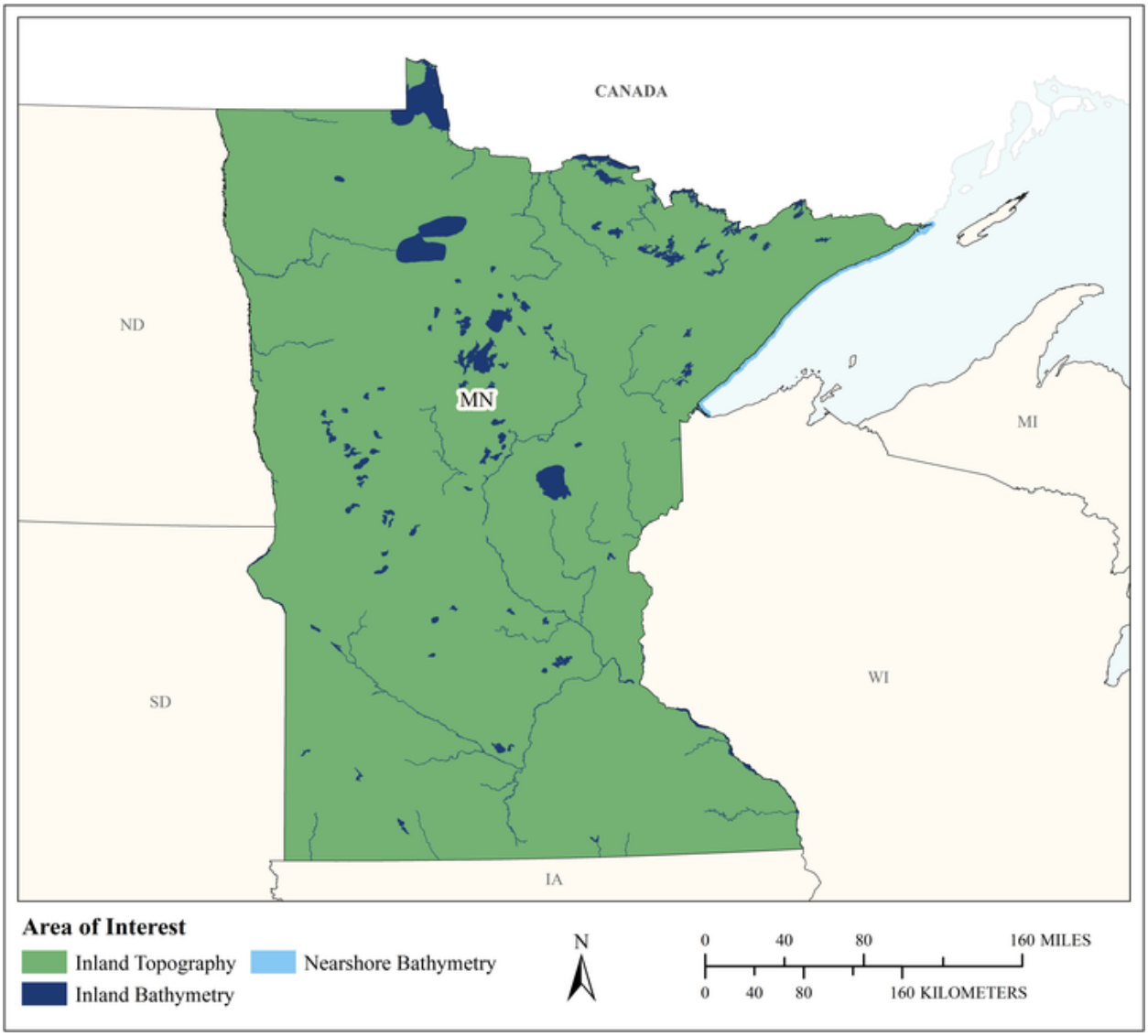
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	Minor	Minor	I don't know
Improved customer experience	Moderate	Minor	Minor	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	I don't know
Environmental	Major	Minor	Minor	I don't know
Public safety, including life and property	Major	Minor	Minor	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Increased revenues	None			Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Major			I don't know		
Environmental	Moderate			Major			Major			I don't know		
Public safety, including life and property	Moderate			Moderate			Moderate			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes		
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Telecommunications



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Telecommunication tower site selection. Design of radio and radar systems. Interference analysis. Path profiles. Undersea telecommunication route selection and deployment.
MCA Title	Telecommunications
MCA ID	60624
Organization Type	State or U.S. Territorial government
Organization Name	State of Minnesota
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 28 - Telecommunications
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL2B	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required	Highly desirable		Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Not required	Highly desirable		Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have	Highly desirable	
DTM	Highly desirable	Nice to have	Highly desirable	
DEM	Highly desirable	Nice to have	Highly desirable	
Raw point cloud data	Highly desirable	Nice to have	Highly desirable	
Classified point cloud	Required	Nice to have	Highly desirable	
Edited/cube XYZ		Nice to have	Highly desirable	
Full waveform	Highly desirable	Nice to have	Highly desirable	
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Highly desirable	Not required	Highly desirable	
Ground control/ground truthing	Highly desirable	Nice to have	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	
Underwater videography			Highly desirable	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Nice to have	Highly desirable	Nice to have	
Water column properties - Physical			Highly desirable	
Water column properties - Chemical			Highly desirable	
Water column properties - Biological			Highly desirable	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Highly desirable	
Habitat distribution and classification			Highly desirable	
Boundaries			Highly desirable	
Routes			Highly desirable	
Offshore cadastral			Highly desirable	
Lease areas			Highly desirable	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Required	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Highly desirable	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Required	Highly desirable	Highly desirable	
Cultural resources	Required	Highly desirable	Highly desirable	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI		Yes		
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	I don't know	
Cost savings/cost reduction	Major	Major	I don't know	
Cost avoidance	Major	Major	I don't know	
Increased revenues	None	None	I don't know	
Mission-driven performance improvements	Major	Major	I don't know	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	I don't know	

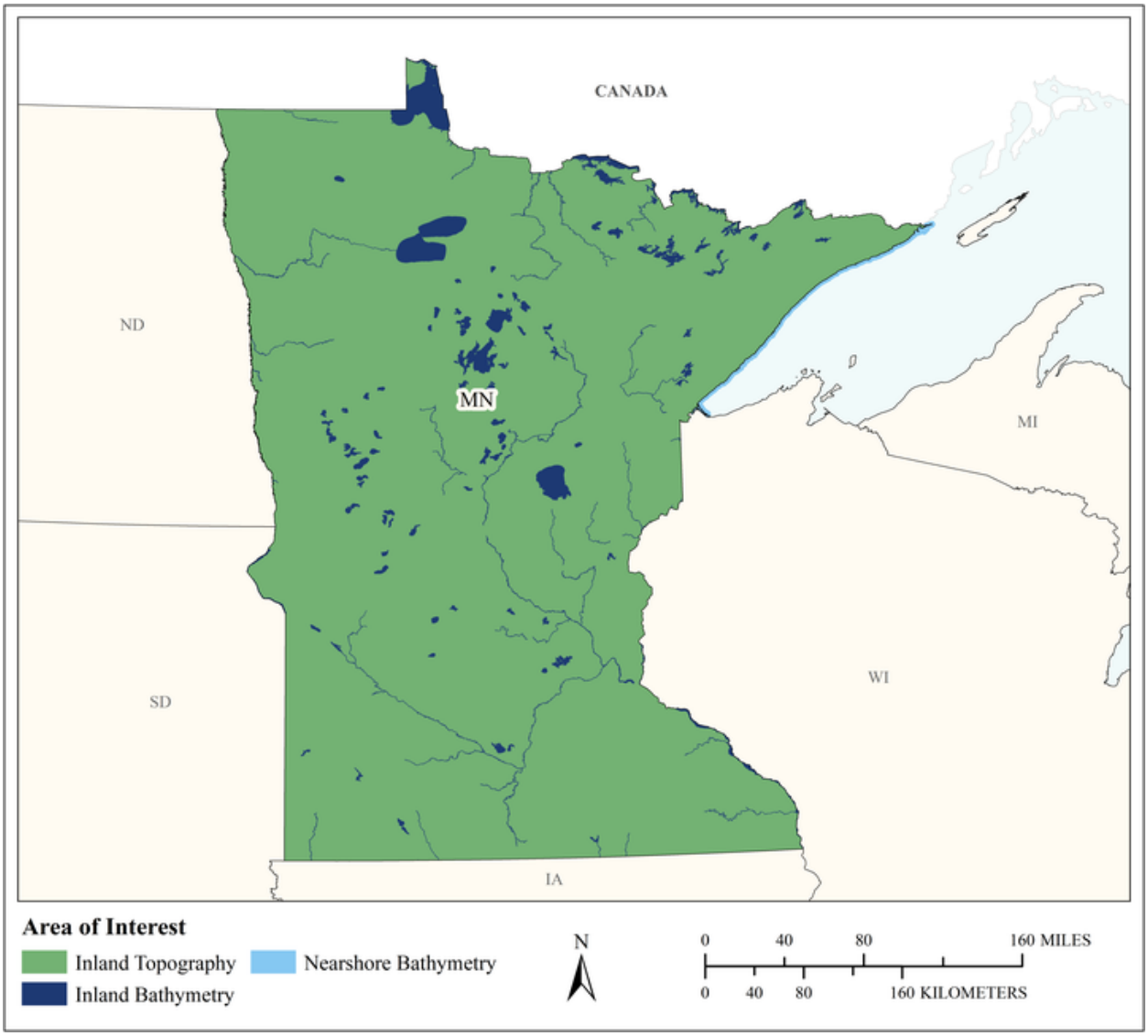
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major	Major	I don't know	
Improved customer experience	Major	Major	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	Minor	Minor	
Environmental	None	Minor	Minor	
Public safety, including life and property	Major	Major	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know			I don't know					
Environmental	I don't know			I don't know			I don't know					
Public safety, including life and property	I don't know			Major			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Military



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Tactical military operations. Strategic defense. Amphibious landings and logistics over-the-shore. Operation of ships and submarines. Weapons system testing. Management of flight facilities and offshore launch or target areas.
MCA Title	Military
MCA ID	60625
Organization Type	State or U.S. Territorial government
Organization Name	State of Minnesota
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 29 - Military
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	I don't know
Tops of vegetation	I don't know
Tops of submerged structures, objects	I don't know
Tops of submerged vegetation	I don't know
Subcanopy of vegetation/understory	I don't know
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	I don't know
Ocean/sea bottom (>10 m deep)	I don't know

General Geographic Area and Size	
Average geographic extent of day-to-day area	
Smallest 3D features needed	
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	I don't know
Rivers and Streams	
Less than 10 ft	I don't know
10 - 50 ft	I don't know
51 - 100 ft	I don't know
101 - 500 ft	I don't know
501 - 2,500 ft	I don't know
Greater than 2,500 ft	I don't know
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	I don't know
½ - 1 acre	I don't know
1.1 – 2 acres	I don't know
2.1 – 5 acres	I don't know
5.1 – 10 acres	I don't know
Greater than 10 acres	I don't know

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	I don't know	I don't know	I don't know	
Update Frequency	I don't know	I don't know	I don't know	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	I don't know	I don't know	I don't know	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	I don't know
Hydro-enforcement	I don't know
Hydro-conditioning	I don't know
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					I don't know	
Temporal Seamlessness						
Entire AOI in same acquisition season	I don't know	I don't know	I don't know		I don't know	I don't know
Entire AOI under same environmental conditions	I don't know	I don't know	I don't know		I don't know	I don't know
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	I don't know	I don't know	I don't know		I don't know	I don't know
DEM for entire AOI needs to be seamless	I don't know	I don't know	I don't know		I don't know	I don't know
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	I don't know	I don't know	I don't know	
DTM	I don't know	I don't know	I don't know	
DEM	I don't know	I don't know	I don't know	
Raw point cloud data	I don't know	I don't know	I don't know	
Classified point cloud	I don't know	I don't know	I don't know	
Edited/cube XYZ		I don't know	I don't know	
Full waveform	I don't know	I don't know	I don't know	
Bathymetric Attributed Grid (BAG)		I don't know	I don't know	
Breaklines required for standard hydro-flattening	I don't know	I don't know		
Additional breaklines for hydro-enforcement of culverts	I don't know			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			I don't know	
Tide Predictions			I don't know	
Tidal Constituent And Residual Interpolation (TCARI)			I don't know	
Intensity imagery/sidescan imagery	I don't know	I don't know	I don't know	
Ground control/ground truthing	I don't know	I don't know	I don't know	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			I don't know	
Nautical and/or navigation charts			I don't know	
Acoustic imagery of the seafloor			I don't know	
Aerial and/or satellite imagery	I don't know	I don't know	I don't know	
Underwater videography			I don't know	
Bottom texture			I don't know	
Bottom type			I don't know	
Submerged features			I don't know	
Subbottom characteristics			I don't know	
Geologic and seismic data	I don't know	I don't know	I don't know	
Water column properties - Physical			I don't know	
Water column properties - Chemical			I don't know	
Water column properties - Biological			I don't know	
Currents			I don't know	
Tide/wave heights			I don't know	
Sea ice conditions			I don't know	
Habitat distribution and classification			I don't know	
Boundaries			I don't know	
Routes			I don't know	
Offshore cadastral			I don't know	
Lease areas			I don't know	
Fixed obstructions			I don't know	
Floating observation/navigation systems			I don't know	
Shorelines – current, historic, change rates	I don't know	I don't know	I don't know	
Land use/land cover	I don't know	I don't know	I don't know	
Wetlands	I don't know	I don't know	I don't know	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			I don't know	
Inland surface water features	I don't know	I don't know	I don't know	
Bridges/culverts	I don't know	I don't know		
Landmark features	I don't know	I don't know	I don't know	
Cultural resources	I don't know	I don't know	I don't know	
Coastal and riverine structures	I don't know	I don't know	I don't know	
Overhead structures			I don't know	
Lowest Floor Elevation of Buildings	I don't know			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know	I don't know	I don't know	
Cost savings/cost reduction	I don't know	I don't know	I don't know	
Cost avoidance	I don't know	I don't know	I don't know	
Increased revenues	I don't know	I don't know	I don't know	
Mission-driven performance improvements	I don't know	I don't know	I don't know	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know	I don't know	I don't know	

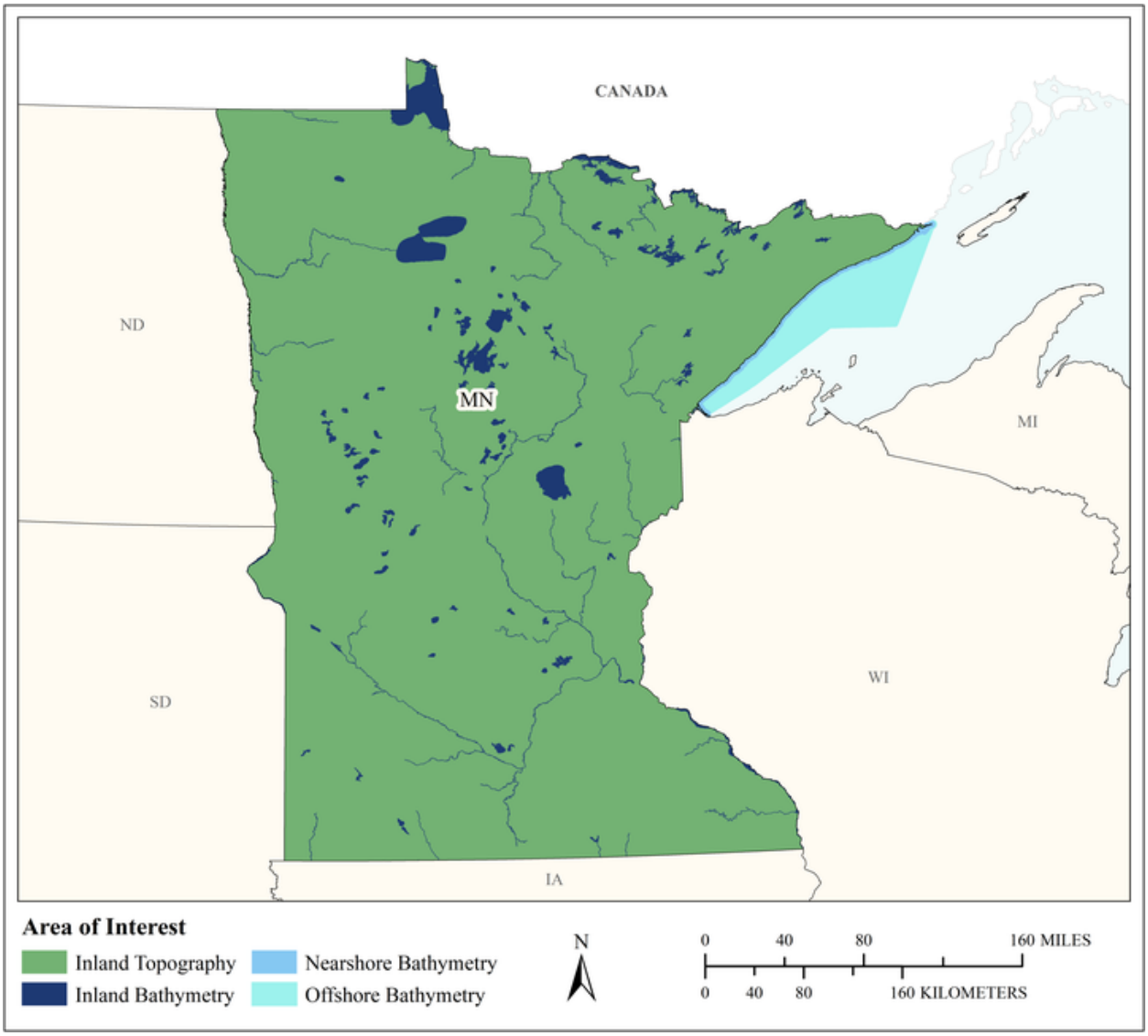
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	I don't know	I don't know	I don't know	
Improved customer experience	I don't know	I don't know	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Moderate	
Environmental	Moderate	Moderate	Moderate	
Public safety, including life and property	Major	Moderate	Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know			I don't know					
Environmental	I don't know			I don't know			I don't know					
Public safety, including life and property	I don't know			I don't know			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Maritime and Land Boundary Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Delimitation of legal and other coastal boundaries, inland boundaries, and ordinary high water lines (OHWL).
MCA Title	Maritime and Land Boundary Management
MCA ID	60626
Organization Type	State or U.S. Territorial government
Organization Name	State of Minnesota
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 30 - Maritime and Land Boundary Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B	QL0B	I don't know
Update Frequency	6-10 years	6-10 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Highly desirable	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Nice to have	Nice to have	Highly desirable	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable	Highly desirable	Required	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable	Highly desirable	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	Required
DTM	Required	Required	Required	Required
DEM	Highly desirable	Required	Required	Required
Raw point cloud data	Nice to have	Highly desirable	Required	Required
Classified point cloud	Highly desirable	Highly desirable	Required	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Not required	Nice to have
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Not required
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Nice to have	Required	Not required	Not required
Ground control/ground truthing	Highly desirable	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Required	Highly desirable	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Nice to have
Water column properties - Biological			Not required	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Highly desirable	Nice to have
Routes			Nice to have	Highly desirable
Offshore cadastral			Highly desirable	Nice to have
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Required	Required
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Nice to have
Wetlands	Required	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Highly desirable	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Minor	None	I don't know
Cost savings/cost reduction	Moderate	None	Minor	Moderate
Cost avoidance	Moderate	None	Minor	Moderate
Increased revenues	Minor	None	None	I don't know
Mission-driven performance improvements	Major	None	Moderate	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None	None	I don't know

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	None	Minor	Moderate
Improved customer experience	Major	None	Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	Minor	Moderate
Environmental	Major	Moderate	Minor	Moderate
Public safety, including life and property	Minor	Minor	Minor	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	Minor	Unable to provide		None			None			I don't know	Unable to provide	
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Moderate			Moderate		
Environmental	Minor			Major			Major			Major		
Public safety, including life and property	None			Moderate			Moderate			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps		Yes		
Cross sections		Yes		
Height-Above-Ground maps		Yes		
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

Mississippi

Mississippi has a dispersed population of nearly three million residents in an area of approximately 48,000 square miles (~125,000 square kilometers). Consisting of mostly low hills and lowland plains, the exception is the Mississippi Alluvial Plain or 'The Delta' which has an average slope of four inches per mile from Memphis to Vicksburg. Most of the state has Quality Level 3 (QL3) data less than 10 years old. Due to the low slope of the Delta region, a higher quality level of data is justifiable to better plan and mitigate ever-present drainage issues. Much as with the early days of LiDAR adoption, bathymetric requirements for the state continue to be developed as the general understanding of the applications for the data are better understood. Despite the depth of our sediment rich waters being crucial to so many decisions, people are only recently beginning to shed the long-standing idea of such information as 'unobtainable'

Traditionally, flooding is the major elevation concern of Mississippi. Resource management is another prime use for elevation data in the state. Government, private sector, researchers, and the public all use the elevation data regularly for planning and management purposes.

Mississippi currently has a decent coverage of elevation data. QL2 is sufficient for the vast majority of hilly areas other than for specific projects/special purposes. The Delta region, near-inland coast, and low-lying areas prone to flooding should all have QL1 data. Mississippi is a coastal state built on the ready availability of water travel. Bathymetric data is not only of extreme importance but is also naturally more dynamic than terrestrial changes in our state. Bathymetric data requires a higher refresh rate to reflect the many unseen changes occurring under the water surface.

Repetitive losses due to flooding could be prevented with the better resource management and planning made possible with higher level data.

There is a proven need for higher resolution bathymetry in the Mississippi Sound and beyond the barrier islands within the artificial reefs. Additional areas throughout the state are expected to have a high demand in the future as more people apply bathymetry data to their workflows.

The State of Mississippi has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

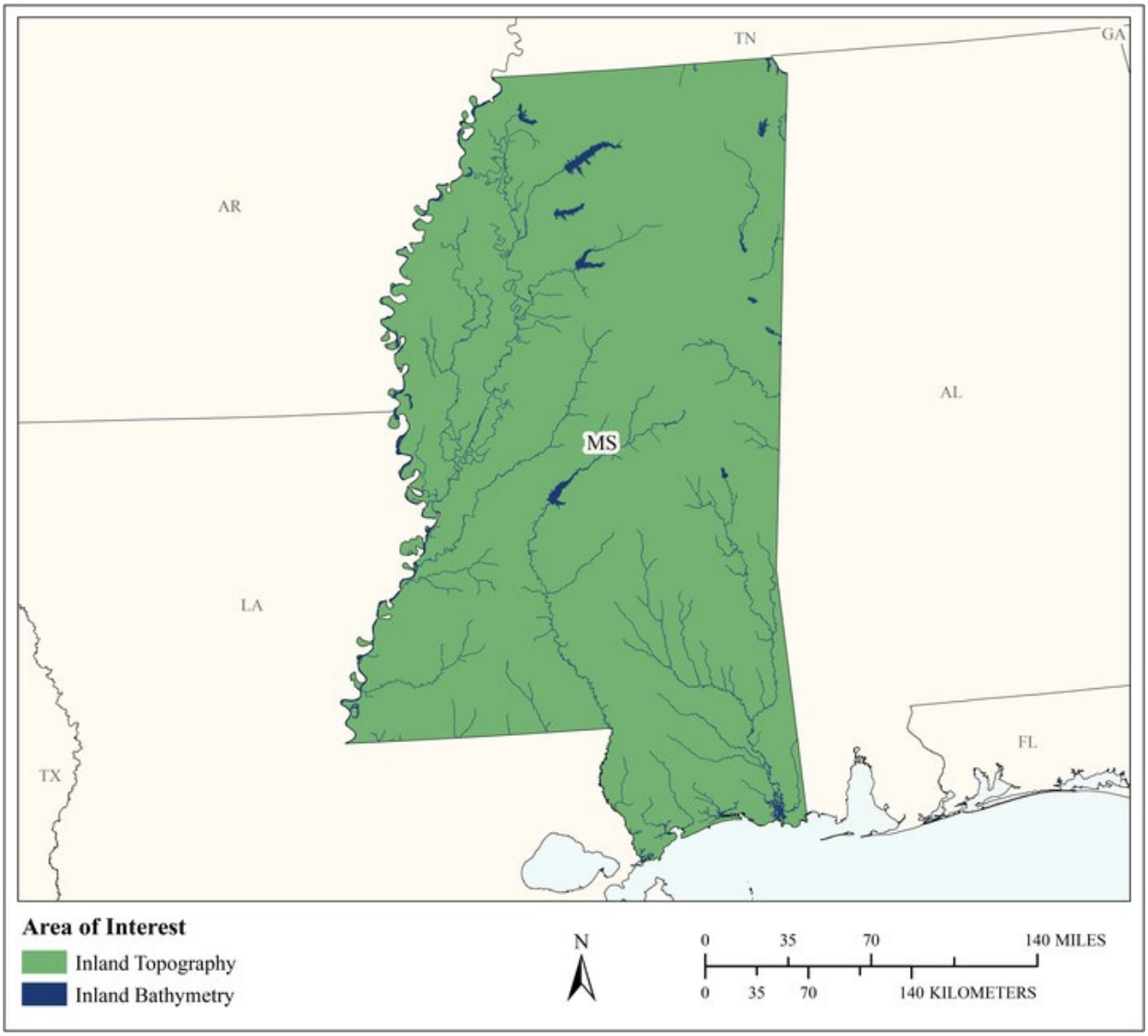
Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	State of Mississippi	60244	Water Supply and Quality	Inland Topo	QL2	4-5 years	$264,291	$70,791	Moderate	Major	Moderate
				Inland Bathy	QL1B	6-10 years	$1,143,345	$119,484	Moderate	Major	Moderate
BU 02 – Riverine Ecosystem Management	Mississippi Automated Resource Information System	22152	Geospatial Clearinghouse Activities	Inland Topo	QL0 HD	(a) 2-3 years (b) 6-10 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 03 – Coastal Zone Management	Mississippi Department of Marine Resources	21682	Coastal Resource Management	Inland Topo	QL1	4-5 years	$92,726	$16,210	I don't know	Moderate	I don't know
				Inland Bathy	I don't know	4-5 years	$39,791	$23,327	None	Moderate	Minor
				Nearshore Bathy	QL3B	6-10 years	$183,973	$311,213	I don't know	Moderate	I don't know
				Offshore Bathy	I don't know	(a) 4-5 years (b) >10 years	Unable to quantify	Unable to quantify	I don't know	Moderate	I don't know
BU 04 – Forest Resource Management	Mississippi Forestry Commission	1411	Forest Resources Management	Inland Topo	QL1 HD	4-5 years	$94,068	Unable to quantify	Minor	Major	Moderate
BU 06 – Natural Resource Management	Mississippi Department of Environmental Quality	21481	Environmental Quality	Inland Topo	(a) QL1 (b) QL2	(a) 2-3 years (b) 6-10 years	$1,869,609	$6,865,775	Minor	Major	Major
				Inland Bathy	Cross sections and/or transects meet needs	Event driven	$253,404	$11,407	I don't know	I don't know	I don't know
BU 07 – Wildlife and Habitat Management	Mississippi Department of Wildlife, Fisheries, and Parks	22087	Conservation Planning for Wildlife Management	Inland Topo	QL2	4-5 years	$10,854	Unable to quantify	Minor	Moderate	Moderate
				Inland Bathy	QL1B	4-5 years	$25,657	Unable to quantify	Moderate	Moderate	Moderate
BU 07 – Wildlife and Habitat Management	Mississippi State University	22122	Habitat and Ecosystem Mapping	Inland Topo	QL1	Annually	$47,798	Unable to quantify	Minor	Major	I don't know
				Nearshore Bathy	QL1B	Annually	$50,652	Unable to quantify	Minor	Major	I don't know
BU 14 – Cultural Resource Management	State of Mississippi	60245	Cultural Resources Preservation and Management	Inland Topo	QL1	4-5 years	$8,736	$7,638	Minor	Minor	Minor
BU 15 – Flood Risk Management	State of Mississippi	60246	Flood Risk Management	Inland Topo	QL2	4-5 years	$6,692,622	$1,170,999	Major	Moderate	Major
				Inland Bathy	QL1B	4-5 years	$464,915	$521,981	Moderate	Moderate	Major

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 18 – Homeland Security	State of Mississippi	60247	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management	Inland Topo	QL2	4-5 years	$1,406,162	$24,853	Major	Moderate	Major
BU 19 – Land Navigation	State of Mississippi	60248	Land Navigation and Safety	Inland Topo	QL0	2-3 years	$617,486	$49,865	Minor	Major	Major
				Inland Bathy	QL0B	2-3 years	$26,338	$272	Minor	Moderate	Moderate
BU 21 – Aviation Navigation	State of Mississippi	60249	Aviation Navigation and Safety	Inland Topo	QL1 HD	Annually	$161,138	$200,691	Minor	Moderate	Moderate
BU 25 – Real Estate, Banking, and Insurance	State of Mississippi	60250	Real Estate, Banking, Mortgage, and Insurance	Inland Topo	QL1 HD	4-5 years	$1,656,183	Unable to quantify	Minor	Minor	Major
BU 26 – Education and Basic Research	University of Southern Mississippi	1469	Geodetic Monitoring and Geospatial Modeling and Mapping the Effects of Sea Level Rise or Subsidence	Inland Topo	QL0 HD	Annually	$48,971	$7,537	Major	None	None
				Inland Bathy	QL0B	Annually	$85,316	Unable to quantify	Major	Major	Moderate
				Nearshore Bathy	Cross sections and/or transects meet needs	Annually	$3,015	Unable to quantify	Major	Major	Major
BU 26 – Education and Basic Research	Mississippi State University	22056	Geospatial Education and Research	Inland Topo	QL0	Depends on research project	$250,491	$598,748	Major	I don't know	Major
				Inland Bathy	QL1B	2-3 years	$63,124	Unable to quantify	Major	I don't know	Major
				Nearshore Bathy	QL3B	Annually	$2,693	$106	Major	Major	Major
BU 26 – Education and Basic Research	University of Southern Mississippi	22191	Hydrographic Survey Education and Research	Inland Bathy	QL0B	4-5 years	$2,381	Unable to quantify	Major	Minor	None
				Nearshore Bathy	QL0B	4-5 years	$2,693	$106	Major	None	I don't know
				Offshore Bathy	Order 1a	6-10 years	Unable to quantify	Unable to quantify	Major	None	I don't know
BU 27 – Recreation	State of Mississippi	60251	Recreation	Inland Bathy	QL0B	4-5 years	$6,586	Unable to quantify	Major	Major	Moderate
BU 28 – Telecom-munications	State of Mississippi	60252	Telecommunications	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 30 – Maritime and Land Boundary Management	State of Mississippi	60253	Maritime and Land Boundary Management	Inland Bathy	QL2B	6-10 years	$40,252	Unable to quantify	Major	Major	Moderate
				Nearshore Bathy	QL0B	2-3 years	$188,679	Unable to quantify	Moderate	Major	Moderate

MCA Title: Water Supply and Quality



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Fate and transport of contaminants. Pollution risk mitigation. Runoff and sedimentation analyses. Point- or non-point source pollution modeling. Management of contaminants and marine debris - point, non-point, vessel, and atmospheric pollution; spills; trash.
MCA Title	Water Supply and Quality
MCA ID	60244
Organization Type	State or U.S. Territorial government
Organization Name	State of Mississippi
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B		
Update Frequency	4-5 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Required			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Highly desirable	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	Major	Minor		
Increased revenues	Minor	None		
Mission-driven performance improvements	Major	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		

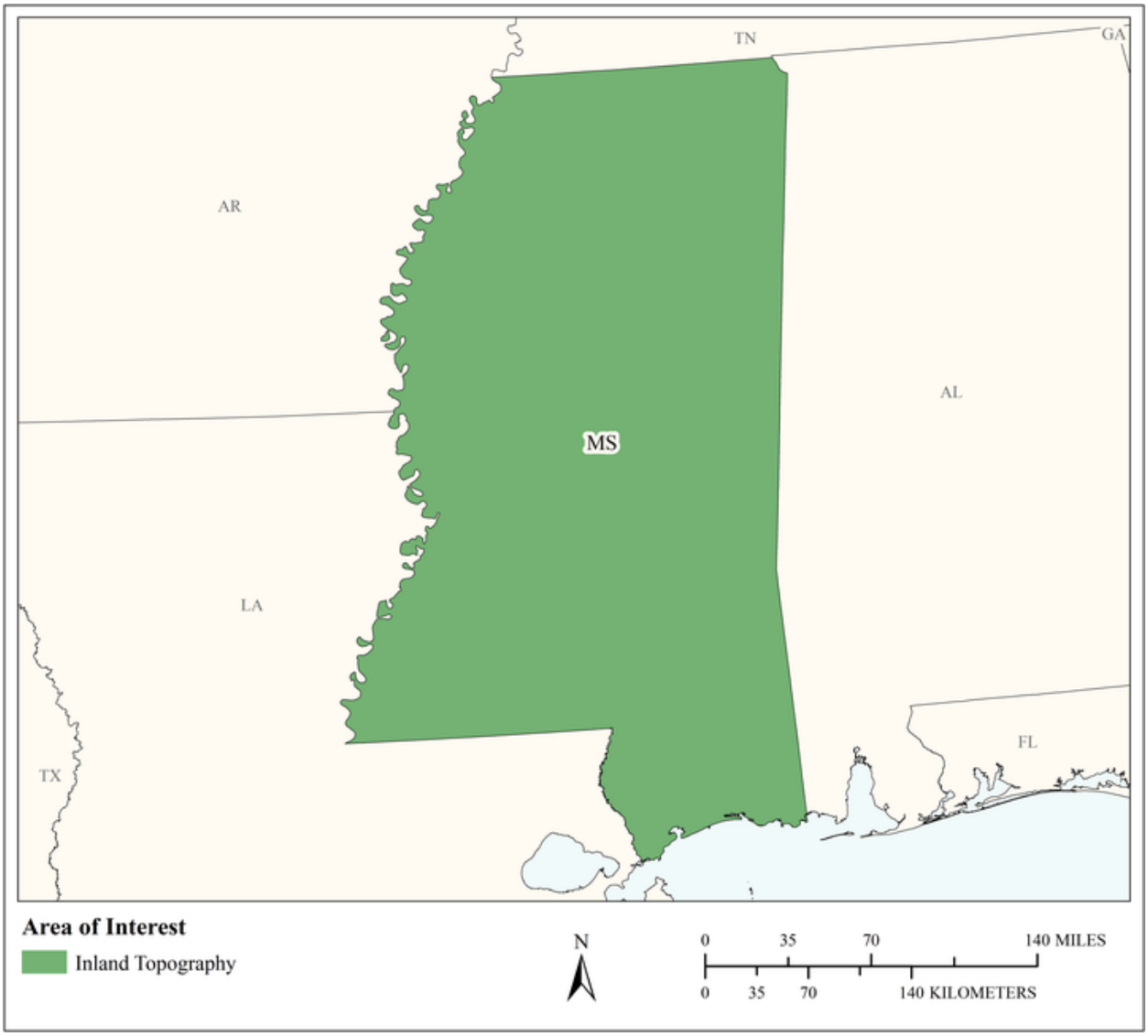
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor		
Improved customer experience	Major	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor		
Environmental	Major	Moderate		
Public safety, including life and property	Major	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$264,291		Annual dollars saved/ realized	$1,143,345						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide							
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$70,791		Annual dollars saved/ realized	$119,484						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate								
Environmental	Major			Major								
Public safety, including life and property	Moderate			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geospatial Clearinghouse Activities



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Area split by varying quality level or update frequency			
Sub Area Requirements	Mississippi			

MCA Description	Response
Mission Critical Activity	MARIS is a geospatial clearinghouse - assisting all other users of geospatial data in their individual mission critical activities. In-house, mission critical activities include: NHD stewards for Mississippi, oil & gas production mapping, legislative reapportionment, emergency management, change detection for natural resource management and urban planning, telecommunication mapping, compilation of local addressing and technical assistance in best management practices for addressing and a wide variety of geospatial activities. Laser leveling is used in delta areas to flatten land. Culverts dramatically change flow direction. Bi-directional flow is a problem for modeling
MCA Title	Geospatial Clearinghouse Activities
MCA ID	22152
Organization Type	Academic or Not-for-Profit
Organization Name	Mississippi Automated Resource Information System
Sub-Agency or Division	
Organization Mission	MARIS serves as the legislative mechanism for the arrangement and distribution of natural and cultural resource information for the state of Mississippi for over 35 years. MARIS acts as a geospatial coordination body in Mississippi working with federal, state, local, tribal, academic, private sector, and non-profits to advance the sharing of geospatial resources in Mississippi.
Program Name	MARIS Technical Center - All activities are consolidated to occur under this single umbrella.
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	BU 23 - Urban and Regional Planning
Tertiary Business Use	BU 26 - Education K12 and Beyond, Basic Research

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Individual manmade structure such as mailboxes or on-ground power transformers.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Update Frequency	(a) 2-3 years (b) 6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI	Each county has different requirements and areas within each county have varying requirements. Counties in the Coastal Meadows and Alluvial Plain required 2-3 years and other Counties need 6-10 years.			
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Nice to have
Hydro-conditioning	Highly desirable
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	It is a dichotomy - raw data must be kept original for projects, final DEM must be 'pretty' for end users who don't wish to understand the complexities involved and think all mapping is done by 'the Finger of God'. Explaining discrepancies gives elected officials and other cause to question the validity of ALL data.					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			
Other	Highly desirable			
Other description	My historical experience is that most everything is useful - often long after the original project is over - except for TINs, TINs are no longer of general use and can be re-generated if needed.			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current dataset used	http://www.maris.state.ms.us/HTM/DownloadData/LIDAR.html http://www.maris.state.ms.us/HTM/DownloadData/DEM.html http://www.maris.state.ms.us/HTM/DownloadData/ContourMain.html Being a state clearinghouse we have a fair handle on inventory of inland data available. Often, coastal data is collected without much notification. Small examples of research data are also often unknown.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	http://www.maris.state.ms.us			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			
Other Current Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other	Major			
Other description	Accurate and timely elevation data provides the most value to geospatial information - only geodesy is more basic and even orthoimagery relies on having the best available elevation data.			

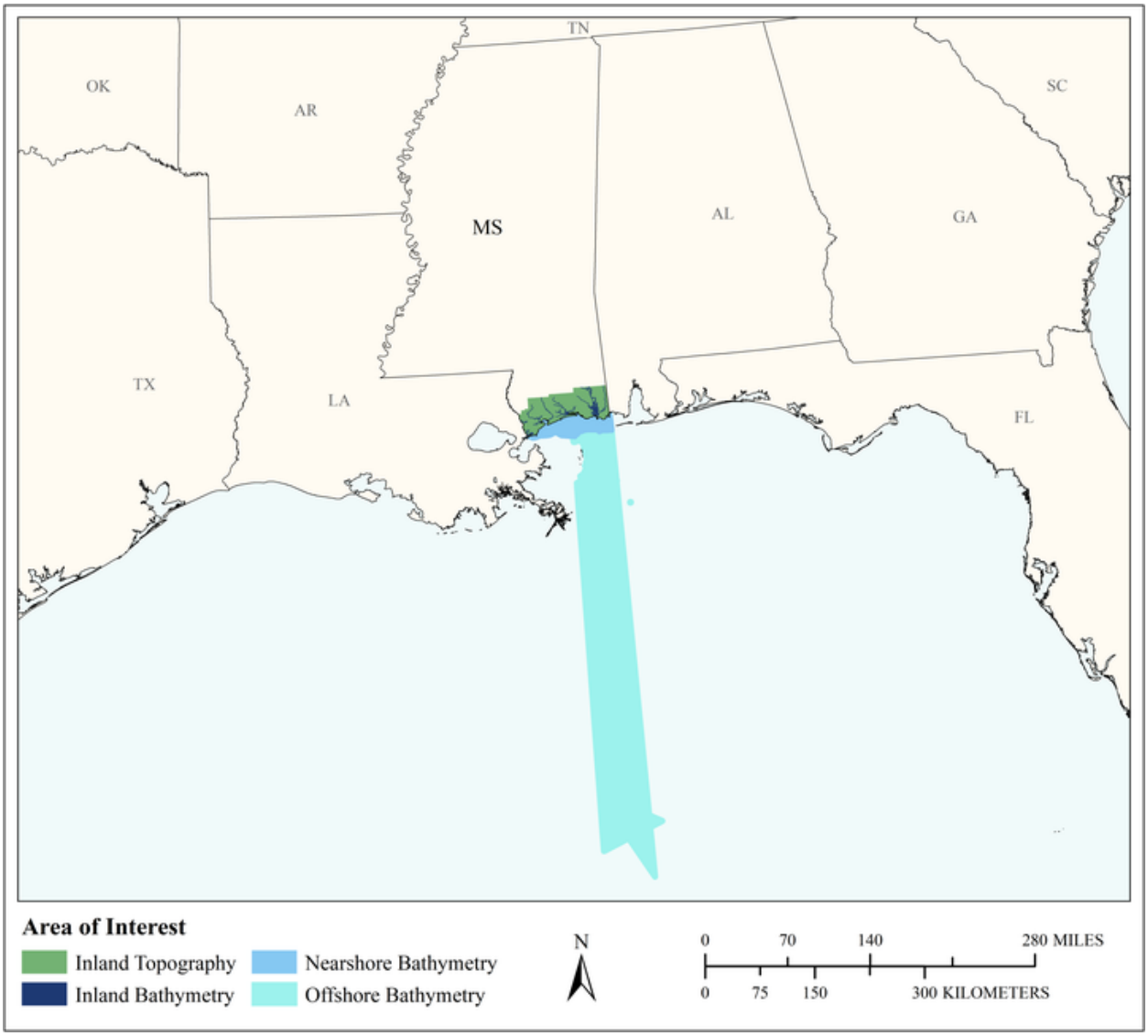
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Time savings description	No way to know how many errors have been fixed before the data comes to us. Field mapping of hydrologic features or urban features/addresses would be an impossible task for our small shop. Only good LiDAR data allows for the in-office mapping of such extensive areas. We still merge data on a regular basis to fit project requirements. Logical (non-political) prioritization of areas most in need of updating is done largely through analysis of new data.											
Cost savings/cost reduction	Major	Unable to provide										
Cost savings/cost reduction description	Providing the data and education to others enables the daily operations of ALL entities who use such data in the state. Our small operation has no operational budget outside salaries. Data acquisition is not an option for us.											
Cost avoidance	Major	Unable to provide										
Cost avoidance description	Accurate location of housing units - huge for 1st responders. Flood evacuation yes, tornadoes & hurricanes - help with clean ups. Our small shop could never process the volume of data currently being collected in our state to such a schedule. Keeps the data at quantifiable standards - we are able to refer users to the metadata for most questions rather than trying to explain how/why each step was performed in specific ways.											
Increased revenues	Major	Unable to provide										
Increased revenues description	Geospatial data is an excellent investment as an essential public good. Much better timber volume estimates. The future hold more than we can predict. Good geospatial data has a way of creating new benefits that even the biggest proponents never see coming.											
Mission-driven performance improvements	Major	Unable to provide										
Mission-driven performance improvements description	Over 25 years in geospatial coordination and I am never able to fully capture how beneficial better and more frequent data is to the operations of government and the private sector.											
Other operational benefits	Major	Unable to provide										
Other operational benefits description	Over 25 years in geospatial coordination and I am never able to fully capture how beneficial better and more frequent data is to the operations of government and the private sector.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Value added to products or services description	Driver-less vehicles will require such data to operate safely. Such applications are new to our area - good data is essential to their prudent adoption. Insufficient data can easily lead to unwise application and a 'souring' of the ideas in the public's mind.											
Improved response or timeliness	Major	Unable to provide										
Improved response or timeliness description	Everything seems to come down to borders and jurisdictions. Better data enables faster more confident decisions. Most of our hazardous areas are already known, but refined information will ensure higher efficiency in determining all who are at risk for specific situations. Mapping changes has become far more frequent in the past 30 years, but more frequent and accurate elevation data will. Efficient recovery efforts also rely on better information to act quickly. Both existing companies and entrepreneurs with a vision will implement such practices in ways we can't fully imagine. The more informed 1st responders are - the better for all.											
Improved customer experience	Major	Unable to provide										
Improved customer experience description	Excellent data begets all-encompassing customer confidence. We strive to be such a one-stop shop for MS geospatial data. Entrepreneurs ALWAYS surprise us with creativity and ability to make things work.											
Other customer service benefits	Major	Unable to provide										
Other customer service benefits description	Providing geospatial data to others is our main mission. Everyone benefits when we are able to provide newer and more accurate data. From end users to other data collectors, everyone benefits from better elevation data.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Education or outreach description	New data equals new users and a need for education.											
Environmental	Major											
Environmental description	A better, more accurate model of our environment leads to better decisions and wiser allocation of resources.											
Public safety, including life and property	Major											
Public safety, including life and property description	Better data equals better situational awareness.											
Other	Greater geospatial coordination											
Other benefits	Major											
Other description	Better elevation data provides the 'same song sheet' for everyone to use. a common layer which provides a basis for other datasets and the resulting decisions* (*Geodesy is the ultimate basis, but only a few are fully enjoy geodetic control)											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Coastal Resource Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Respondent provided own shapefile, KML, or geodatabase
Sub Area Requirements	Hancock, Harrison, and Jackson Counties, MS	Hancock, Harrison, and Jackson Counties, MS		Mississippi out to the EEZ

MCA Description	Response
Mission Critical Activity	Coastal Resource Management. Elevation data are needed for management of fisheries (e.g. economic aspects), habitat suitability modeling, suitability modeling for restoration and beneficial use (e.g. dredge material for rebuilding of habitats), wetland mapping and restoration, management of National Estuarine Research Reserves (NERRs), evaluation of marsh subsidence, and habitat mapping. The data are also needed for management of coastal reserves including marsh monitoring, monitoring shoreline change for habitat mapping, and determining the state boundary of tidelands for tidelands permitting (e.g. permitting for bulkheading, permitting for activities adjacent to wetlands or state owned waters, etc.).
MCA Title	Coastal Resource Management
MCA ID	21682
Organization Type	State or U.S. Territorial government
Organization Name	Mississippi Department of Marine Resources
Sub-Agency or Division	
Organization Mission	In 1994, the Mississippi Legislature created the Department of Marine Resources as a separate governing agency to enhance, protect and conserve marine interests of the state. We manage all marine life, public trust wetlands, adjacent uplands and waterfront areas, and provide for the balanced commercial, recreational, educational and economic uses of these resources consistent with environmental concerns and social changes.
Program Name	Coastal Resource Management
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 09 - Fisheries Management and Aquaculture
Tertiary Business Use	BU 30 - Maritime and Land Boundary Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Artificial reef features - these include concrete culverts, rumble mounds, sunken vessels

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Not required
5.1 – 10 acres	Nice to have
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	I don't know	QL3B	I don't know
Update Frequency	4-5 years	4-5 years	6-10 years and certain events.	(a) 4-5 years (b) >10 years
Event type(s)			Major hurricanes or high surge events	
Quality Level and/or update frequency variability across AOI				Higher accuracy, frequency (4-5 years), and density is required within artificial reef fish havens and decommissioned drilling platforms used as artificial reefs. I am not sure what the resolution/accuracy would need to be, but high enough to differentiate a culvert from the natural bottom. The remainder of the offshore area can be more generalized and less frequent.
Acceptable Horizontal Error	Up to 80 cm	I don't know	Up to 5 meters	Up to 5 meters
Acceptable Vertical Error	Up to 30 cm	I don't know	Up to 40 cm	I don't know
How far onshore needed			To Mean Higher High Water (MHHW)	
How far down the beach profile needed	To MLLW		Below MLLW	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement			MHW	I don't know
Cross sections and/or transects meet needs				Partial
Cross section/transect requirement				Higher accuracy, frequency (4-5 years), and density is required within artificial reef fish havens and decommissioned drilling platforms used as artificial reefs. I am not sure what the resolution/accuracy would need to be, but high enough to differentiate a culvert from the natural bottom. The remainder of the offshore area can be more generalized and less frequent.

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable	Not required	Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Nice to have	Highly desirable	Not required	Nice to have	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Nice to have	Nice to have	Not required	Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Nice to have	Nice to have	Not required	Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Highly desirable	Highly desirable
DTM	Highly desirable	Nice to have	Highly desirable	Not required
DEM	Required	Highly desirable	Required	Required
Raw point cloud data	Not required	Not required	Not required	Not required
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Not required	Not required	Not required
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	Nice to have
Tide Predictions			Required	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Nice to have	Highly desirable
Ground control/ground truthing	Highly desirable	Highly desirable	Nice to have	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Nice to have	Nice to have
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Highly desirable	Nice to have	Highly desirable	Highly desirable
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Required	Required
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Not required	Nice to have	Not required	Not required
Water column properties - Physical			Highly desirable	Highly desirable
Water column properties - Chemical			Highly desirable	Highly desirable
Water column properties - Biological			Highly desirable	Highly desirable
Currents			Nice to have	Nice to have
Tide/wave heights			Highly desirable	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Required	Required
Boundaries			Highly desirable	Highly desirable
Routes			Highly desirable	Highly desirable
Offshore cadastral			Not required	Not required
Lease areas			Not required	Highly desirable
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates	Required	Highly desirable	Required	
Land use/land cover	Highly desirable	Highly desirable	Nice to have	Nice to have
Wetlands	Required	Highly desirable	Required	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Nice to have
Inland surface water features	Highly desirable	Highly desirable	Highly desirable	
Bridges/culverts	Required	Nice to have		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Highly desirable	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Mississippi Coastal 2015 QL2 Lidar	Current products used: local side scan as needed and U.S. Estuarine Bathymetric Data (30 meters- published 1998) from the Special Projects Office of the National Ocean Service (NOS). The MCA is an upcoming modeling activity that does not have established requirements at this time.	NCEI Estuarine Bathymetric Digital Elevation Models published in 1998 by NOS (30 meter). When more up to date bathymetry is needed for a small specific area, manually poling for depths in a grid pattern in 50-100 meter transects is used.	Sub-meter multi-beam contracted for specific areas (Artificial Reefs). Various datasets from NCEI Bathymetric Data Viewer.
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast		Yes	Yes	Yes
NCEI			Yes	Yes
Open Topography				
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			

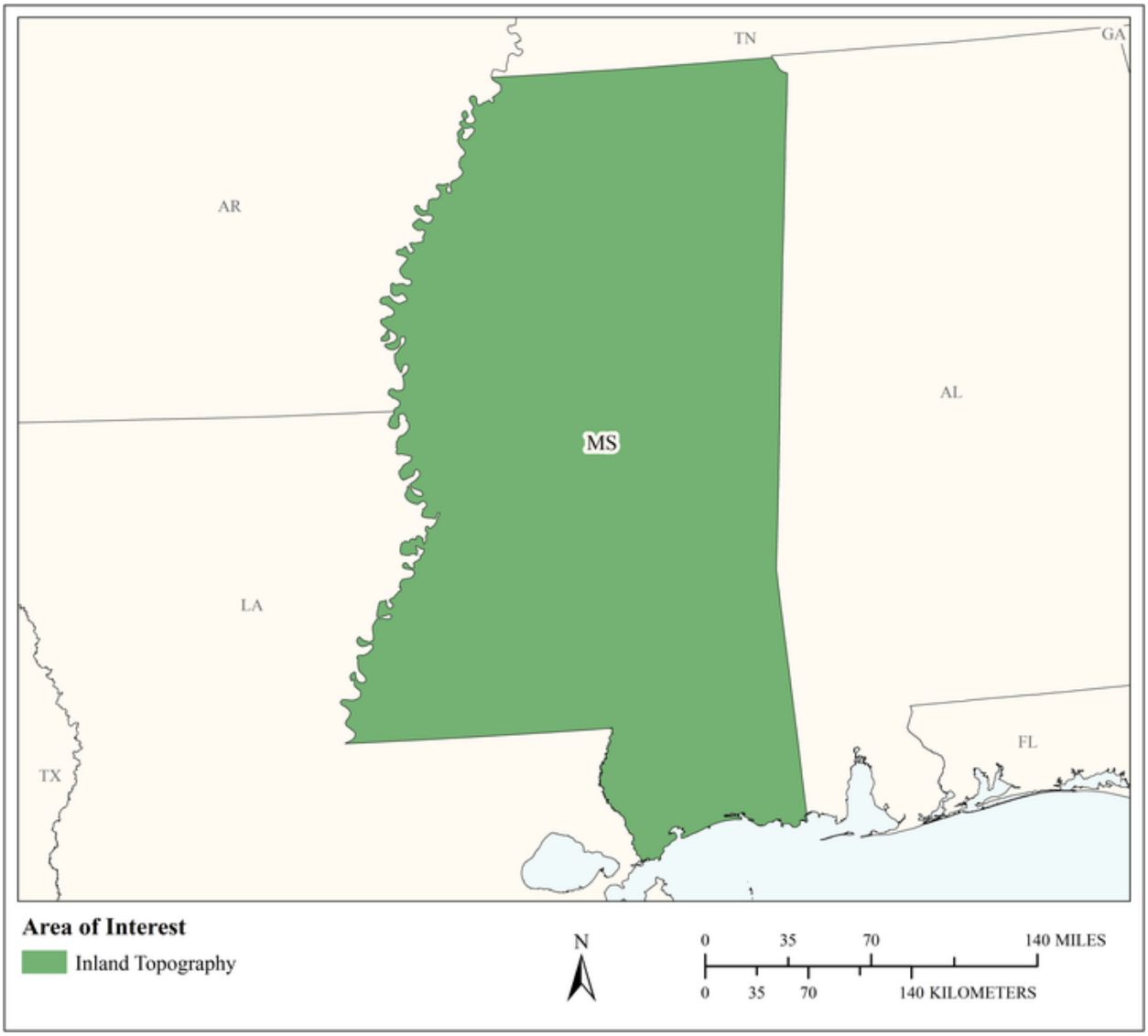
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
State repositories used	Mississippi Automated Resource Information System (MARIS)			
Other	Yes			Yes
Other description	Directly from recipient			Contracts for multi-beam
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Major	Major
Cost savings/cost reduction	I don't know	Minor	Moderate	Moderate
Cost avoidance	I don't know	Minor	Moderate	Moderate
Increased revenues	I don't know	None	I don't know	I don't know
Mission-driven performance improvements	Moderate	Moderate	Moderate	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Moderate	Moderate
Improved response or timeliness	I don't know	None	None	None
Improved customer experience	I don't know	None	None	None
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	None	I don't know	I don't know
Environmental	Moderate	Moderate	Moderate	Moderate
Public safety, including life and property	I don't know	Minor	I don't know	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Time savings description							Manually polling is time consuming and can only cover a small area of AOI.					
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction description				Producing inland bathy within our agency would be cost prohibited.								
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$92,726		Annual dollars saved/ realized	$39,791		Annual dollars saved/ realized	$183,973			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness description				Inland Bathy may assist with decisions on prestaging vessels with the appropriate draft for a specific body of water.								
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience description	Elevation products will likely be included in interactive mapping applications available to the public and coastal managers.											
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$16,210		Annual dollars saved/ realized	$23,327		Annual dollars saved/ realized	$311,213			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			None			I don't know			I don't know		
Environmental	Moderate			Moderate			Moderate			Moderate		
Environmental description	Allows the ability to delineate vegetation/species type by elevation											
Public safety, including life and property	I don't know			Minor			I don't know			I don't know		
Public safety, including life and property description	May assist in search in rescue operations by quickly identifying low lying areas											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades				
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Forest Resources Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Forest Resources Management. Elevation data improves situational awareness and the safety of our fire fighters. It is critical to proper implementation and monitoring of our Forestry Best Management Practices. Topography data is invaluable in forest management. Time saved in planning and through focused field reconnaissance is a major benefit to our agency.
MCA Title	Forest Resources Management
MCA ID	1411
Organization Type	State or U.S. Territorial government
Organization Name	Mississippi Forestry Commission
Sub-Agency or Division	
Organization Mission	Our mission is to provide active leadership in forest protection, forest management, forest inventory, and effective forest information distribution, necessary for Mississippi's sustainable forest-based economy.
Program Name	Forest Management
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Individual trees in some cases.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Vertical Error	Up to 30 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	DEMs, 1:24,000 or larger topographic maps and hill shade models.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI	Yes			
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	The Mississippi Automated Resource Information System.			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Moderate			
Cost avoidance	Minor			
Increased revenues	None			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Moderate			
Public safety, including life and property	Minor			

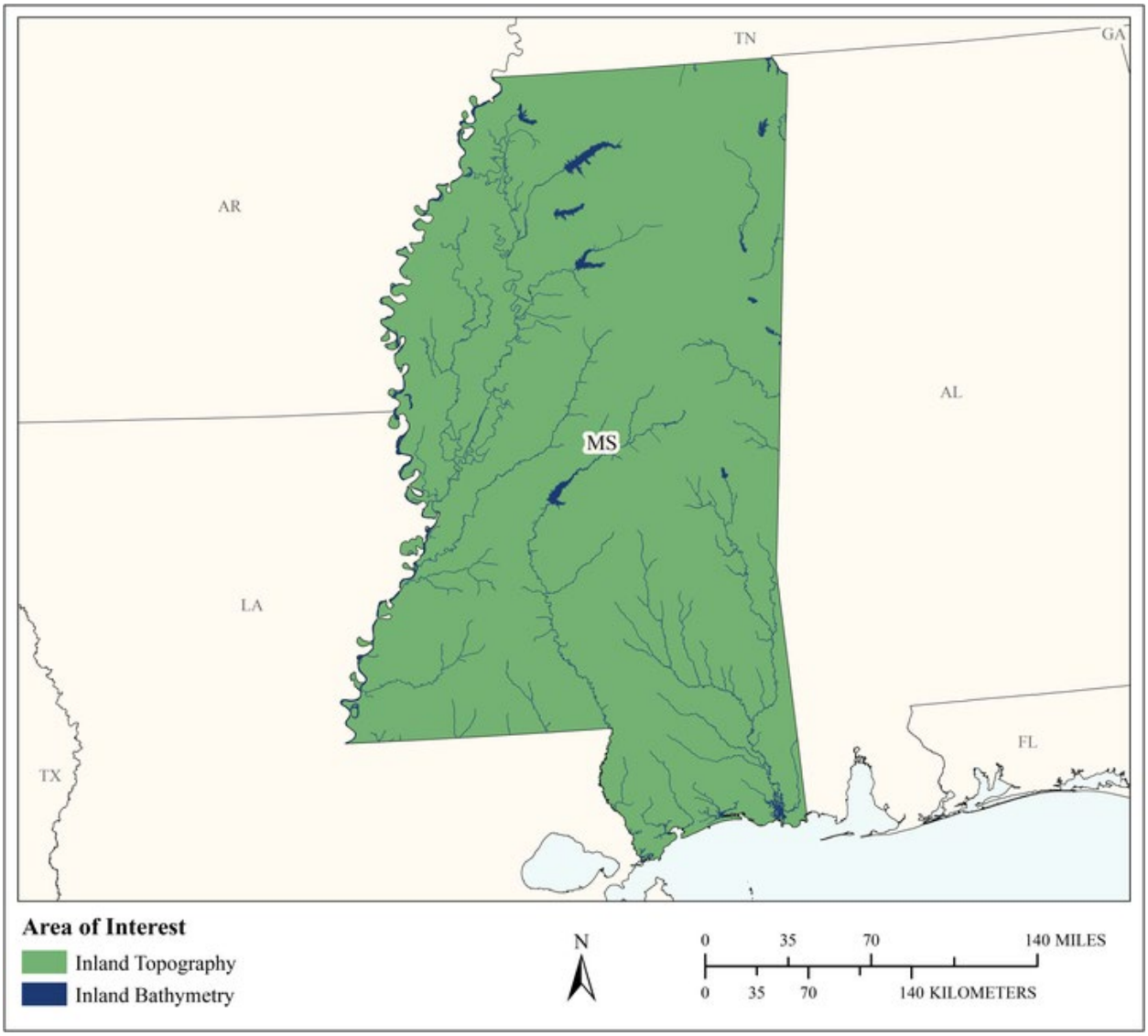
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$94,068									
Time savings description	We have 25 area foresters that can leverage this data prior to field inspections. I'm assuming it saves each one at least five hours per month. Helps streamline our BMP Implementation Survey and forest certification audits.											
Cost savings/cost reduction	Moderate	Unable to provide										
Cost savings/cost reduction description	Cost savings in road and firelane construction. Not sure how to capture that cost. I don't know what it would cost to acquire this data ourselves, but am sure it would be cost prohibitive.											
Cost avoidance	Moderate	Unable to provide										
Cost avoidance description	We don't currently have processes in place to do this, so I cannot estimate. We've attempted processing our own LAS files, but lack the computer resources to accomplish it on a useful scale.											
Increased revenues	Moderate	Unable to provide										
Increased revenues description	Definitely helps plan harvest operations and accessibility.											
Mission-driven performance improvements	Moderate	Unable to provide										
Mission-driven performance improvements description	Provides better information for forest management planning. Allows us to do more from the office.											
Other operational benefits	Major	Unable to provide										
Other operational benefits description	Non-point source pollution control. Having good elevation data can help ensure compliance with our Forestry Best Management Practices.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Value added to products or services description	Improved accuracy in mapping critical areas to protect and where to install Best Management Practices. We can integrate this data into applications we deploy to our field staff.											
Improved response or timeliness	Moderate	Unable to provide										
Improved response or timeliness description	Very useful post-hurricane Katrina. We always need to be prepared with current data for similar catastrophic events. Support forest certification audits. Core data in field applications we deploy to field personnel. Support fire suppression operations.											
Improved customer experience	Moderate	Unable to provide										

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved customer experience description	Tremendous improvement over in-house capabilities. Used in most of our field applications and we are continually developing and refining them. Elevation improves situational awareness in all of our field applications.			
Societal Benefits	**Benefits**	**Benefits**	**Benefits**	**Benefits**
Education or outreach	Minor			
Education or outreach description	Not a major use of this data for us.			
Environmental	Major			
Environmental description	Protecting water quality is a major concern and this data is critical toward that end.			
Public safety, including life and property	Moderate			
Public safety, including life and property description	Improves safety of our fire suppression crews highlighting dangerous areas and informing firelane location decisions			

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Environmental Quality



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Area split by varying quality level or update frequency	One or more states, territories, or counties		
Sub Area Requirements	Mississippi			

MCA Description	Response
Mission Critical Activity	Environmental Quality. Elevation data are needed for NFIP floodplain mapping, dam safety, H&H modeling, dam breach routing, evaluation of storage volumes, monitoring water quality, TMDL modeling, non-point source pollution, geological mapping including alluvial soils and subsurface geology, and management of erosion issues. BU 01 – Water Supply and Quality could be added as another Business Use. Bathymetry is needed for navigable waters to identify areas suitable for casino placement.
MCA Title	Environmental Quality
MCA ID	21481
Organization Type	State or U.S. Territorial government
Organization Name	Mississippi Department of Environmental Quality
Sub-Agency or Division	
Organization Mission	The mission of the Mississippi Department of Environmental Quality is to safeguard the health, safety, and welfare of present and future generations of Mississippians by conserving and improving our environment through focused research and responsible regulation.
Program Name	MS-NFHL / D-FIRM, Dam Safety, Clean Water Act 303d Listing / 305b Assessment, Groundwater Assessment and Remediation, StateMap, MDEM
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Tertiary Business Use	BU 15 - Flood Risk Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Building, road, stream, bridge/culvert

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	(a) QL1 (b) QL2	Cross sections and/or transects meet needs		
Update Frequency	(a) 2-3 years (b) 6-10 years	Event driven only – Data need to coincide with a specific event.		
Event type(s)		A flood or significant erosion		
Quality Level and/or update frequency variability across AOI	QL1 every 2-3 years needed for coastal areas, lowland delta areas, urban areas. Use physiographic regions Coastal Meadows and Alluvial Plain for coastal/delta, Census for urban areas.			
Acceptable Horizontal Error	Up to 30 cm	Up to 1 meter		
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed	To MHW			
Tide correction requirement				
Cross sections and/or transects meet needs		Yes		
Cross section/transect requirement		Do not know		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable

Hydrologic Processing Required	Response
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required			Not required	
Entire AOI under same environmental conditions	Required	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have			Nice to have	
DEM for entire AOI needs to be seamless	Required	Nice to have			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have		
DTM	Highly desirable	Nice to have		
DEM	Required	Required		
Raw point cloud data	Nice to have	Not required		
Classified point cloud	Required	Not required		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required	Highly desirable		
Land use/land cover	Nice to have	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Highly desirable		
Bridges/culverts	Required	Required		
Landmark features	Nice to have	Not required		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL2 across multiple collections: 2017-2012; QL3 across multiple collections: 2013-2009 Point cloud, bare-earth, intensity, break lines, contours.	Side scan sonar transects from MDWFP on some state lakes.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes			
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Mississippi Digital Earth Model https://www.mdeq.ms.gov/mdem/ MARIS http://www.maris.state.ms.us			

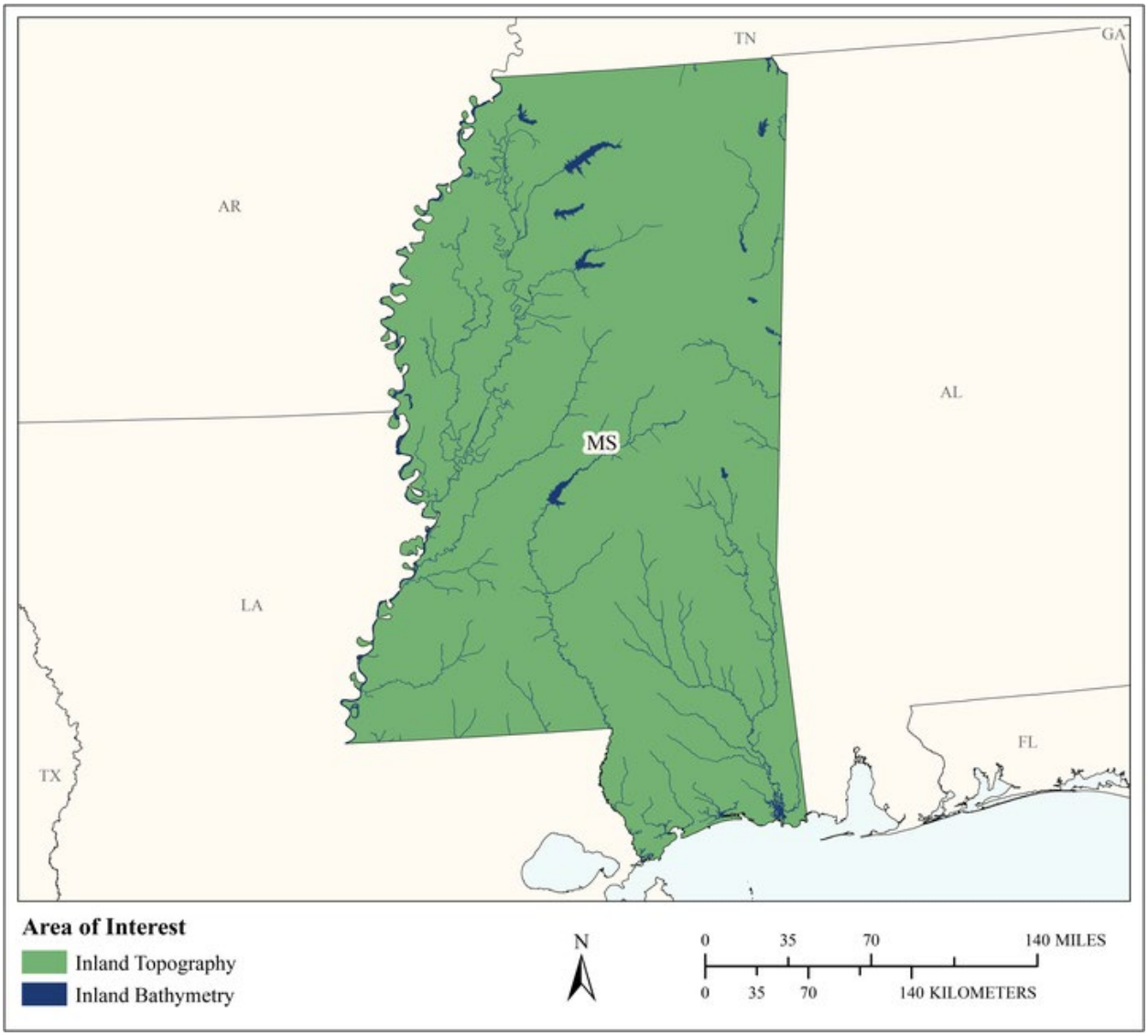
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other		Yes		
Other description		MDWFP Point Transects		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Inland bathy data not available		
Cost savings/cost reduction	Moderate	Inland bathy data not available		
Cost avoidance	Moderate	Inland bathy data not available		
Increased revenues	None	Inland bathy data not available		
Mission-driven performance improvements	Major	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Inland bathy data not available		
Improved response or timeliness	Major	Inland bathy data not available		
Improved customer experience	Major	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Inland bathy data not available		
Environmental	Major	Inland bathy data not available		
Public safety, including life and property	Major	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		I don't know	Unable to provide							
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide							
Increased revenues	None			I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,869,609		Annual dollars saved/ realized	$253,404						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	Major	Unable to provide		I don't know	Unable to provide							
Improved customer experience	Moderate	Unable to provide		I don't know	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$6,865,775		Annual dollars saved/ realized	$11,407						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			I don't know								
Environmental	Major			I don't know								
Public safety, including life and property	Major			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps				
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Conservation Planning for Wildlife Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation planning for wildlife management. Conservation of critical habitats. Management of diverse habitats. Private lands management recommendations for healthier fish and wildlife populations. Search and rescue efforts need precise bathymetry data very quickly. Search and rescue teams encompass numerous agencies responsible for emergency operations. Bathymetry is also needed for management of freshwater fisheries.
MCA Title	Conservation Planning for Wildlife Management
MCA ID	22087
Organization Type	State or U.S. Territorial government
Organization Name	Mississippi Department of Wildlife, Fisheries, and Parks
Sub-Agency or Division	
Organization Mission	The mission of the Mississippi Department of Wildlife, Fisheries, and Parks is to conserve and enhance Mississippi's wildlife, fisheries, and parks, provide quality outdoor recreation, and engage the public in natural resource conservation.
Program Name	Wildlife Bureau , Fisheries Bureau and Law enforcement
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	BU 09 - Fisheries Management and Aquaculture
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Drainage Ditches, lake bottoms

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Highly desirable
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 40 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial			
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Nice to have			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable		
DTM	Highly desirable	Highly desirable		
DEM	Required	Highly desirable		
Raw point cloud data	Highly desirable	Nice to have		
Classified point cloud	Highly desirable	Highly desirable		
Edited/cube XYZ		Highly desirable		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Not required	Not required		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Nice to have	Not required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Not required		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Not required	Not required		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	DEM and LAS	MDWFP collected data on state Lakes and Rivers		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	MARIS	MARIS		
Other		Yes		
Other description		MDWFP		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	I don't know		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	Major	Minor		
Increased revenues	None	Minor		

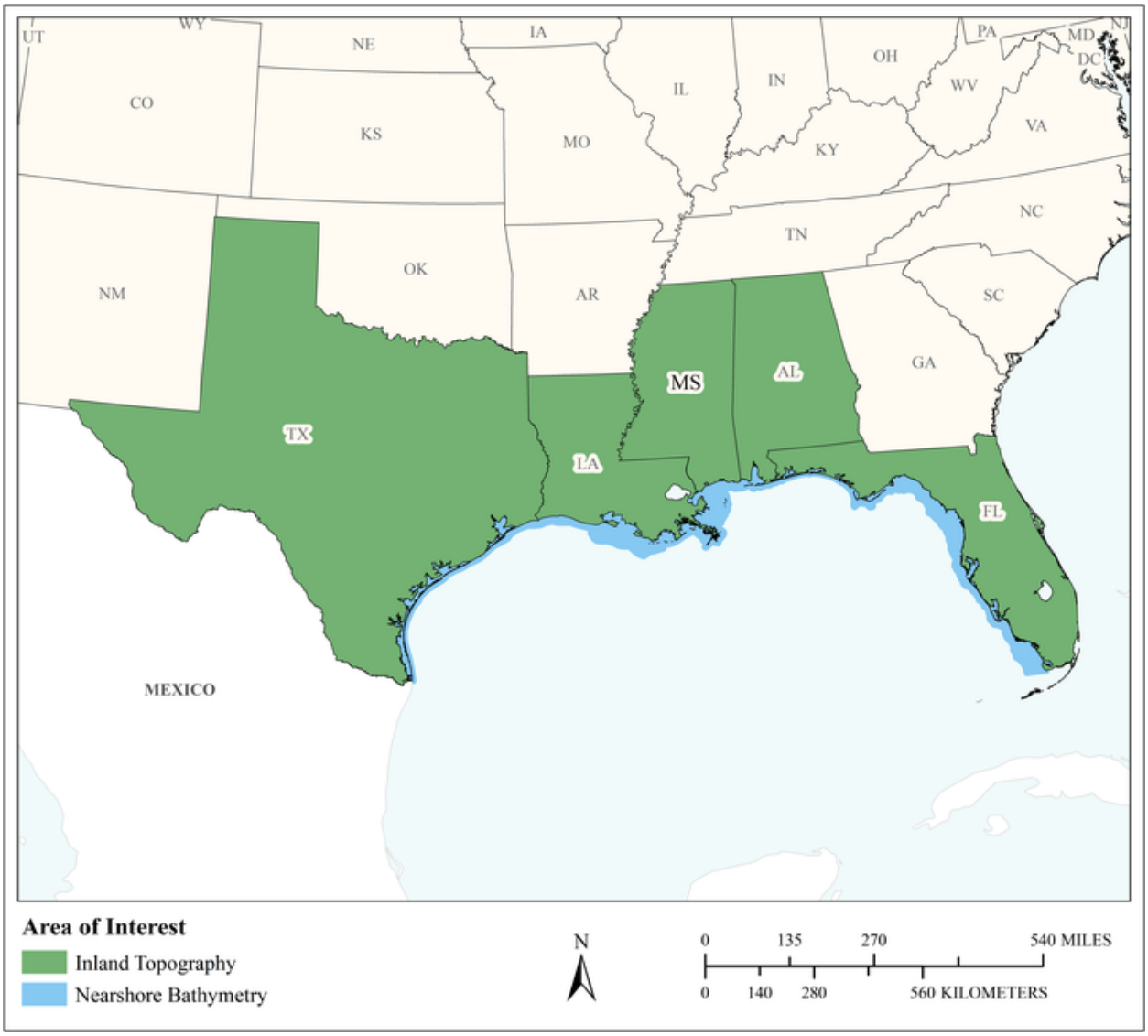
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Mission-driven performance improvements	Moderate	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		
Improved response or timeliness	Major	Minor		
Improved customer experience	Moderate	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate		
Environmental	Major	Moderate		
Public safety, including life and property	Major	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$10,854	Major	Annual dollars saved/realized	$18,964						
Time savings description				37 state lakes * 4 hours per (wag). 37 lakes * 4 hours per (wag). 37 state lakes * 2 hours per (wag). 37 state lakes * 3 hours per (wag).								
Cost savings/cost reduction	Major	Unable to provide		I don't know	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Annual dollars saved/realized	$6,693						
Cost avoidance description				37 lakes * 4 hours per (wag). 37 lakes * 2 hours per (wag).								
Increased revenues	Moderate	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements description				Ability to see and analyze 3D data provides a greater decision make matrix.								
Other operational benefits	Major	Unable to provide										
Other operational benefits description												
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide							
Value added to products or services description				Improves ability to create timely and more accurate maps to be used by GPS instruments,. Will improve response time in creating flood related maps and GPS related documents.								
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide							
Improved response or timeliness description				Would provide greater response time in all categories listed below.								
Improved customer experience	Moderate	Unable to provide		Major	Unable to provide							
Other customer service benefits	Moderate	Unable to provide										
Other customer service benefits description	Topography models on state managed lands.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Moderate								
Education or outreach description	Land Navigation											
Environmental	Moderate			Moderate								
Environmental description	Fisheries management											
Public safety, including life and property	Moderate			Moderate								
Public safety, including life and property description	Law enforcement Response during disasters											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Habitat and Ecosystem Mapping



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	One or more states, territories, or counties		Custom description	
Sub Area Requirements			Gulf of Mexico	

MCA Description	Response
Mission Critical Activity	Mapping of imperiled species' habitat and associated ecosystems
MCA Title	Habitat and Ecosystem Mapping
MCA ID	22122
Organization Type	Academic or Not-for-Profit
Organization Name	Mississippi State University
Sub-Agency or Division	
Organization Mission	Mississippi State University is a public, land-grant university whose mission is to provide access and opportunity to students from all sectors of the state's diverse population, as well as from other states and countries, and to offer excellent programs of teaching, research, and service. Enhancing its historic strengths in agriculture, natural resources, engineering, mathematics, and natural and physical sciences, Mississippi State offers a comprehensive range of undergraduate and graduate programs; these include architecture, the fine arts, business, education, the humanities, the social and behavioral sciences, and veterinary medicine. The university embraces its role as a major contributor to the economic development of the state through targeted research and the transfer of ideas and technology to the public, supported by faculty and staff relationships with industry, community organizations, and government entities. Building on its land-grant tradition, Mississippi State strategically extends its resources and expertise throughout the entire state for the benefit of Mississippi's citizens, offering access for working and place-bound adult learners through its Meridian Campus, Extension, and distance learning programs. Mississippi State is committed to its tradition of instilling among its students and alumni ideals of diversity, citizenship, leadership, and service.
Program Name	Gulf of Mexico Coastal Geomorphology and Mapping
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	BU 06 - Natural Resources Conservation
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Sub-meter resolution dune footprints; individual shrubs, grasses, trees

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1		QL1B	
Update Frequency	Annually		Annually	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm		Up to 1 meter	
Acceptable Vertical Error	Up to 20 cm		Up to 30 cm	
How far onshore needed			>1 kilometer inland	
How far down the beach profile needed	To MHHW		To MHHW	
Tide correction requirement			MHW	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable		Highly desirable			Highly desirable
Entire AOI under same environmental conditions	Highly desirable		Highly desirable			Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Highly desirable			Highly desirable
DEM for entire AOI needs to be seamless	Required		Required			Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable		Highly desirable	
DTM	Required		Highly desirable	
DEM	Required		Required	
Raw point cloud data	Nice to have		Nice to have	
Classified point cloud	Nice to have		Nice to have	
Edited/cube XYZ			Nice to have	
Full waveform	Not required		Not required	
Bathymetric Attributed Grid (BAG)			Not required	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have		Nice to have	
Ground control/ground truthing	Nice to have		Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Not required	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Highly desirable		Highly desirable	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Not required	
Submerged features			Not required	
Subbottom characteristics			Not required	
Geologic and seismic data	Nice to have		Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Highly desirable	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Highly desirable	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable		Required	
Land use/land cover	Highly desirable		Required	
Wetlands	Highly desirable		Required	
Estuaries			Required	
Inland surface water features	Nice to have		Nice to have	
Bridges/culverts	Not required			
Landmark features	Not required		Not required	
Cultural resources	Not required		Not required	
Coastal and riverine structures	Nice to have		Nice to have	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current dataset used	-2014 Mobile County, AL Lidar (Dauphin Island-MS/AL border; QL2) -2015 USACE NCMP Topbathy Lidar (Florida Gulf Coast; QL1) -2016 USACE NCMP Tobobathy Lidar (Gulf Coast [South Padre Island, TX - Destin, FL]; QL2) -2015 USGS/CPRA South Terrabone (Breton, LA/MS Sound barrier islands; QL2) -2015 MDEQ Lidar: Coastal MS (MS coastal counties;QL2) -2017 NWFWMD Choctawhatchee Lidar (Santa Rosa Island, FL-Port. St. Joe, FL; QL2) -2017 NWFWMD Escambia & Santa Rosa Counties, FL Lidar (Perdido Key, FL- Santa Rosa, FL; QL2)		2015 USACE NCMP Topbathy Lidar (Florida Gulf Coast; QL1) 2016 USACE NCMP Tobobathy Lidar (Gulf Coast (South Padre Island, TX - Destin, FL; QL2)(	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes		Yes	
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor		Moderate	
Cost savings/cost reduction	Major		Major	
Cost avoidance	Major		Major	
Increased revenues	Minor		I don't know	
Mission-driven performance improvements	Major		Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		Moderate	
Improved response or timeliness	Major		Moderate	
Improved customer experience	I don't know		Moderate	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor		Minor	
Environmental	Moderate		Major	
Public safety, including life and property	None		None	

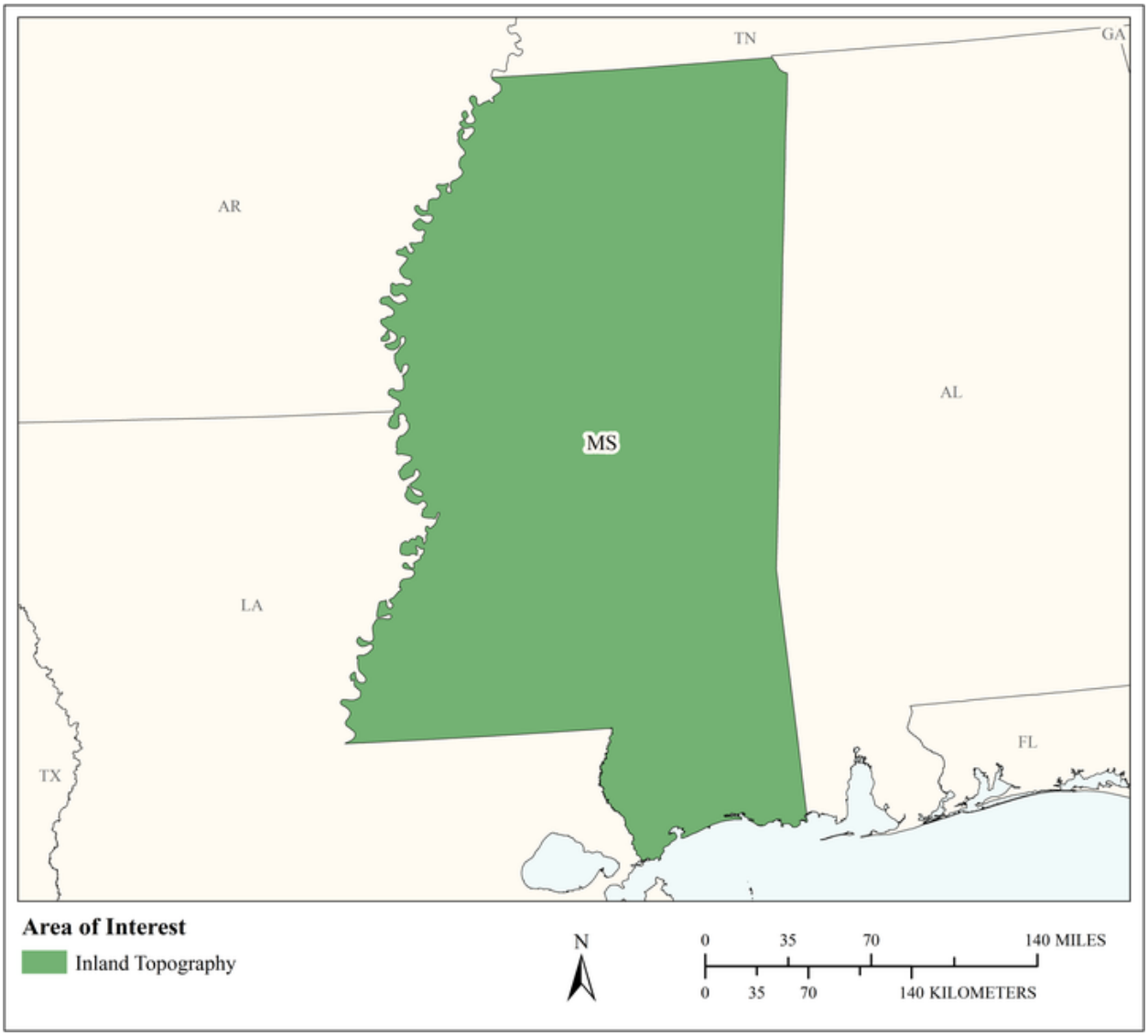
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$39,798				Major	Annual dollars saved/realized	$50,652			
Time savings description	This is likely our greatest challenge since we are working across multiple states - any effort toward reducing the need for data manipulation related to combining data would be significant. Already have data dissemination pretty streamlined. Assuming not having to manually create DEMs is a significant reduction in potential error but that is challenging to quantify. Will still need to do some field validation.						Data manipulation is our greatest time sink right now - improvements in seamless data products would be tremendously helpful.					
Cost savings/cost reduction	Major	Unable to provide					Major	Unable to provide				
Cost savings/cost reduction description	Publicly available products have potential to save millions in project costs, but challenging to quantify at the scale we work at. Improving beach/dune restoration strategies again could save millions but I am not qualified to quantify this potential cost savings.											
Cost avoidance	Major	Annual dollars saved/realized	$8,000				Major	Unable to provide				
Cost avoidance description	Reduce graduate student time in processing data could save 1/2 a year grad salary.											
Increased revenues	None						None					
Mission-driven performance improvements	Major	Annual percent improvement	40%				Major	Annual percent improvement	42%			
Mission-driven performance improvements description	Improved spatial models to target beach/dune and marsh restoration efforts could improve effectiveness substantially. Improved data could continue to support innovative research program. Theoretically improved spatial targeting of conservation efforts will be the result of more informed decision making.						Improved maps could improve conservation delivery substantially. Improved maps could improve conservation decision making substantially.					
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide					Major	Unable to provide				
Improved response or timeliness description	USFWS could benefit from improved critical habitat designations. Baseline geomorphic models could support recovery activities of other organizations.						Improved species recovery efforts after an overwash event. Improved specificity in critical habitat designations.					
Improved customer experience	Major	Unable to provide					Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor						Minor					
Education or outreach description	Outreach will be one element associated with improved mapping and habitat associations											
Environmental	Major						Major					
Environmental description	Improved habitat association models should vastly increase benefits of management for target species											

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Public safety, including life and property	I don't know		I don't know	

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes		Yes	
Aspect maps	Yes		Yes	
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes		Yes	
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints			Yes	
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Cultural Resources Preservation and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Discovery and analysis of underwater archaeological and historical cultural sites. Site protection and preservation planning. Discovery and analysis of Native American and other historical cultural sites and subsistence activities.
MCA Title	Cultural Resources Preservation and Management
MCA ID	60245
Organization Type	State or U.S. Territorial government
Organization Name	State of Mississippi
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Nice to have					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have					
DEM for entire AOI needs to be seamless	Nice to have					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Moderate			
Cost avoidance	Minor			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			

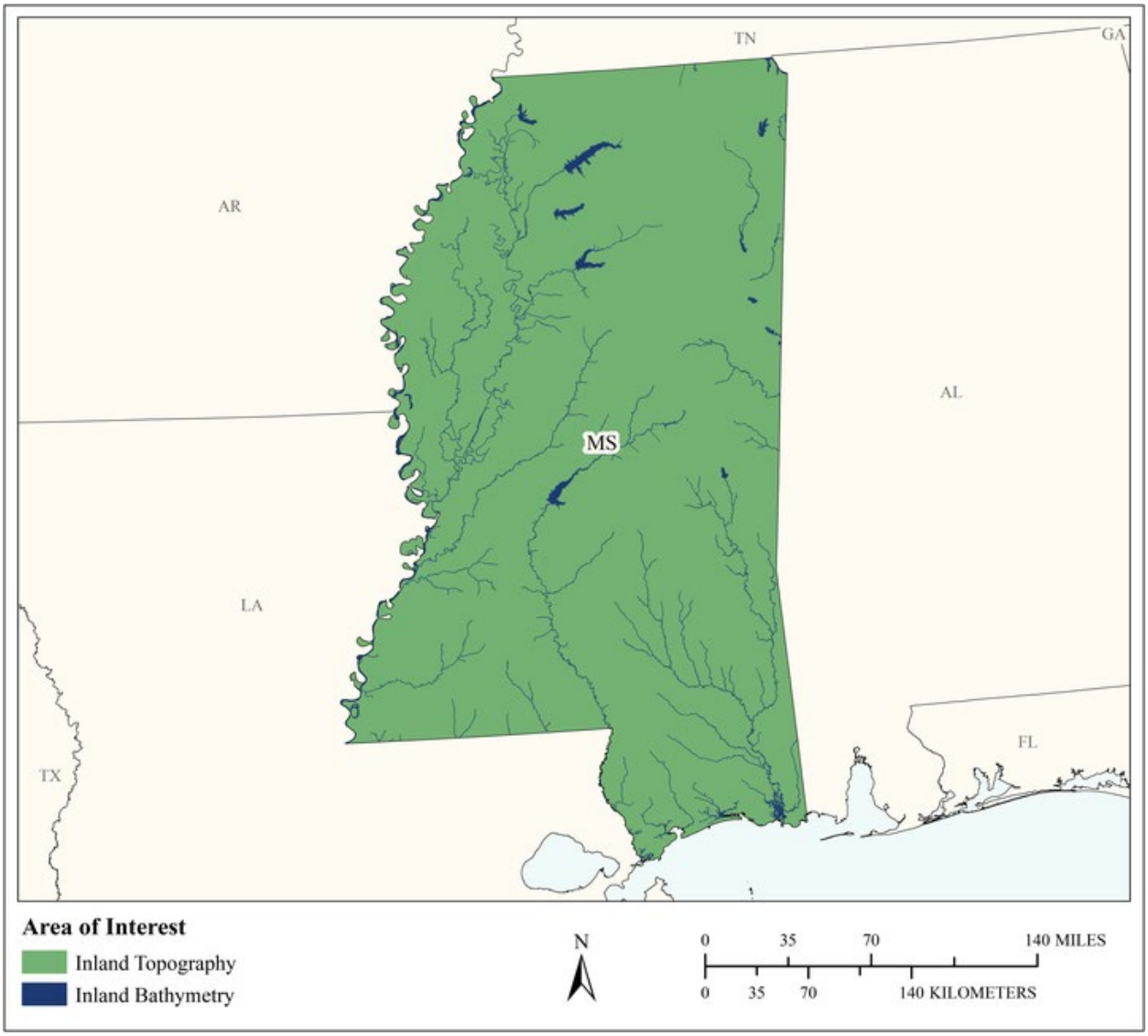
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Cost savings/cost reduction	Minor	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Moderate	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$8,736									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$7,638									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	Minor											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Flood Risk Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Flood risk modeling and mapping of riverine and coastal areas. Dam/dike/levee safety analysis. Emergency management. Flood forecasts.
MCA Title	Flood Risk Management
MCA ID	60246
Organization Type	State or U.S. Territorial government
Organization Name	State of Mississippi
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Required	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Required	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	Major	Moderate		
Increased revenues	Minor	Minor		
Mission-driven performance improvements	Major	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		

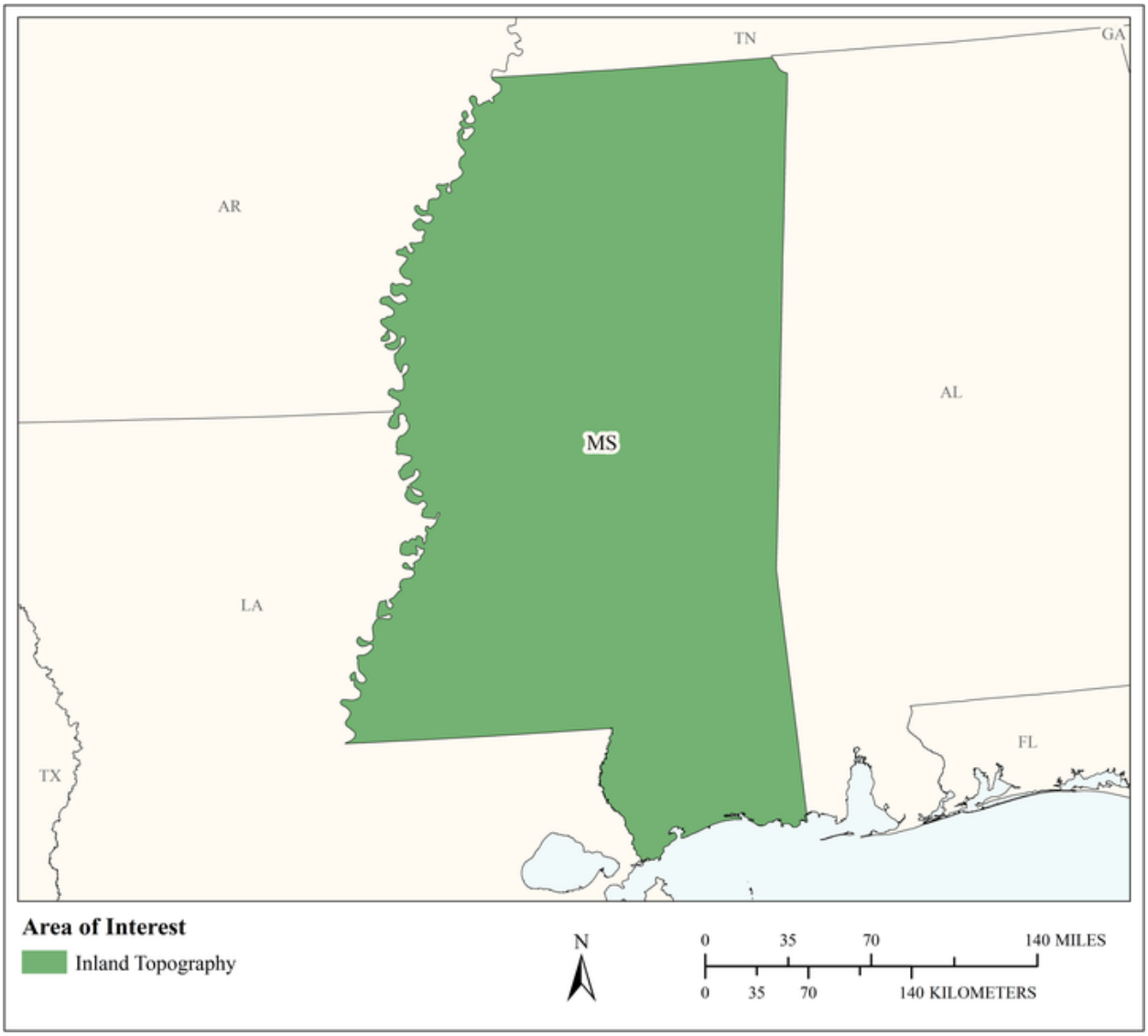
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor		
Improved customer experience	Major	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor		
Environmental	Major	Moderate		
Public safety, including life and property	Major	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		None								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$6,692,622		Annual dollars saved/ realized	$464,915						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,170,999		Annual dollars saved/ realized	$521,981						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate								
Environmental	Moderate			Moderate								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Homeland Security, Law Enforcement, Disaster Response, and Emergency Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Infrastructure and border protection. Coastal search and rescue. Population dynamics. Emergency fuel supply and movement. Line of sight analysis in urban areas. Disaster response. Flood risk analysis resulting from acts of terrorism.
MCA Title	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
MCA ID	60247
Organization Type	State or U.S. Territorial government
Organization Name	State of Mississippi
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

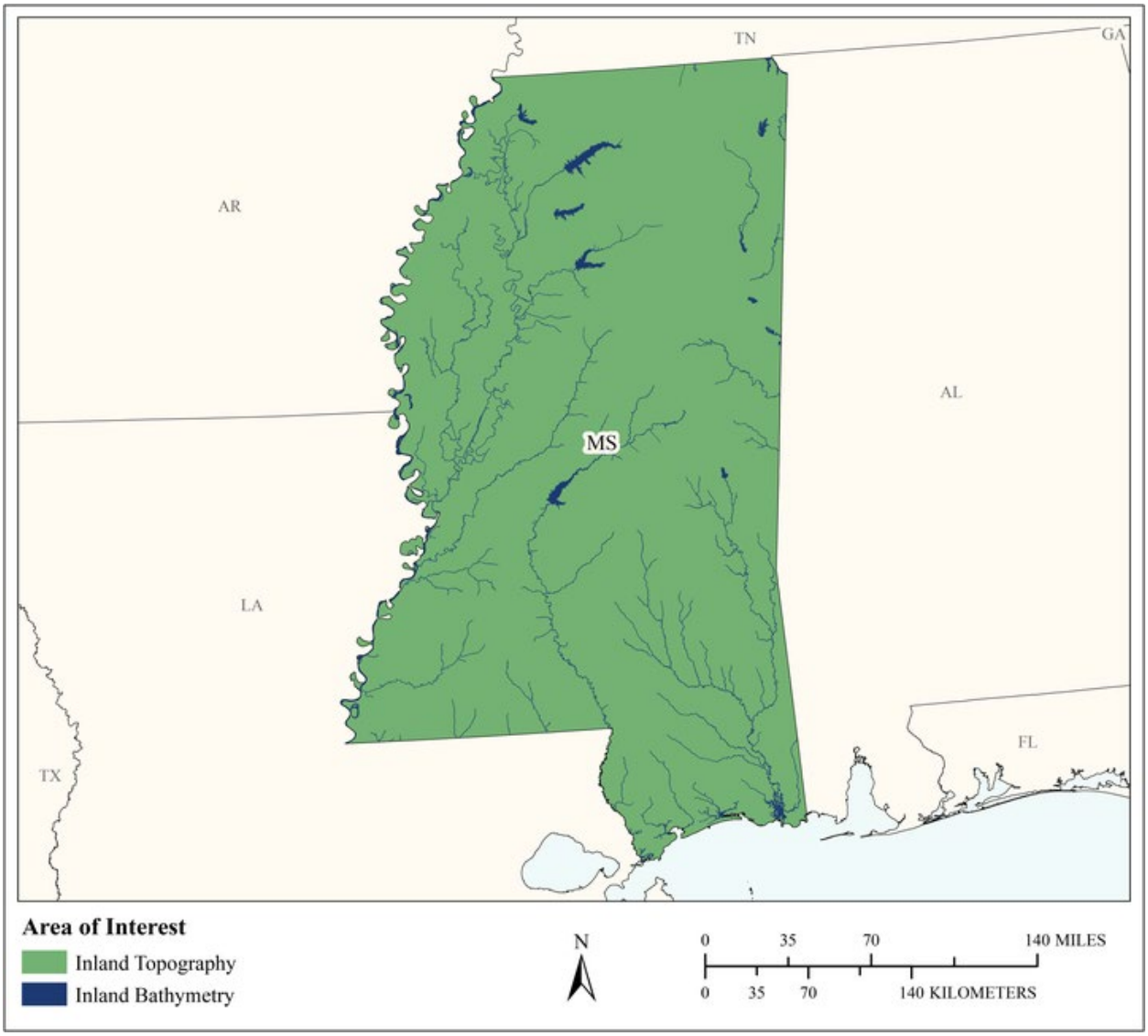
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Minor			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,406,162									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$24,853									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Moderate											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Land Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Road and railroad route selection and maintenance. Slope analysis for autonomous cars. GPS navigation visualization.
MCA Title	Land Navigation and Safety
MCA ID	60248
Organization Type	State or U.S. Territorial government
Organization Name	State of Mississippi
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 19 - Land Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL0B		
Update Frequency	2-3 years	2-3 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	Up to 2 meters		
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Highly desirable	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Required		
Land use/land cover	Highly desirable	Required		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	Moderate	Minor		
Increased revenues	None	None		
Mission-driven performance improvements	Major	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		

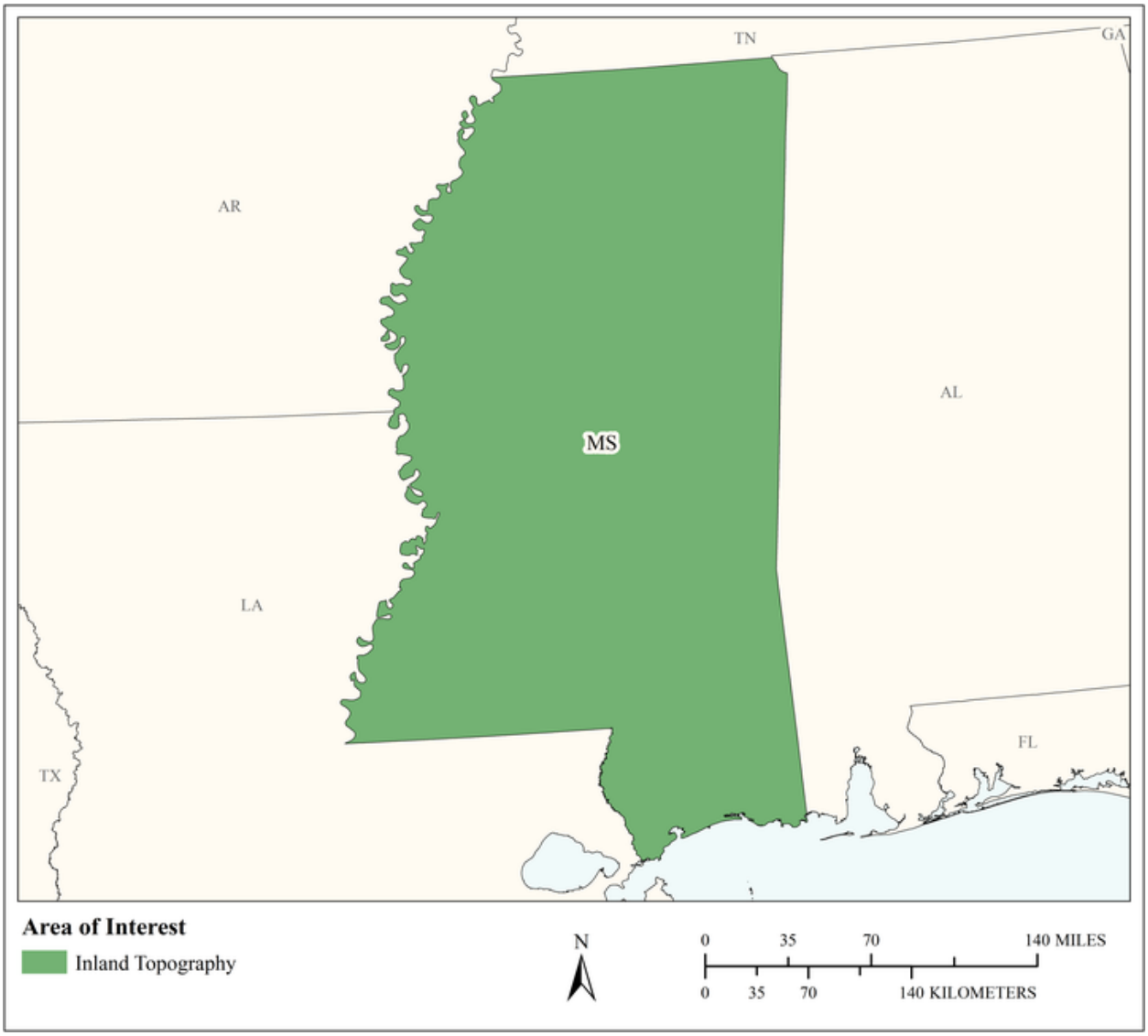
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor		
Improved customer experience	Major	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor		
Environmental	Moderate	Moderate		
Public safety, including life and property	Major	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$617,486		Annual dollars saved/ realized	$26,338						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide							
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$49,865		Annual dollars saved/ realized	$272						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor								
Environmental	Major			Moderate								
Public safety, including life and property	Major			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Aviation Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of in-flight hazards and path obstructions. Aeronautical charting. Runway construction and repair.
MCA Title	Aviation Navigation and Safety
MCA ID	60249
Organization Type	State or U.S. Territorial government
Organization Name	State of Mississippi
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 21 - Aviation Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes			
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Major			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

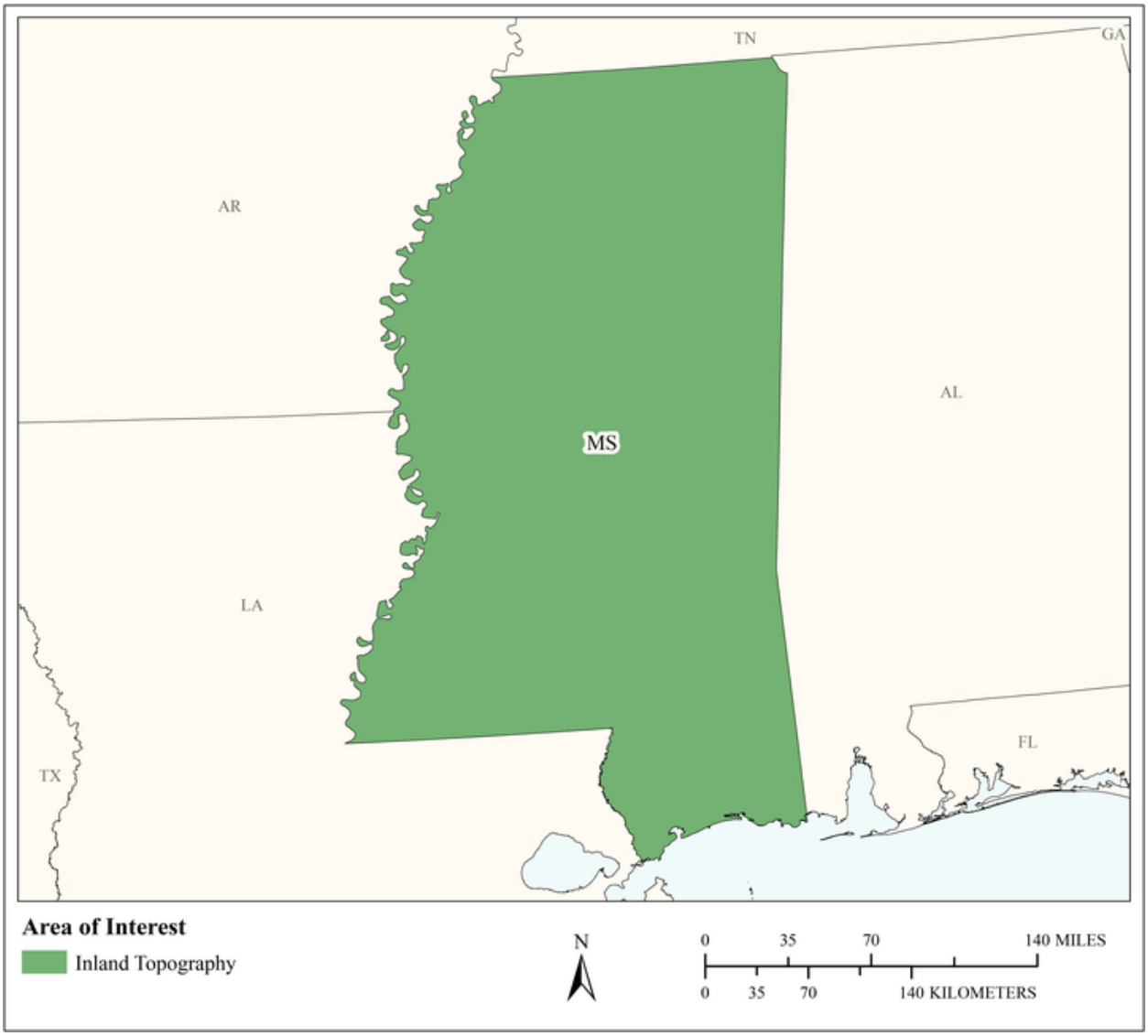
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$161,138									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$200,691									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Moderate											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Real Estate, Banking, Mortgage, and Insurance



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Assessment of risk for natural hazards (e.g., sinkholes, flooding) to inform insurance policy rates and the determination of mandatory insurance. Building permit compliance.
MCA Title	Real Estate, Banking, Mortgage, and Insurance
MCA ID	60250
Organization Type	State or U.S. Territorial government
Organization Name	State of Mississippi
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 25 - Real Estate, Banking, Mortgage, and Insurance
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

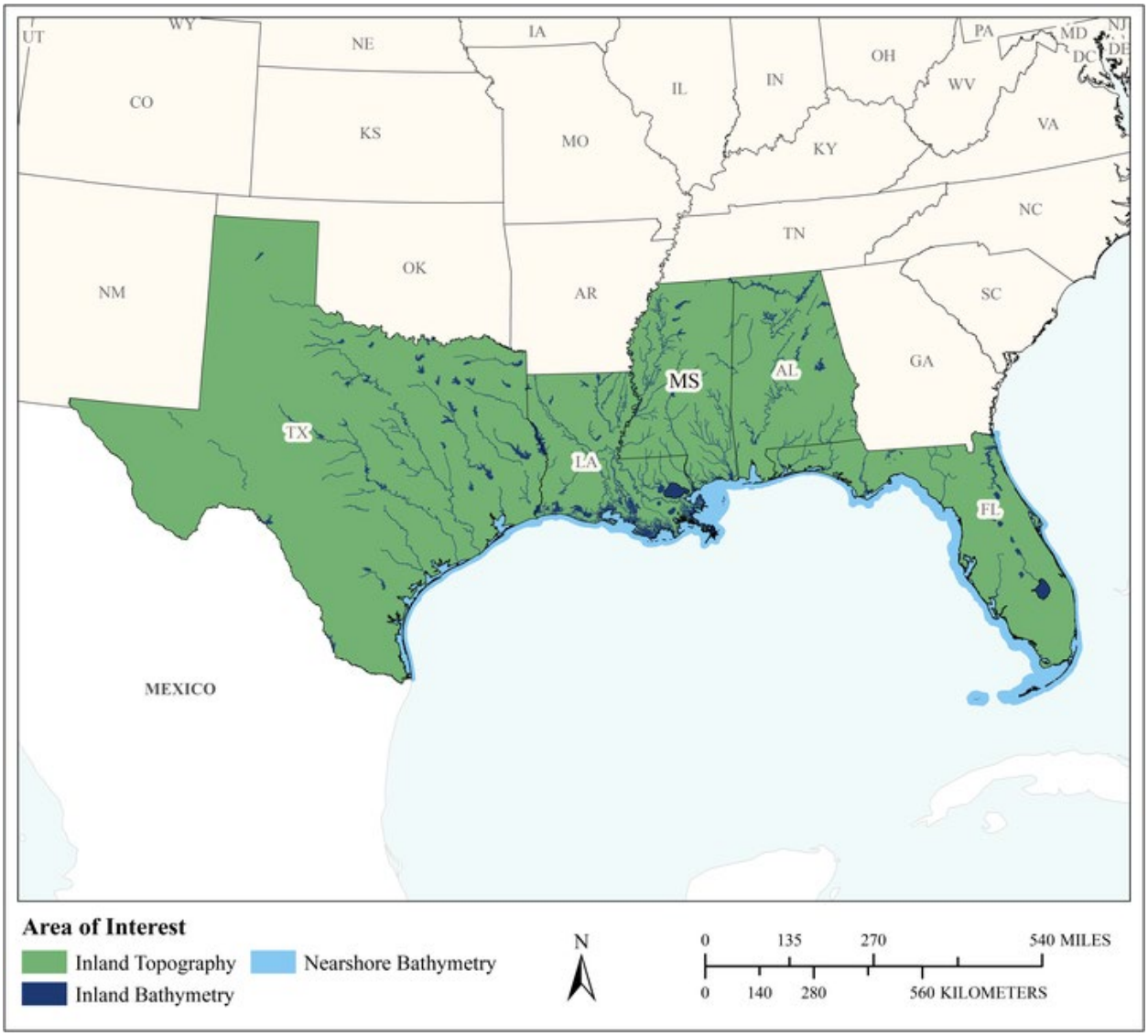
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Moderate			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,656,183									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geodetic Monitoring and Geospatial Modeling and Mapping the Effects of Sea Level Rise or Subsidence



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Geodetic monitoring, geospatial modeling and mapping the effects of sea level rise or subsidence. Population, ecological, and economic vulnerability assessments. Coastal inundation and infrastructure assessment. Elevation data are needed to administer the CORS program as well as for marine program activities.
MCA Title	Geodetic Monitoring and Geospatial Modeling and Mapping the Effects of Sea Level Rise or Subsidence
MCA ID	1469
Organization Type	Academic or Not-for-Profit
Organization Name	University of Southern Mississippi
Sub-Agency or Division	
Organization Mission	The University of Southern Mississippi is a community of engaged citizens, operating as a public, student-centered, doctoral-granting research university serving Mississippi, the nation, and the world. The University is dedicated to scholarship and learning, integrating students at all levels in the creation and application of knowledge through excellence in teaching, research, creative activities, outreach, and service. The University nurtures student success by providing distinctive and competitive educational programs embedded in a welcoming environment, preparing a diverse student population to embark on meaningful life endeavors.
Program Name	The Gulf Coast Geospatial Center
Total Annual Program Budget	
Primary Business Use	BU 26 - Education K12 and Beyond, Basic Research
Secondary Business Use	BU 03 - Coastal Zone Management
Tertiary Business Use	BU 16 - Sea Level Rise and Subsidence

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	1-2 cm accuracy for positioning
Description of smallest 3D features	Point data at 1-2 cm level

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Nice to have
51 - 100 ft	Required

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B	Cross sections and/or transects meet needs	
Update Frequency	Annually	Annually	Annually	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm	Less than 10 cm	
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed	Not applicable		Below MLLW	
Tide correction requirement			No requirement for tide correction	
Cross sections and/or transects meet needs			Yes	
Cross section/transect requirement			I don't know	

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Required	Required		Required	Required
Entire AOI under same environmental conditions	Required	Required	Required		Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Required		Highly desirable	Required
DEM for entire AOI needs to be seamless	Required	Highly desirable	Required		Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Required	
DTM	Required	Highly desirable	Required	
DEM	Required	Highly desirable	Required	
Raw point cloud data	Required	Highly desirable	Required	
Classified point cloud	Required	Highly desirable	Required	
Edited/cube XYZ		Highly desirable	Required	
Full waveform	Required	Highly desirable	Required	
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Required	Highly desirable	Highly desirable	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Not required	
Submerged features			Nice to have	
Subbottom characteristics			Not required	
Geologic and seismic data	Nice to have	Not required	Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Highly desirable	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Highly desirable	
Routes			Not required	
Offshore cadastral			Highly desirable	
Lease areas			Not required	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Required	Required	Required	
Wetlands	Required	Required	Required	
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Highly desirable	Not required	Highly desirable	
Cultural resources	Not required	Not required	Not required	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Gathered in house. RTK, RTN, terrestrial LIDAR. sub cm	NFIP data from flood studies	Available NOAA and USACE data	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes		Yes	
NCEI	Yes		Yes	
Open Topography				
NOAA nautical charts		Yes	Yes	
USACE navigation charts		Yes	Yes	
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Other project related data			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Minor	Major	
Cost savings/cost reduction	Major	Moderate	Major	

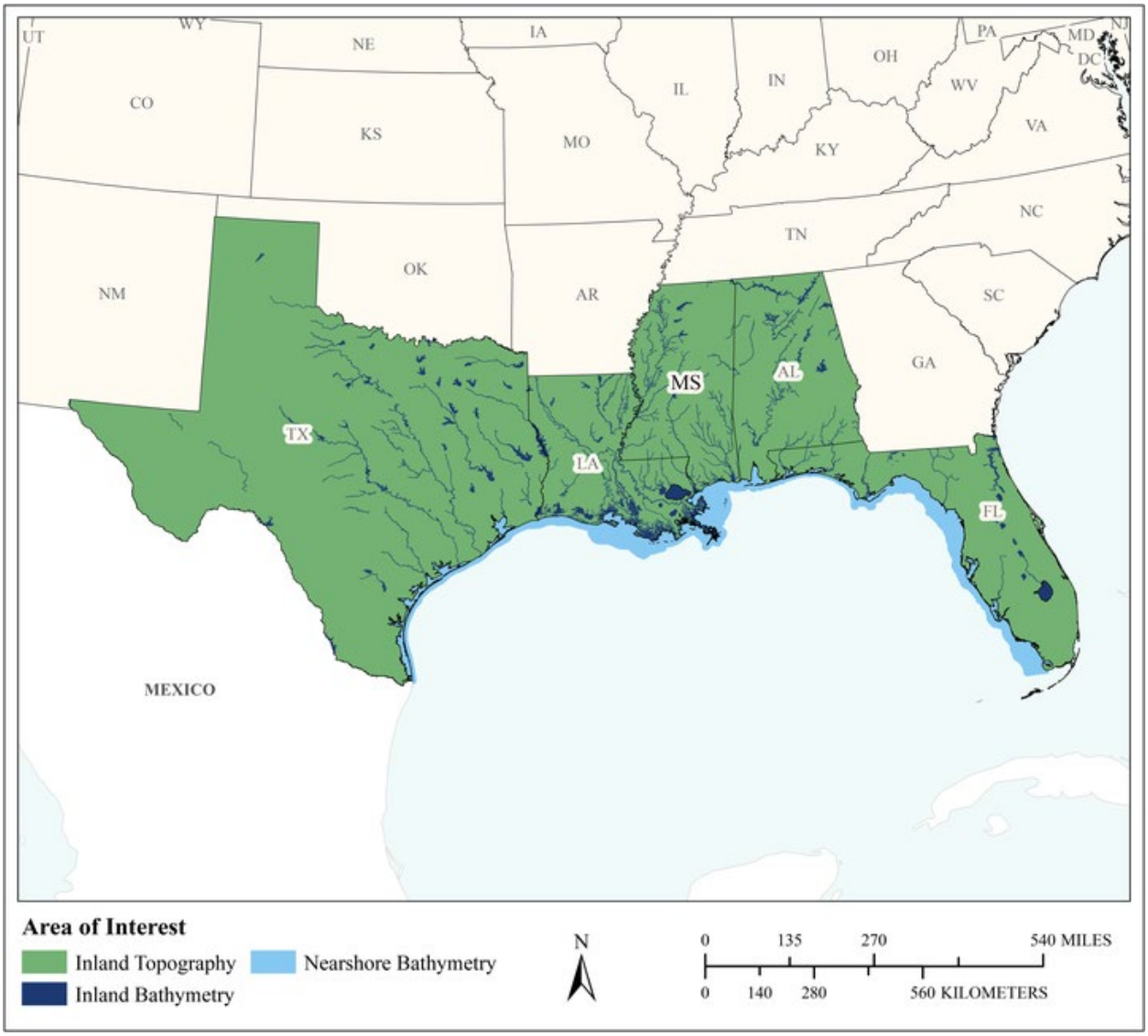
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Cost avoidance	Moderate	Minor	Major	
Increased revenues	None	None	None	
Mission-driven performance improvements	Moderate	Minor	Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	Minor	Major	
Improved response or timeliness	Moderate	Moderate	Major	
Improved customer experience	Moderate	Minor	Major	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	Major	
Environmental	I don't know	None	None	
Public safety, including life and property	Major	Moderate	None	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$48,632	Major	Annual dollars saved/realized	$15,316	Major	Annual dollars saved/realized	$3,015			
Cost savings/cost reduction	None			Moderate	Annual dollars saved/realized	$50,000	Major	Unable to provide				
Cost avoidance	Moderate	Annual dollars saved/realized	$340	Moderate	Annual dollars saved/realized	$20,000	Moderate	Unable to provide				
Increased revenues	None			None			None					
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Annual dollars saved/realized	$7,538	Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major					
Environmental	None			Major			Major					
Public safety, including life and property	None			Moderate			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes	Yes	Yes	
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Geospatial Education and Research



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Custom description	
Sub Area Requirements			Gulf of Mexico	

MCA Description	Response
Mission Critical Activity	Our primary mission critical activity centers around all things geospatial. There is no one MCA that is deemed more primary than another. The funding determines what's primary today. Given the BUs, the MCA that best describes what we do would be: Scientific research. Data dissemination. Our basic research, applied research, process development, and data/information dissemination includes: Fate and transport of contaminants. Runoff and sedimentation analyses. Point and non-point source pollution modeling. Stream channel analysis and mapping. Stream bank erosion analysis. Analysis of coastal erosion and inundation. Hurricane storm surge and wind damage modeling and assessment. Coastal hazard modeling and mapping. Land use and environmental planning. Coastal resiliency. Forest health assessment. Determination of standing inventory of forest resources. Soils and wetlands mapping and characterization. Modeling of biological and ecological systems. Detailed site analysis to support precision farming. Flood risk modeling and mapping of riverine and coastal areas. Flood forecasts. Modeling and mapping the effects of sea level rise or subsidence. Post fire analysis to assess regrowth. Bathymetric measurements of near-shore submerged coastal topography. Under the ASSURE drone program, the University is working on rules-based drone management. MSU is a leader in the ASSURE consortium. MSU is a land grant university involved in precision agriculture, forestry, invasive species management, and other programs that aid the state in managing its lands.
MCA Title	Geospatial Education and Research
MCA ID	22056
Organization Type	Academic or Not-for-Profit
Organization Name	Mississippi State University
Sub-Agency or Division	
Organization Mission	The Geosystems Research Institute (GRI) provides capabilities in remote sensing, computational technologies, visualization techniques, agriculture and natural resource management, and the transition of these into operational agency research, planning and decision-support programs. GRI has developed nationally recognized research strengths with strong relationships and inherent respect from state, regional and national agencies and business entities. The Northern Gulf Institute (NGI), a NOAA Cooperative Institute, develops, operates, and maintains an increasingly integrated research and transition program, the results of which raise awareness and understanding of the Gulf region. NGI has been recognized as critical and well positioned to provide baseline, current, and future science and outreach needs to the region. The necessity of such a role for NGI is acutely demonstrated by Gulf of Mexico catastrophes like Hurricane Katrina and the Deepwater Horizon incident.
Program Name	Mississippi State University's Geosystems Research Institute and Northern Gulf Institute.
Total Annual Program Budget	
Primary Business Use	BU 26 - Education K12 and Beyond, Basic Research
Secondary Business Use	BU 01 - Water Supply and Quality
Tertiary Business Use	BU 03 - Coastal Zone Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required

What Needs to be Measured in 3D	Response
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	We are highly focused on the exploitation of small unmanned aerial systems, researching issues where they provide the greatest value. Emerging plants (<1 cm) and marsh grasses (1 cm GSD) are probably the smallest.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Not required
5.1 – 10 acres	Not required
Greater than 10 acres	Not required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL1B	QL3B	
Update Frequency	Depends on research project	2-3 years	Annually	
Event type(s)				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI	If developing state hydrography layer, QL2 every 3 years is needed now. If modeling coast inundation or evacuation routes, need more recent data. If determining SLR or sedimentation by mapping marsh grasses, need annual data.			
Acceptable Horizontal Error	Less than 20 cm	Up to 1 meter	Less than 50 cm	
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm	Up to 30 cm	
How far onshore needed			>1 kilometer inland	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable	Nice to have		Nice to have	Not required
Entire AOI under same environmental conditions	Highly desirable	Required	Not required		Highly desirable	Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Nice to have		Nice to have	Not required
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Nice to have		Nice to have	Not required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	
DTM	Highly desirable	Highly desirable	Highly desirable	
DEM	Highly desirable	Highly desirable	Highly desirable	
Raw point cloud data	Nice to have	Not required	Not required	
Classified point cloud	Nice to have	Not required	Nice to have	
Edited/cube XYZ		Not required	Not required	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Not required	Not required	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	
Ground control/ground truthing	Highly desirable	Nice to have	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Nice to have	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Not required	Not required	Highly desirable	
Water column properties - Physical			Highly desirable	
Water column properties - Chemical			Highly desirable	
Water column properties - Biological			Highly desirable	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Not required	
Habitat distribution and classification			Not required	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Nice to have	Not required	Not required	
Wetlands	Nice to have	Not required	Not required	
Estuaries			Not required	
Inland surface water features	Nice to have	Highly desirable	Nice to have	
Bridges/culverts	Highly desirable	Required		
Landmark features	Highly desirable	Required	Nice to have	
Cultural resources	Not required	Not required	Not required	
Coastal and riverine structures	Highly desirable	Required	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Various; best available	Various; best available	We are collecting our own	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	
NCEI	Yes	Yes		
Open Topography				
NOAA nautical charts		Yes	Yes	
USACE navigation charts		Yes		
USGS Inland Waters server		Yes		
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	MARIS			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Major	
Cost savings/cost reduction	Major	Major	Major	
Cost avoidance	Major	Major	Major	
Increased revenues	Major	Major	Major	

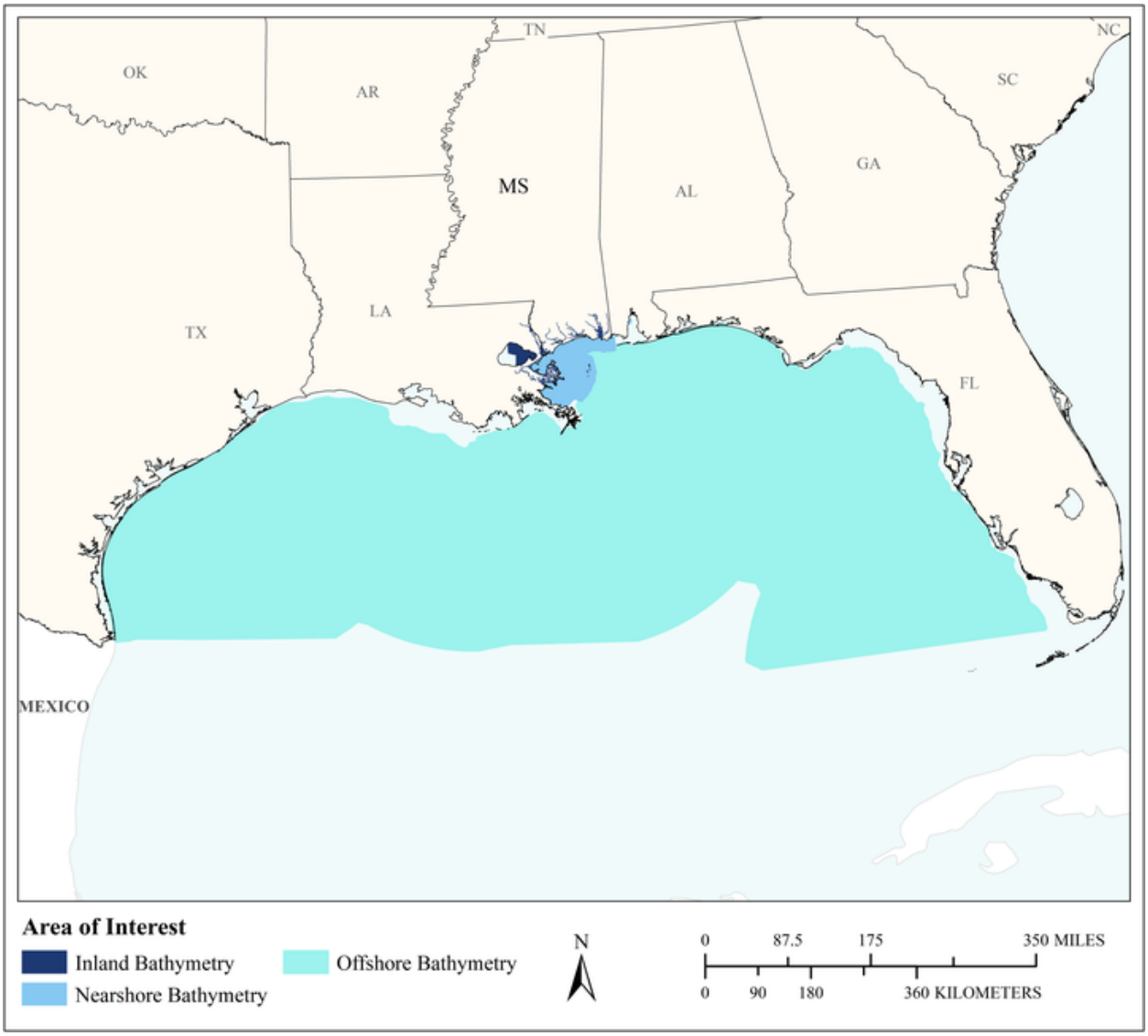
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Mission-driven performance improvements	Major	Major	Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	
Improved response or timeliness	Major	Major	Major	
Improved customer experience	Major	Major	Major	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major	Major	
Environmental	Minor	None	Major	
Public safety, including life and property	None	Major	Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	None			I don't know	Unable to provide		Major	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$250,491		Annual dollars saved/ realized	$63,124		Annual dollars saved/ realized	$2,693			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$598,748					Annual dollars saved/ realized	$106			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major					
Environmental	I don't know			I don't know			Major					
Public safety, including life and property	Major			Major			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Hydrographic Survey Education and Research



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type		Required	Required	Required
Geographic Area Requirements		One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Custom description
Sub Area Requirements		Jackson, Harrison, and Hancock Counties, MS; St. Bernard, Orleans, and St. Tammany Parishes, LA	Jackson, Harrison, and Hancock Counties, MS; St. Bernard, Orleans, and St. Tammany Parishes, LA	Gulf of Mexico

MCA Description	Response
Mission Critical Activity	CAT A hydrographic Survey education for M.S. in Hydrographic Science degree. CAT B hydrographic survey education for B.S. Marine Science (Hydrography) degree. Research in hydrographic hardware, software, techniques, data management.
MCA Title	Hydrographic Survey Education and Research
MCA ID	22191
Organization Type	Academic or Not-for-Profit
Organization Name	University of Southern Mississippi
Sub-Agency or Division	
Organization Mission	Education and research
Program Name	Hydrographic Science
Total Annual Program Budget	
Primary Business Use	BU 26 - Education K12 and Beyond, Basic Research
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Not required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Obstructions to navigation 1m proud above general bottom

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Not required
51 - 100 ft	Not required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Not required

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Not required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order		QL0B	QL0B	Order 1a
Update Frequency		4-5 years	4-5 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error		Up to 1 meter	Up to 1 meter	Up to 2 meters
Acceptable Vertical Error		Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed			To MHW	
How far down the beach profile needed			Below MLLW	
Tide correction requirement			MLLW	MLLW
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season		Nice to have	Nice to have	Nice to have		Nice to have
Entire AOI under same environmental conditions		Nice to have	Nice to have	Nice to have		Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless		Highly desirable	Highly desirable	Highly desirable		Highly desirable
DEM for entire AOI needs to be seamless		Highly desirable	Highly desirable	Highly desirable		Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM		Required	Required	Required
DTM		Required	Required	Required
DEM		Required	Required	Required
Raw point cloud data		Required	Required	Required
Classified point cloud		Required	Required	
Edited/cube XYZ		Required	Required	Required
Full waveform		Required	Required	Required
Bathymetric Attributed Grid (BAG)		Required	Required	Required
Breaklines required for standard hydro-flattening		Highly desirable		
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Nice to have
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery		Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing		Highly desirable	Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery		Required	Required	Required
Underwater videography			Nice to have	Nice to have
Bottom texture				Nice to have
Bottom type			Nice to have	Highly desirable
Submerged features			Required	Required
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data		Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Required	Required
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Highly desirable	Highly desirable
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Highly desirable	Required
Routes			Required	Required
Offshore cadastral			Highly desirable	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Required	Required
Floating observation/navigation systems			Required	Required
Shorelines – current, historic, change rates		Required	Required	
Land use/land cover		Nice to have	Nice to have	Nice to have
Wetlands		Nice to have	Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Nice to have
Inland surface water features		Nice to have	Nice to have	
Bridges/culverts		Required		
Landmark features		Required	Highly desirable	
Cultural resources		Highly desirable	Highly desirable	
Coastal and riverine structures		Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used		USACE data sets, imagery	NOAA charts and databases	NOAA Charts and databases Admiralty charts
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast		Yes	Yes	Yes
NCEI		Yes	Yes	Yes
Open Topography				
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts		Yes	Yes	Yes
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings		Major	Major	Major
Cost savings/cost reduction		None	Major	Major
Cost avoidance		Major	Major	Major
Increased revenues		None	None	None
Mission-driven performance improvements		Major	Major	Moderate

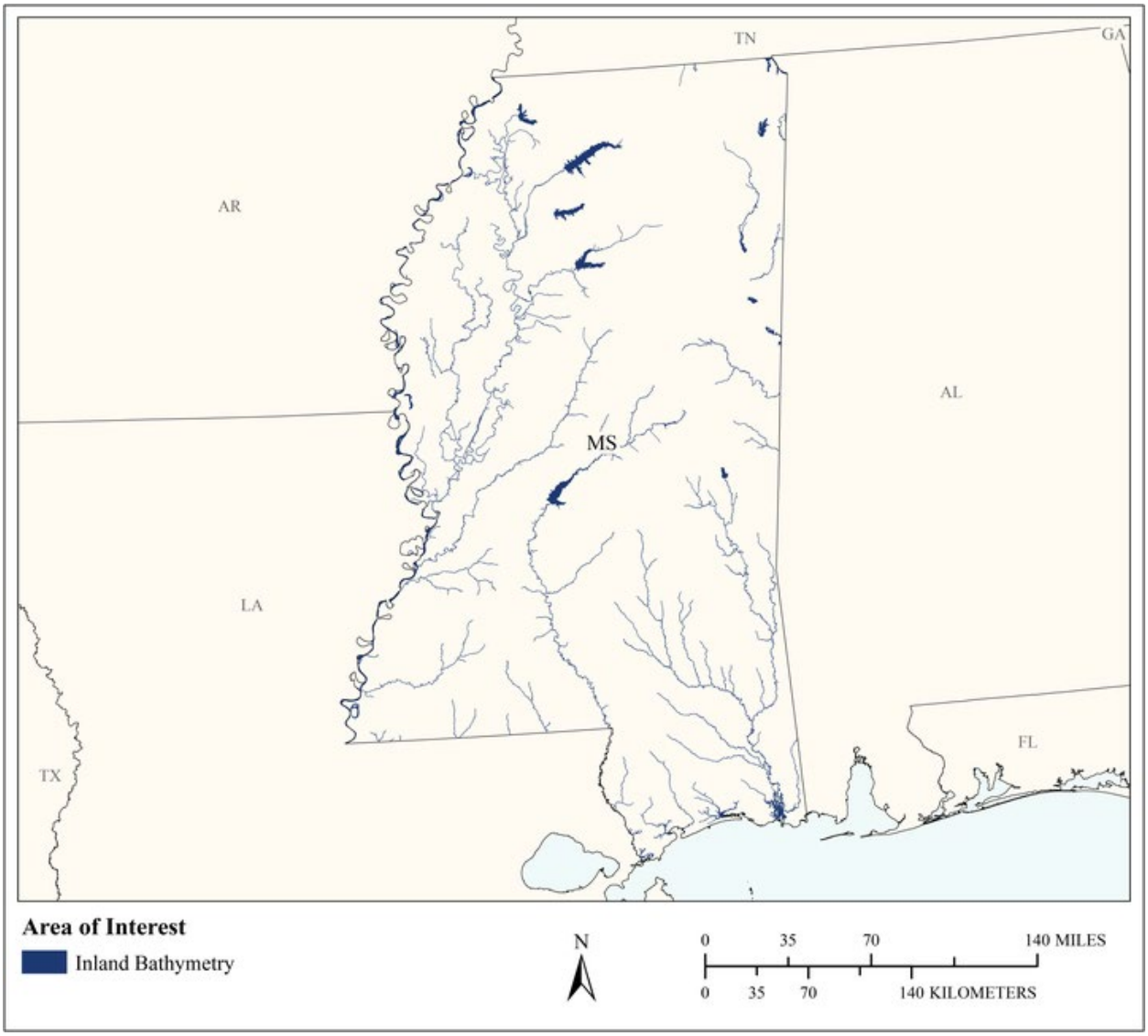
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services		Major	Major	Moderate
Improved response or timeliness		None	Moderate	Moderate
Improved customer experience		Major	Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach		Major	Major	Major
Environmental		None	None	None
Public safety, including life and property		None	None	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings				Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction				Minor	Unable to provide		None			Major	Unable to provide	
Cost avoidance				Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues				None			None			None		
Mission-driven performance improvements				Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation					Annual dollars saved/ realized	$2,381		Annual dollars saved/ realized	$2,693			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services				Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness				Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Improved customer experience				Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation								Annual dollars saved/ realized	$106			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach				Major			Major			Major		
Environmental				Minor			None			None		
Public safety, including life and property				None			I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes	Yes	Yes
Contours		Yes	Yes	Yes
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Recreation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type		Required		
Geographic Area Requirements		One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Planning and development of recreational facilities such as rafting, boating, swimming, diving, and fishing areas; ski slopes; and golf courses. Location- based products and services such as maps and guides. Tourism. Trail and vista site planning. Orienteering.
MCA Title	Recreation
MCA ID	60251
Organization Type	State or U.S. Territorial government
Organization Name	State of Mississippi
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 27 - Recreation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order		QL0B		
Update Frequency		4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error		Up to 2 meters		
Acceptable Vertical Error		Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season		Not required				
Entire AOI under same environmental conditions		Not required				
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless		Nice to have				
DEM for entire AOI needs to be seamless		Nice to have				
Amount of acceptable vertical manipulation to achieve spatial seamlessness		I don't know				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM		Required		
DTM		Highly desirable		
DEM		Required		
Raw point cloud data		Nice to have		
Classified point cloud		Highly desirable		
Edited/cube XYZ		Highly desirable		
Full waveform		Nice to have		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening		Highly desirable		
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery		Nice to have		
Ground control/ground truthing		Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery		Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data		Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates		Highly desirable		
Land use/land cover		Highly desirable		
Wetlands		Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features		Required		
Bridges/culverts		Highly desirable		
Landmark features		Highly desirable		
Cultural resources		Highly desirable		
Coastal and riverine structures		Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings		Minor		
Cost savings/cost reduction		Minor		
Cost avoidance		Minor		
Increased revenues		Minor		
Mission-driven performance improvements		Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services		Minor		

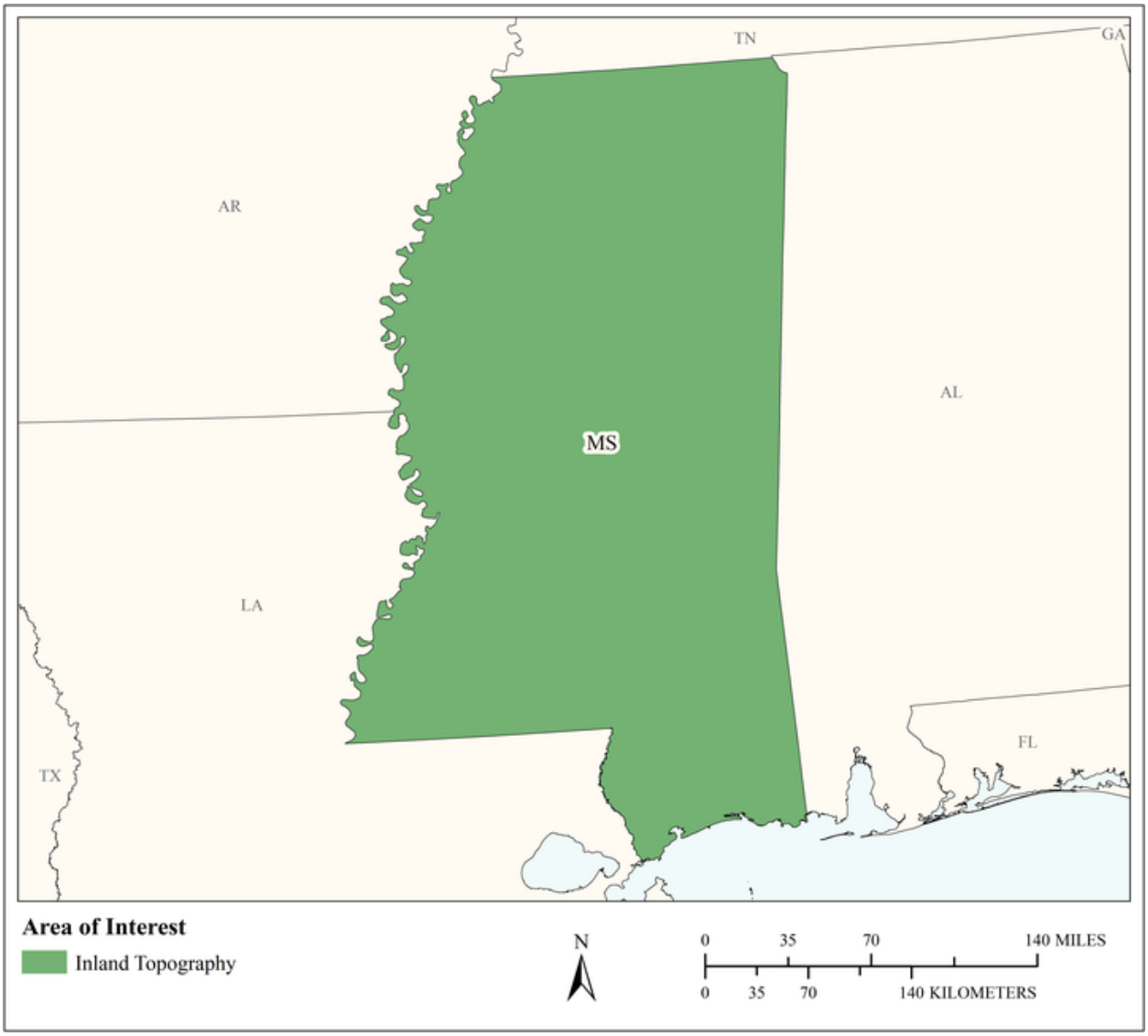
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness		Minor		
Improved customer experience		Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach		Minor		
Environmental		Minor		
Public safety, including life and property		Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings				Major	Unable to provide							
Cost savings/cost reduction				Major	Unable to provide							
Cost avoidance				Major	Unable to provide							
Increased revenues				Moderate	Unable to provide							
Mission-driven performance improvements				Major	Unable to provide							
Future annual operational benefits added during validation					Annual dollars saved/ realized	$6,586						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services				Major	Unable to provide							
Improved response or timeliness				Major	Unable to provide							
Improved customer experience				Major	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach				Major								
Environmental				Major								
Public safety, including life and property				Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes		
Contours		Yes		
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes		
Building footprints		Yes		
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness		Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Telecommunications



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Telecommunication tower site selection. Design of radio and radar systems. Interference analysis. Path profiles. Undersea telecommunication route selection and deployment.
MCA Title	Telecommunications
MCA ID	60252
Organization Type	State or U.S. Territorial government
Organization Name	State of Mississippi
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 28 - Telecommunications
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Highly desirable			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

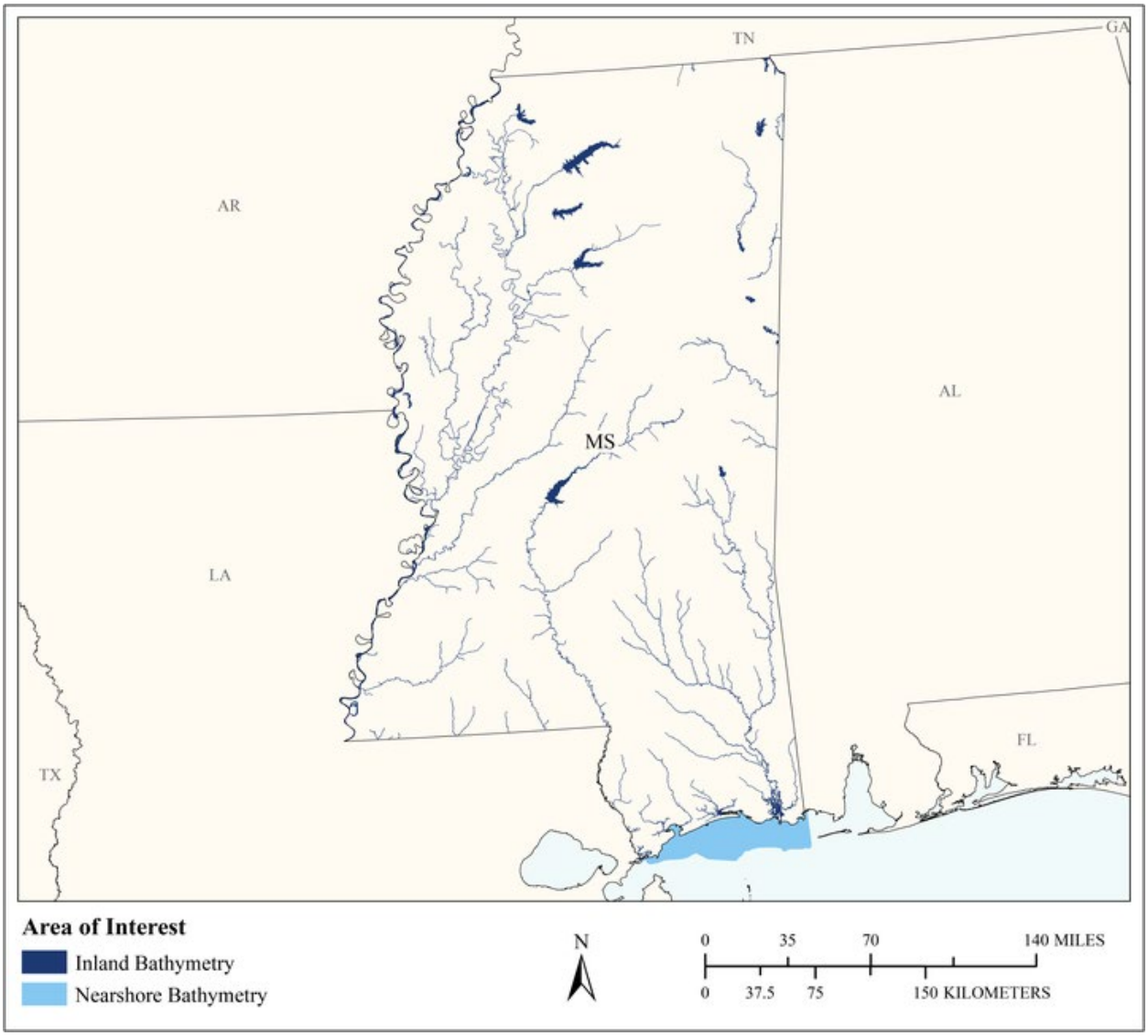
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Maritime and Land Boundary Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type		Required	Required	
Geographic Area Requirements		One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Delimitation of legal and other coastal boundaries, inland boundaries, and ordinary high water lines (OHWL).
MCA Title	Maritime and Land Boundary Management
MCA ID	60253
Organization Type	State or U.S. Territorial government
Organization Name	State of Mississippi
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 30 - Maritime and Land Boundary Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order		QL2B	QL0B	
Update Frequency		6-10 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error		Up to 5 meters	Up to 2 meters	
Acceptable Vertical Error		Up to 40 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season		Nice to have	Nice to have			Nice to have
Entire AOI under same environmental conditions		Highly desirable	Nice to have			Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless		Required	Highly desirable			Highly desirable
DEM for entire AOI needs to be seamless		Required	Highly desirable			Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM		Required	Required	
DTM		Required	Required	
DEM		Required	Required	
Raw point cloud data		Highly desirable	Required	
Classified point cloud		Highly desirable	Required	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform		Not required	Not required	
Bathymetric Attributed Grid (BAG)		Nice to have	Not required	
Breaklines required for standard hydro-flattening		Required		
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery		Required	Not required	
Ground control/ground truthing		Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery		Required	Highly desirable	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data		Nice to have	Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Highly desirable	
Routes			Nice to have	
Offshore cadastral			Highly desirable	
Lease areas			Highly desirable	
Fixed obstructions			Required	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates		Required	Highly desirable	
Land use/land cover		Highly desirable	Highly desirable	
Wetlands		Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features		Highly desirable	Highly desirable	
Bridges/culverts		Highly desirable		
Landmark features		Highly desirable	Highly desirable	
Cultural resources		Nice to have	Highly desirable	
Coastal and riverine structures		Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings		Minor	None	
Cost savings/cost reduction		None	Minor	
Cost avoidance		None	Minor	
Increased revenues		None	None	
Mission-driven performance improvements		None	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services		None	None	

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness		None	Minor	
Improved customer experience		None	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach		Minor	Minor	
Environmental		Minor	Minor	
Public safety, including life and property		None	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings				Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction				Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance				Major	Unable to provide		Moderate	Unable to provide				
Increased revenues				None			None					
Mission-driven performance improvements				Moderate	Unable to provide		Moderate	Unable to provide				
Future annual operational benefits added during validation					Annual dollars saved/ realized	$40,252		Annual dollars saved/ realized	$188,679			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services				Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness				Major	Unable to provide		Moderate	Unable to provide				
Improved customer experience				Moderate	Unable to provide		Moderate	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach				Major			Moderate					
Environmental				Major			Major					
Public safety, including life and property				Moderate			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes	Yes	
Contours		Yes	Yes	
Hillshades		Yes	Yes	
Slope maps		Yes		
Aspect maps		Yes		
Curvature maps		Yes		
Cross sections		Yes		
Height-Above-Ground maps		Yes		
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints		Yes	Yes	
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

Missouri

Current status of elevation data for Missouri

Missouri relies on data supplied from federal sources for projects that cover the entire state, which unfortunately does not have complete coverage. Approximately 77% of the state's counties will have acquired lidar data by 2021. The range of Quality Levels (QL) will be as follows: QL1 = 2%; QL2 = 69%; QL3 = 7%; and QL4 = 22% (QL and percentages are based on data holdings of the USGS 3DEP database) Percentages are approximate, as there are a few overlapping coverage areas. Very generally, the QL2 coverage area is over the more forested regions of the state, with the QL3 covering the more agricultural and urban counties.

The lack of QL2 data in broad areas of the state mean agencies/entities that require a higher resolution for their projects must purchase that 3D data themselves. This is feasible for smaller projects that are limited in size.

Although the state has not sponsored 3D data collection across the whole state, it does periodically collect statewide imagery. When imagery is flown, it has been done collaboratively, with multiple business partners contributing funds to the project. When imagery contracts are written, they have always included deliverables for 3D data products such as lidar. While imagery is being flown, entities can take advantage of a "buy up" option to collect additional data, which may include 3D deliverables. The duration of the contract period is long enough that smaller ad hoc projects can also be completed, taking advantage of this existing contract mechanism. All state agencies and local governments can utilize the state's contract.

Elevation and lidar data are made available through the state's GIS clearinghouse, in a cooperative agreement between the University of Missouri and Washington University: http://www.msdis.missouri.edu/data/lidar/index.html

The majority of the data featured on the state clearinghouse is from federal sources, but there is data collected and shared through regional efforts. Smaller projects done by cities or state agencies have not generally made their way to the clearinghouse.

In addition, elevation and lidar data for Missouri are available through the USGS National Map: https://viewer.nationalmap.gov/basic/

Importance of elevation data to Missouri

Elevation data are used in a variety of applications. Floodplain management is of major importance for Missouri's economy and for public safety, at all levels of government. Missouri sits at the convergence of the Missouri and Mississippi Rivers, and has experienced flood events that stretched from border to border covering hundreds of miles. Missouri has a strong history of wildlife and habitat management, and elevation data are used extensively for projects throughout the state. Missouri ranks 7th in the nation for the size of its highway system, and elevation data are used for both road and bridge management. Missouri maintains a permit issuing application that relies on an elevation model to determine which water systems will be impacted by placing a facility at a particular location.

At Missouri's GIS data clearinghouse, lidar requests are second only to high-resolution imagery for most requested data. The lidar directory, where data are hosted on an imagery server, has seen over 730,000 requests since going live in April of 2018. When contacted directly, requests for lidar versus any other requests tend to be about half. Many questions include an inquiry for when the rest of Missouri will be completed.

High-level summary of elevation data requirements

The available QL3 data, covering over half the state, are not considered adequate for the majority of projects requiring elevation. The boot heel region is part of the Mississippi River floodplain. Due to the flatness of this region, QL1 inland topography updated every 2-3 years and QL1B inland bathymetry updated every 4-5 years should be a general requirement. Outside this region, QL2 coverage is expected to satisfy 75% of the elevation needs. For some projects, the time of year is as much a consideration as the data quality. For example, for waterfowl habit and pool management, the pools are drained during certain times of the year.

High-level summary of benefits that would come from higher resolution elevation data

Considering the lack of consistent QL2 data in Missouri, projects that require elevation data must include data acquisition as a major cost for completing a project. This has led to a very piecemeal coverage of elevation data across Missouri. Transportation planning projects, or wildlife habitat that happen in smaller geographic areas generally require a higher resolution than is available as the statewide data set. The span of time that the current elevation data covers is also a consideration.

Additional comments

Despite being an inland state**,** concerns for flooding are relevant with its two major rivers and sometimes excessive rain events.

As a state west of the Mississippi, Missouri tends to be treated as being completely prairie in its landscape. However, approximately one-third of the state is forested, roughly 14 million acres. The Mississippi River is an easy feature for determining how data should be collected but serves as a less than perfect choice for a boundary line.

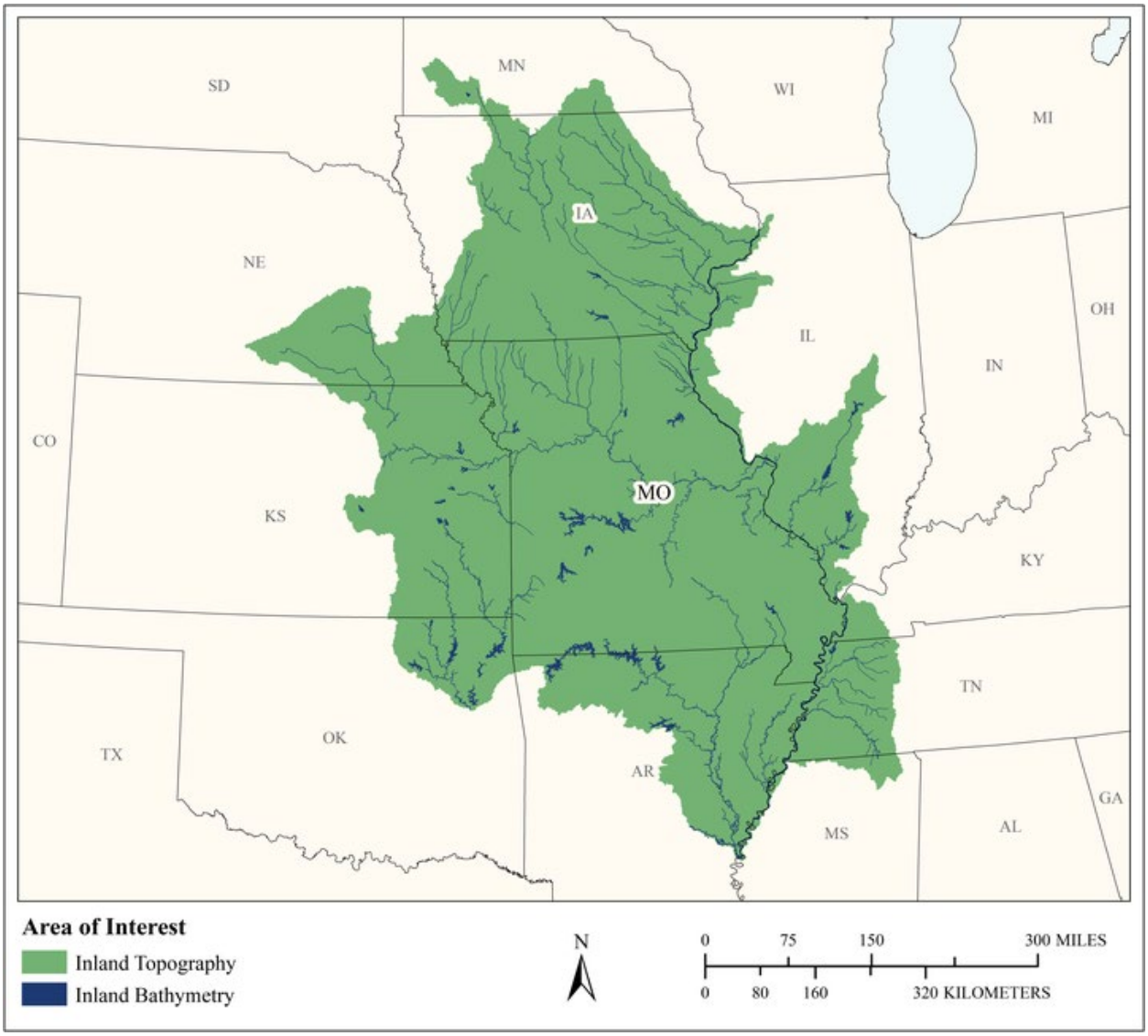
The State of Missouri has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	State of Missouri - Office of Geospatial Information	1298	Environmental Permitting	Inland Topo	QL2	(a) 4-5 years (b) 6-10 years	$2,604,960	Unable to quantify	I don't know	I don't know	I don't know
				Inland Bathy	QL3B	6-10 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 07 – Wildlife and Habitat Management	Missouri Department of Conservation	1226	Fish, Forest, and Wildlife Management; Infrastructure Asset Management; and Recreation	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	None	Minor	Minor
				Inland Bathy	I don't know	>10 years	Unable to quantify	Unable to quantify	Minor	Minor	Minor
BU 15 – Flood Risk Management	Missouri Department of Natural Resources	1332	Flood Risk Modeling and Mapping of Riverine Areas	Inland Topo	QL1	The required update frequency varies geographically from annually for certain areas to as infrequently as 5 years more broadly.	Unable to quantify	Unable to quantify	I don't know	Moderate	Moderate
				Inland Bathy	QL0B	6-10 years	$100,000	Unable to quantify	None	Minor	I don't know
BU 15 – Flood Risk Management	City of Branson, Missouri	21657	Flood Plain Management and Stormwater Analysis	Inland Topo	QL2	2-3 years	$46,652	Unable to quantify	Major	Major	Major
BU 22 – Infrastructure Management	City of Jefferson	1346	City of Jefferson Infrastructure Management and City Engineering	Inland Topo	QL0 HD	2-3 years	$20,000	Unable to quantify	None	None	None
				Inland Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	None	None	None
BU 22 – Infrastructure Management	Missouri Department of Transportation	21699	Transportation System Infrastructure Improvement	Inland Topo	QL0 HD	2-3 years	$25,000	Unable to quantify	Moderate	Major	Major
				Inland Bathy	Cross sections and/or transects meet needs	4-5 years	Unable to quantify	Unable to quantify	Minor	Minor	I don't know

MCA Description				**Requirements**			**Future Operational Benefits**	**Future Customer Service Benefits**	**Future Societal Benefits**		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 26 – Education and Basic Research	Missouri Spatial Data Information Service	1431	Geospatial Data Distribution and Education	Inland Topo	QL1	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Inland Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Major

MCA Title: Environmental Permitting



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Highly desirable		
Geographic Area Requirements	Area split by varying quality level or update frequency	One or more Hydrologic Units (HUC4s)		
Sub Area Requirements	HUC4s that cover Missouri			

MCA Description	Response
Mission Critical Activity	Issue of environmental permits. Every DNR permit needs to know the downstream impacts of the proposed project. A surface trace to the first down land stream is performed, then a trace down the stream network to see impacts. The DNR permits all things that would release or drain into the watershed (e.g. industrial, mining, drilling, air pollution, asbestos, wells, boreholes, hazardous waste, land reclamation, stormwater, landfills, infectious waste, etc.). OGIS provides data to other state agencies as well.
MCA Title	Environmental Permitting
MCA ID	1298
Organization Type	State or U.S. Territorial government
Organization Name	State of Missouri - Office of Geospatial Information
Sub-Agency or Division	
Organization Mission	Our mission is to expand and enhance the use of geospatial technologies in state government, and to facilitate the communication and sharing of this technology throughout Missouri.
Program Name	Water Pollution Control
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 06 - Natural Resources Conservation
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Since this activity deals with bare earth, identifying specific 3D features of this nature doesn't make much sense.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Nice to have
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL3B		
Update Frequency	(a) 4-5 years (b) 6-10 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI	Areas around metropolitan areas, or near major rivers are likely to change more often, as opposed to areas of agriculture and forest. 6-10 years update frequency would be adequate for agriculture/forested areas.			
Acceptable Horizontal Error	Up to 2 meters	Up to 2 meters		
Acceptable Vertical Error	Up to 1 meter	Up to 50 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have			Highly desirable	
Entire AOI under same environmental conditions	Required	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have		
DTM	Nice to have	Highly desirable		
DEM	Required	Highly desirable		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Highly desirable	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Nice to have	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Highly desirable		
Land use/land cover	Nice to have	Nice to have		
Wetlands	Nice to have	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Nice to have	Highly desirable		
Cultural resources	Not required	Nice to have		
Coastal and riverine structures	Not required	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	30 meter DEMs resampled to 10 meter spacing	None currently used		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast		Yes		
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Missouri Spatial Data Information Service - msdis.missouri.edu			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	I don't know		
Cost savings/cost reduction	Major	I don't know		
Cost avoidance	Major	I don't know		
Increased revenues	Minor	I don't know		

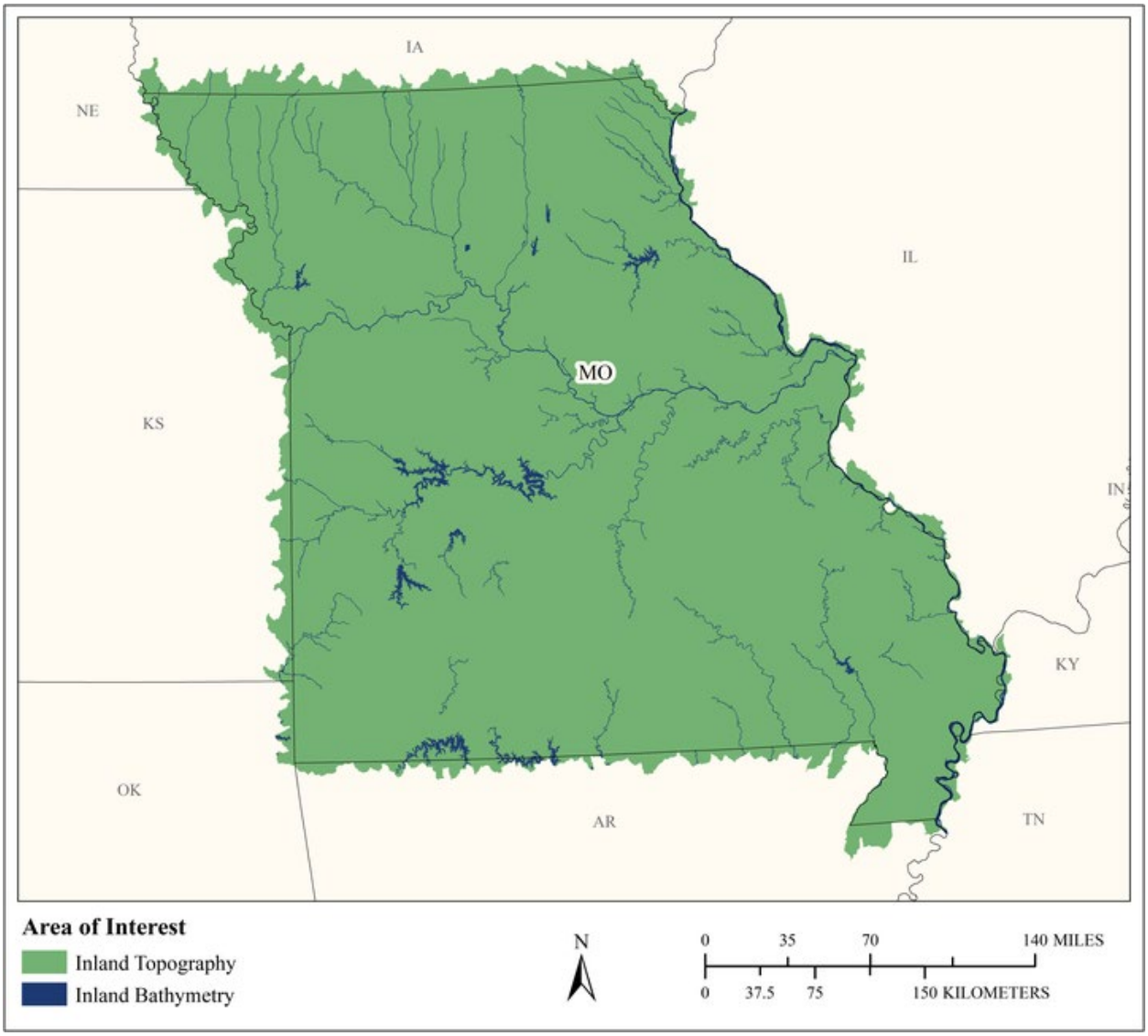
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Mission-driven performance improvements	Major	I don't know		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	I don't know		
Improved response or timeliness	Major	I don't know		
Improved customer experience	Major	I don't know		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	I don't know		
Environmental	Moderate	I don't know		
Public safety, including life and property	Moderate	I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$2,604,960	I don't know	Unable to provide							
Time savings description	Manual process has been replaced with automated system, underlying data now available for research and analysis. Built into our DNR ePermitting system. Public no longer has to research and combine data before submitting request for permit. I'm not sure there was a field inspection portion, or only a lot or research. Cost varies, but every permit issued required hours of work to research, which is not handled through a permitting application. Automated process means information is collected in a consistent manner.											
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide							
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide							
Cost avoidance description	When data is available is multiple formats. Unable to quantify; identification of issued permits likely to assist in determining property loss during a disaster.											
Increased revenues	None			I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	None			I don't know	Unable to provide							
Improved response or timeliness	Major	Unable to provide		I don't know	Unable to provide							
Improved customer experience	Major	Unable to provide		I don't know	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know								
Environmental	I don't know			I don't know								
Public safety, including life and property	I don't know			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours		Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Fish, Forest, and Wildlife Management; Infrastructure Asset Management; and Recreation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Custom description	Custom description		
Sub Area Requirements	All HUC12s that cover Missouri	All HUC12s that cover Missouri		

MCA Description	Response
Mission Critical Activity	1. Waterfowl Habitat and Pool Management 2. Contours are used in base maps for Conservation areas Missouri Department of Conservation (MDC) manages. 3. Engineering Design Plans 4. Hydrologic Modeling MDC uses canopy cover, vegetation types (NLCD), HUC12s, lidar (QL2 0.5m accuracy), and contours to help with navigation to areas, cartography, H&H modeling, wetlands and waterfowl management, pumping water in/out of pools, and vegetation planting. Having a central repository for state data is highly important. Design and development of infrastructure uses aerials and lidar to assign elevations to points. Better elevation data improves decision making. Statewide DEMs are used for many purposes. More accurate than QL2 (survey grade) may be needed for specific projects. MDC's mission includes getting more citizens to discover nature.
MCA Title	Fish, Forest, and Wildlife Management; Infrastructure Asset Management; and Recreation
MCA ID	1226
Organization Type	State or U.S. Territorial government
Organization Name	Missouri Department of Conservation
Sub-Agency or Division	
Organization Mission	To protect and manage the fish, forest, and wildlife resources of the state; to facilitate and provide opportunity for all citizens to use, enjoy, and learn about these resources.
Program Name	Infrastructure Asset Management System (IAMS) Resource Assessment and Monitoring Program (RAM)
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	BU 02 - Riverine Ecosystem Management
Tertiary Business Use	BU 09 - Fisheries Management and Aquaculture

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Building and tree heights

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have

Inland Bathy Feature Size Requirements	Response
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	I don't know		
Update Frequency	6-10 years	>10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI	We have 9 priority geographies distributed throughout the state that vary in size and objective for QL needs. Prairie, wetland, forests, and fisheries are priority watersheds. QL2 is working for these areas.			
Acceptable Horizontal Error	I don't know	I don't know		
Acceptable Vertical Error	I don't know	I don't know		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have

Hydrologic Processing Required	Response
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have		
DTM	Nice to have	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Highly desirable		
Classified point cloud	Nice to have	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Required	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Not required		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Highly desirable		
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Nice to have	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Some of the data are from 2012,	Collect by boat (sonar) as needed for specific projects, not a centralized collection effort		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	MSDIS, Missouri Spatial Data Clearinghouse			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know	Inland bathy data not available		
Cost savings/cost reduction	I don't know	Inland bathy data not available		

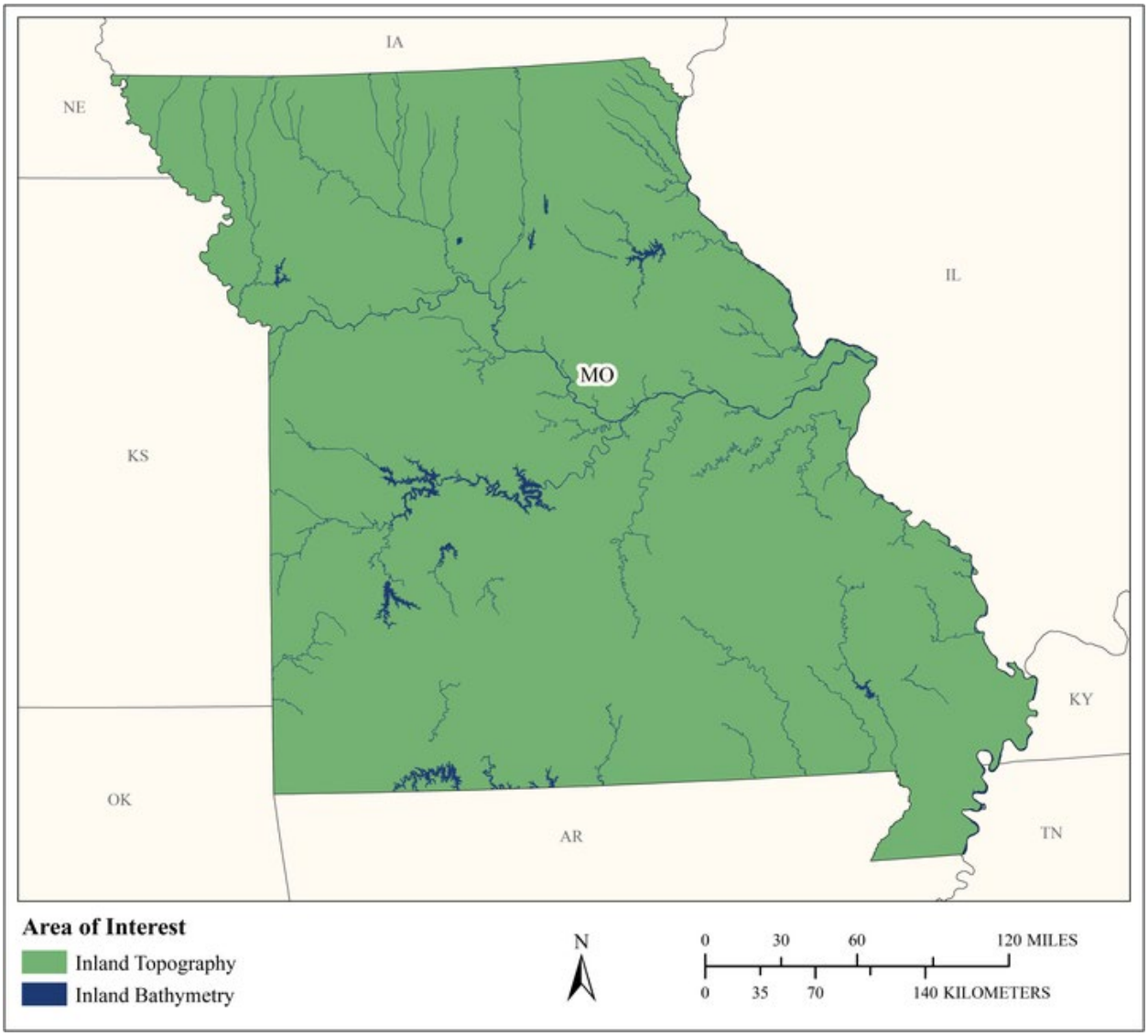
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Cost avoidance	I don't know	Inland bathy data not available		
Increased revenues	I don't know	Inland bathy data not available		
Mission-driven performance improvements	I don't know	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	Inland bathy data not available		
Improved response or timeliness	Minor	Inland bathy data not available		
Improved customer experience	Minor	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Inland bathy data not available		
Environmental	Minor	Inland bathy data not available		
Public safety, including life and property	Minor	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Minor	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Moderate	Unable to provide		Minor	Unable to provide							
Increased revenues	I don't know	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Minor	Unable to provide		Minor	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide		Minor	Unable to provide							
Improved response or timeliness	I don't know	Unable to provide		Minor	Unable to provide							
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			Minor								
Environmental	Minor			Minor								
Public safety, including life and property	Minor			Minor								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Flood Risk Modeling and Mapping of Riverine Areas



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Flood risk modeling and mapping of riverine areas. We would also use bathymetry of reservoirs for analysis of drinking water supplies. For Inland Topo, the 100-year floodplain plus 200 feet horizontally should ideally be collected more frequently and at a higher quality level. Upland areas where there is more relief and steeper slopes and smaller features are less important hydraulically could be collected at a lower frequency and lower quality level. On the other hand, urban areas should be collected more frequently, as features change more frequently, and flatter areas at a county scale should be collected at a higher quality level and at a posting density that can support a higher resolution raster. For example, the notoriously flat Bootheel and some northern Missouri counties should be collected at a higher quality level. As for inland bathy of reservoirs, once every five or ten years would be sufficient. As for quality level, it's generally not necessary do discern features for drinking water yield analyses, but only to calculate the volume-elevation curve for the reservoir and detect any storage losses due to sedimentation.
MCA Title	Flood Risk Modeling and Mapping of Riverine Areas
MCA ID	1332
Organization Type	State or U.S. Territorial government
Organization Name	Missouri Department of Natural Resources
Sub-Agency or Division	
Organization Mission	The mission of the Missouri Department of Natural Resources is to protect Missouri's natural resources while promoting the environmentally sound operations of businesses, agriculture and industry in our interactions with the public.
Program Name	Missouri Water Resources Center
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Not required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)

General Geographic Area and Size	
Description of smallest 3D features	Features are not nearly as important as the shape of the terrain. The smallest features needed are those that would be picked up by an average posting density of one meter. For example, if a ditch is only one meter wide then it's probably not very important or significant. Once a feature is important enough to matter it will be picked up based on the posting density and final resolution of a DEM.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B		
Update Frequency	The required update frequency varies geographically from annually for certain areas to as infrequently as 5 years more broadly.	6-10 years		
Event type(s)				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI	The required update frequency varies geographically from annually for certain areas to as infrequently as 5 years more broadly. The quality level also varies geographically as the state is topographically diverse. Some areas may only require QL2 while others may require QL1 for topographical features to be visible.			
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need		
Acceptable Vertical Error	Up to 10 cm	Up to 20 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Not required
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Required			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Required	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Not required		
DTM	Required	Not required		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Nice to have	Not required		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Highly desirable	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required	Highly desirable		
Land use/land cover	Not required	Not required		
Wetlands	Not required	Nice to have		
Estuaries				
Inland surface water features	Highly desirable	Highly desirable		
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Not required	Not required		
Cultural resources	Not required	Not required		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Generally 1m resolution and posting density 18.5 cm RMSE. It ranges from ten years old to 2 years old.	None		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State repositories used	The state of Missouri has a repository of elevation data. It is poorly organized and maintained. There is an additional repository at MSDIS, but it is poorly funded, staffed, maintained, and organized, and not easily accessible.			
Other	Yes			
Other description	Local Server			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available		
Cost savings/cost reduction	Major	Inland bathy data not available		
Cost avoidance	Major	Inland bathy data not available		
Increased revenues	None	Inland bathy data not available		
Mission-driven performance improvements	Moderate	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Inland bathy data not available		
Improved response or timeliness	None	Inland bathy data not available		
Improved customer experience	None	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	Inland bathy data not available		
Environmental	Minor	Inland bathy data not available		

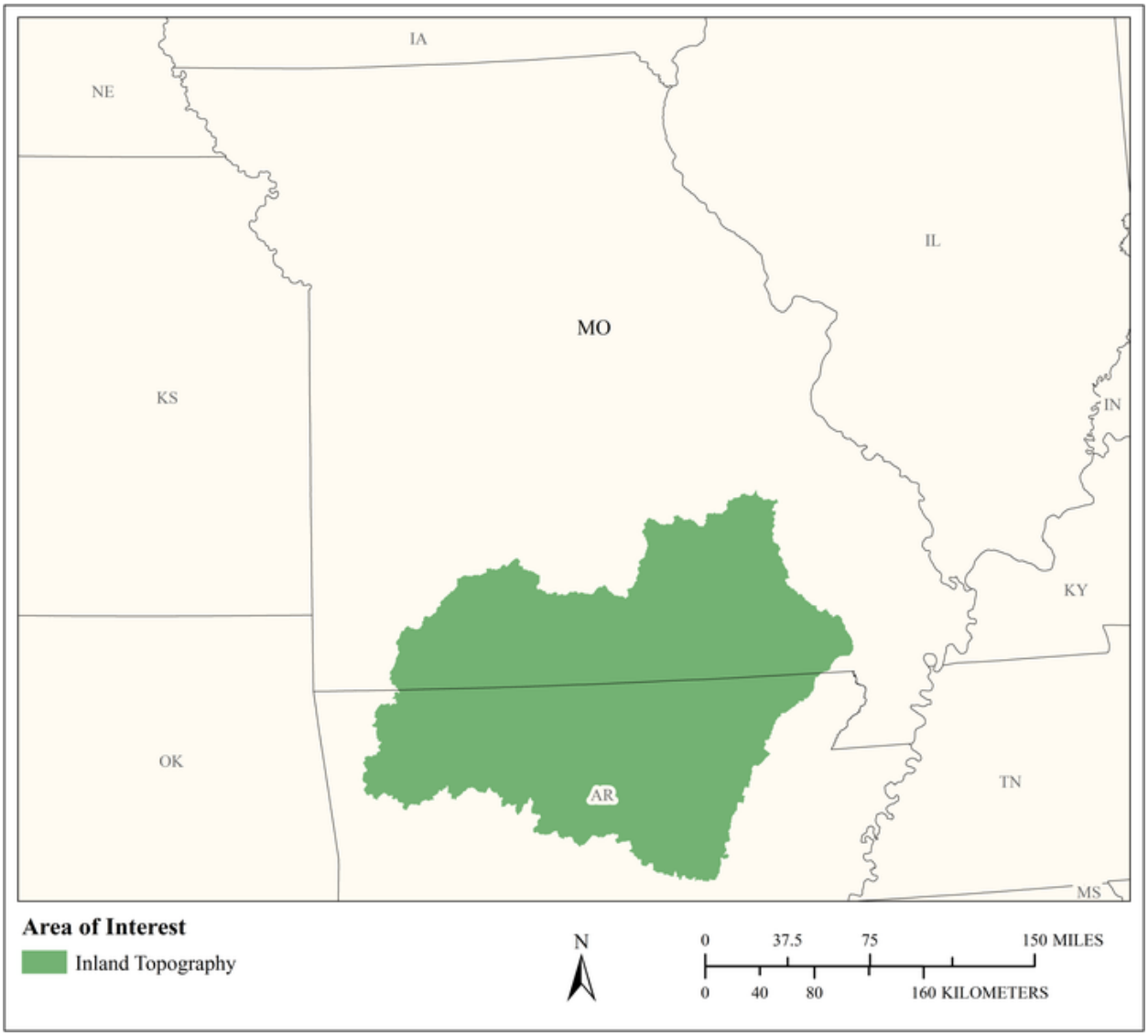
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Public safety, including life and property	Moderate	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		None								
Cost savings/cost reduction	I don't know	Unable to provide		Major	Annual dollars saved/realized	$100,000						
Cost savings/cost reduction description				Contractor cost to conduct bathymetric survey of drinking water reservoirs is $28,000 each. Considering our contractual expenditures for the next five years and spreading that out over the probable currency of that data, I think it's safe to report an annualized benefit or savings of $100,000.								
Cost avoidance	I don't know	Unable to provide		Minor	Unable to provide							
Increased revenues	None			None								
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide							
Mission-driven performance improvements description	Lidar data improves the accuracy of the modeling and the resulting products.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness	Moderate	Unable to provide		None								
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			None								
Environmental	Moderate			Minor								
Public safety, including life and property	Moderate			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours		Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Flood Plain Management and Stormwater Analysis



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Flood Plain Management and Stormwater Analysis. Elevation data is utilized to design and mitigate flood event risks and the impacts of areas of high topographic relief and impervious surface on stormwater and run-off.
MCA Title	Flood Plain Management and Stormwater Analysis
MCA ID	21657
Organization Type	Regional, County, City, or other local government
Organization Name	City of Branson, Missouri
Sub-Agency or Division	
Organization Mission	To serve the citizens and visitors of our municipality with governmental and emergency services.
Program Name	City of Branson Geographic Information System
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 01 - Water Supply and Quality
Tertiary Business Use	BU 22 - Infrastructure and Construction Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Curb inlets, parking medians, small drainage structures, basin swales and weirs

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial			
Cross section/transect requirement	Historically, the contour data derived from topographic data must be within +/- 1 foot of the contour interval on average over our entire project area (60 square miles). Our required contour interval is 2 ft.			

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Existing topographic 3d data includes digital 2ft contour line spatial data with attributes and LIDAR data with classifications taken at a 1.0 meter point spacing.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	Contracted LiDAR acquisition			
Data that meet my needs are not available				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Moderate			
Cost avoidance	Minor			
Increased revenues	Moderate			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Major			

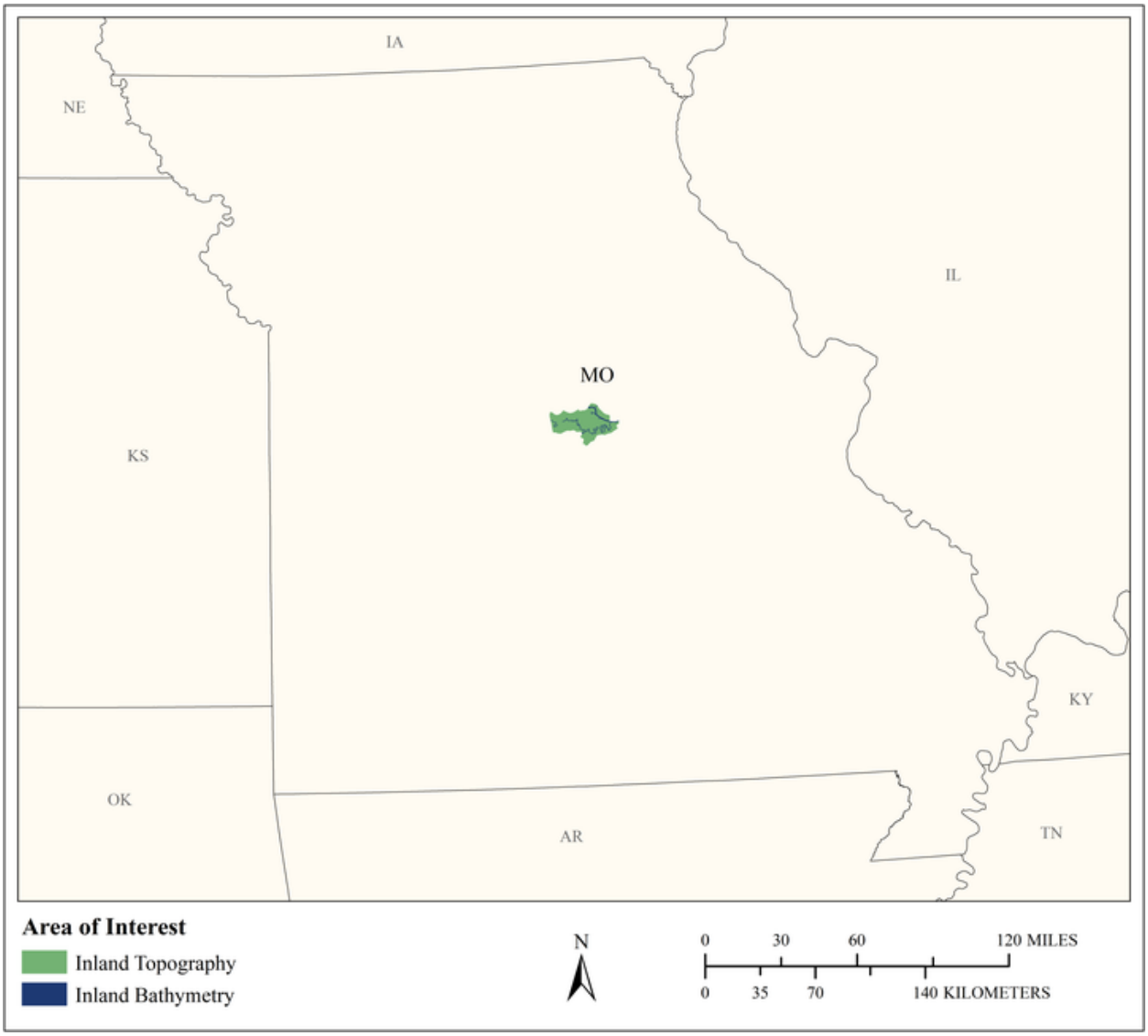
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$26,653									
Time savings description	The ability to access elevation data easily from the desktop for review would save a great deal of time in the field. 5 hours per week for 52 weeks. The ability to access elevation data easily from the desktop for mapping and analysis would save time. 6 hours per week for 52 weeks. The ability to access elevation data easily from the desktop for project planning would save time. 6 hours per week for 52 weeks.											
Cost savings/cost reduction	Major	Annual dollars saved/realized	$10,000									
Cost savings/cost reduction description	The availability of elevation data that meets our specifications would save a great deal of money. $30,000 project over 3 years = $10000 annually.											
Cost avoidance	Major	Annual dollars saved/realized	$10,000									
Cost avoidance description	Accessibility of quality 3d data for natural disaster planning could potentially save a great deal of money. The availability of classified LiDAR data that meets our specifications would save a great deal of money. $30,000 project over 3 years = $10000 annually.											
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	Major	Annual percent improvement	45%									
Mission-driven performance improvements description	Availability of current and frequent 3D elevation data that illustrates the topography changes in our project area could improve our decision making effectiveness by 75% or better. Availability of current and frequent 3D elevation data that illustrates the topography changes in our project area could increase the effectiveness of our operations by 35% or better. Availability of current and frequent 3D elevation data that illustrates the topography changes in our project area could increase the ability to carry out our mission by 25% or better.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Value added to products or services description	Availability of current and frequent 3D elevation data that illustrates the topography changes in our project area could improve our ability to develop applications to address flood and storm water analysis. Availability of current and frequent 3D elevation data that illustrates the topography changes in our project area could improve our stormwater, flood impact and drainage map products.											
Improved response or timeliness	Major	Unable to provide										

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Improved response or timeliness description	Availability of current and frequent 3D elevation data that illustrates the topography changes in our project area could improve our flood plain permitting process. Availability of current and frequent 3D elevation data that illustrates the topography changes in our project area could improve our flood and stormwater related mapping. Availability of current and frequent 3D elevation data that illustrates the topography changes in our project area could improve our flood mitigation and impact analysis programs. Availability of current and frequent 3D elevation data that illustrates the topography changes in our project area could improve our ability to create citizen accessible map viewer applications for flood-related information. Availability of current and frequent 3D elevation data that illustrates the topography changes in our project area could improve our emergency response times, evacuation plans and flood impact analysis.											
Improved customer experience	Major	Unable to provide										
Improved customer experience description	Availability of current and frequent 3D elevation data that illustrates the topography changes in our project area could improve our ability to create citizen accessible map viewer applications for flood-related information.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Education or outreach description	Improved and current 3D elevation data will assist in creating accurate flood impact and stormwater run-off maps that can be useful tools in educating our citizens											
Environmental	Major											
Environmental description	Improved and current 3D elevation data will assist in creating stormwater management best practices and other MS4 related analysis and planning											
Public safety, including life and property	Major											
Public safety, including life and property description	Improved and current 3D elevation data will assist in creating effective flood emergency response planning, flood impact analysis and evacuation plans											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: City of Jefferson Infrastructure Management and City Engineering



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Respondent provided own shapefile, KML, or geodatabase	Respondent provided own shapefile, KML, or geodatabase		
Sub Area Requirements	City of Jefferson, MO	City of Jefferson, MO		

MCA Description	Response
Mission Critical Activity	Our mission critical activity is Infrastructure and Construction Management. This is something we do on a daily basis for sanitary sewer, stormwater, and transportation (sidewalks and streets). Inland bathymetry is required for the Missouri River and is highly desirable elsewhere.
MCA Title	City of Jefferson Infrastructure Management and City Engineering
MCA ID	1346
Organization Type	Regional, County, City, or other local government
Organization Name	City of Jefferson
Sub-Agency or Division	
Organization Mission	We exist to serve the citizens of Jefferson City, Missouri. My department is in charge of managing the GIS data for the entire city. We conduct analysis for each department to meet their business needs.
Program Name	We have had a number of recent flash floods and using current accurate elevation information has been critical in the assessment of what is going on.
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	We would like to use the elevation information to be the most accurate to keep a basemap of 3D objects. This will help us categorize and have an inventory of features throughout the city. This will reduce field work by our survey crew.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Not required
101 - 500 ft	Not required
501 - 2,500 ft	Not required

Inland Bathy Feature Size Requirements	Response
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B		
Update Frequency	2-3 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	Less than 50 cm		
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm		
How far onshore needed				
How far down the beach profile needed	Below MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Highly desirable

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Required			Required	
Entire AOI under same environmental conditions	Required	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Required	Required		
Classified point cloud	Required	Highly desirable		
Edited/cube XYZ		Highly desirable		
Full waveform	Highly desirable	Highly desirable		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required	Highly desirable		
Ground control/ground truthing	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Required		
Land use/land cover	Highly desirable	Required		
Wetlands	Nice to have	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Required		
Bridges/culverts	Highly desirable	Required		
Landmark features	Highly desirable	Required		
Cultural resources	Highly desirable	Required		
Coastal and riverine structures	Required	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	City lidar flown 7-8 years ago, QL unknown	None available		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	Our own data			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know	Minor		
Cost savings/cost reduction	I don't know	Minor		
Cost avoidance	I don't know	Minor		
Increased revenues	I don't know	Minor		

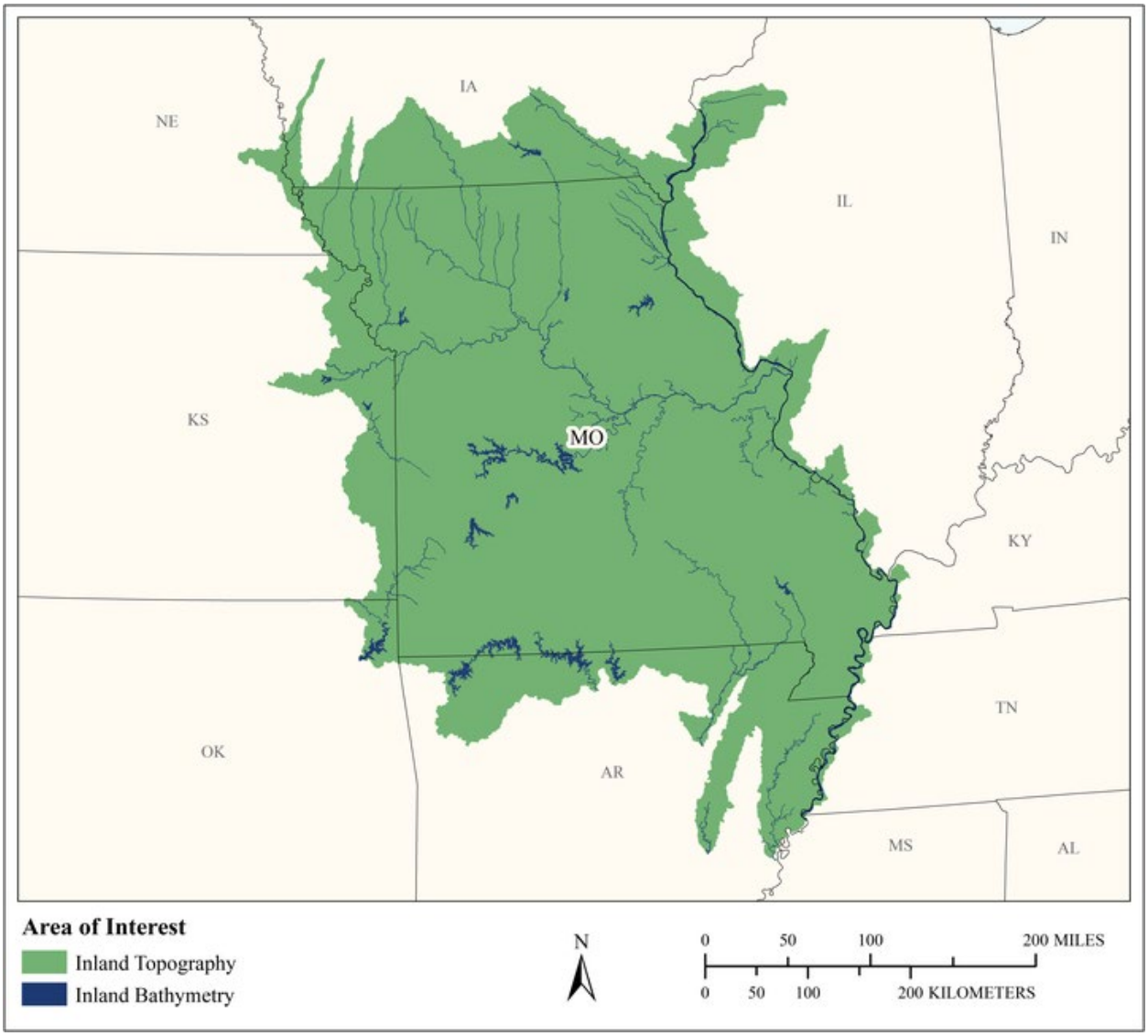
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Mission-driven performance improvements	I don't know	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know	Minor		
Improved response or timeliness	I don't know	Minor		
Improved customer experience	I don't know	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	Minor		
Environmental	I don't know	Minor		
Public safety, including life and property	I don't know	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		None								
Cost savings/cost reduction	Major	Annual dollars saved/realized	$20,000	None								
Cost avoidance	Major	Unable to provide		None								
Increased revenues	None			None								
Mission-driven performance improvements	Moderate	Unable to provide		None								
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	None			None								
Improved response or timeliness	Moderate	Unable to provide		None								
Improved customer experience	Minor	Unable to provide		None								
Other customer service benefits	Minor	Unable to provide										
Other customer service benefits description												
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			None								
Environmental	None			None								
Public safety, including life and property	None			None								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps	Yes	Yes		
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Transportation System Infrastructure Improvement



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more Hydrologic Units (HUC8s)	One or more Hydrologic Units (HUC8s)		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Deliver Transportation Solutions of Great Value. Operate a Reliable and Convenient Transportation System. Use Resources Wisely. Advance Economic Development. Elevation data are broadly used for all scales of projects including small projects (individual intersections) to very large ones (Missouri River bridge design). Stationary lidar are used to catalog features to remove and/or rebuild features and identify historic structures impacted by projects. During project scoping, lidar data are used to look for wetlands, historic sites impacted, etc. Lidar and inland bathy are also needed for roadway and bridge design and construction. MDOT manages over 34,000 centerline miles of roads.
MCA Title	Transportation System Infrastructure Improvement
MCA ID	21699
Organization Type	State or U.S. Territorial government
Organization Name	Missouri Department of Transportation
Sub-Agency or Division	
Organization Mission	“Our mission is to provide a world-class transportation system that is safe, innovative, reliable and dedicated to a prosperous Missouri.”
Program Name	"Our path forward is simple. We will work every day to improve the condition of our infrastructure and our organization "
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 23 - Urban and Regional Planning
Tertiary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Roadway intersection, safety improvement, bridges and culverts

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required

Inland Bathy Feature Size Requirements	Response
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	Cross sections and/or transects meet needs		
Update Frequency	2-3 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	Less than 50 cm		
Acceptable Vertical Error	Up to 20 cm	Up to 20 cm		
How far onshore needed				
How far down the beach profile needed	River Levels, USGS Flood stage			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial	Yes		
Cross section/transect requirement	Roadway centerlines and Right of Way, Adjacent major river banks. 100m spacing	Up to 20 cm accuracy, 100m spacing		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Required			Required	
Entire AOI under same environmental conditions	Nice to have	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Required			Required	
DEM for entire AOI needs to be seamless	Highly desirable	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable		
DTM	Required	Required		
DEM	Required	Highly desirable		
Raw point cloud data	Nice to have	Highly desirable		
Classified point cloud	Required	Required		
Edited/cube XYZ		Highly desirable		
Full waveform	Not required	Highly desirable		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Not required		
Land use/land cover	Highly desirable	Not required		
Wetlands	Required	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Nice to have		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Nice to have		
Cultural resources	Required	Nice to have		
Coastal and riverine structures	Highly desirable	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	NAIP 20616, Orthoimagery Leaf-off 2015, Statewide lidar and project specific data	Contract USGS data		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Missouri Spatial Data Information Service, MSDIS, University of Missouri.			
Other		Yes		
Other description		Contract with USGS		
Data that meet my needs are not available				

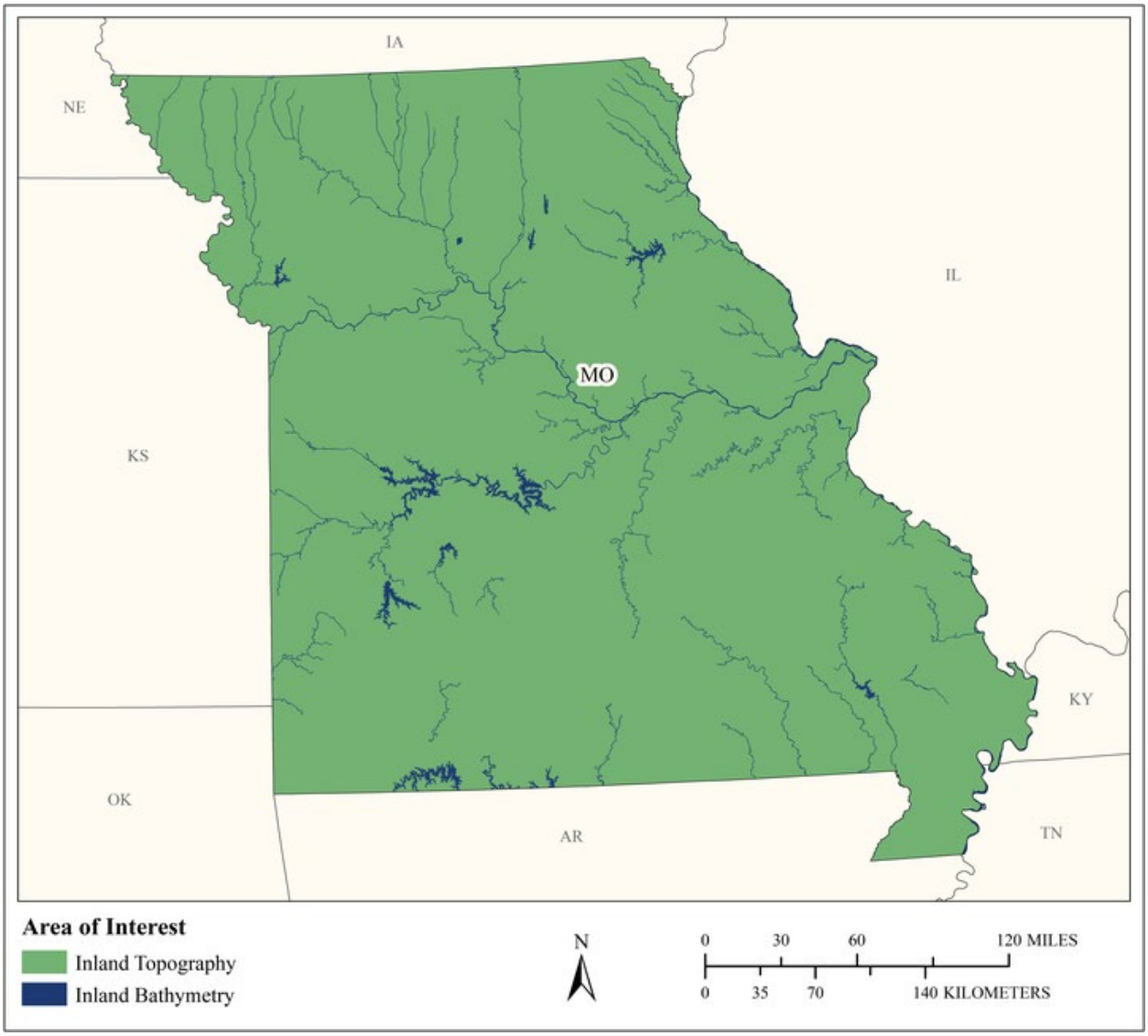
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Moderate	Major		
Cost avoidance	Moderate	None		
Increased revenues	Moderate	None		
Mission-driven performance improvements	Major	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate		
Improved response or timeliness	Major	Moderate		
Improved customer experience	Moderate	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor		
Environmental	Moderate	Minor		
Public safety, including life and property	Moderate	None		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide							
Cost savings/cost reduction	Major	Annual dollars saved/realized	$25,000	Moderate	Unable to provide							
Cost savings/cost reduction description	Survey grade lidar costs are saved if applicable data are available.											
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Moderate	Unable to provide		None								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Other operational benefits	Major	Unable to provide		Moderate	Unable to provide							
Other operational benefits description	Future highway project scoping, environmental issue detection.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		None								
Improved response or timeliness	Major	Unable to provide		Minor	Unable to provide							
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide							
Other customer service benefits	Major	Unable to provide		Minor	Unable to provide							
Other customer service benefits description	Providing accurate, current data to customers builds trust.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Minor								
Education or outreach description	Accurate data for workshops and planning partner services											
Environmental	Major			Minor								
Environmental description	Current data for environmental assessments, pre-highway project scoping											
Public safety, including life and property	Major			I don't know								
Public safety, including life and property description	Best available data during post disaster assessment allows quicker recovery											
Other												
Other benefits				Minor								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes	Yes		
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Geospatial Data Distribution and Education



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Geospatial data distribution and education. Share data with state and local agencies.
MCA Title	Geospatial Data Distribution and Education
MCA ID	1431
Organization Type	Academic or Not-for-Profit
Organization Name	Missouri Spatial Data Information Service
Sub-Agency or Division	
Organization Mission	The Missouri Spatial Data Information Service (MSDIS) is Missouri's geospatial data clearinghouse. MSDIS is responsible for data storage and access, standardization of both digital and tabular data, creation of the data dictionary, compilation of metadata, and statewide GIS user information networks. The clearinghouse is supported by, and operates from within, the University of Missouri College of Arts and Sciences and Department of Geography. Additional support and oversight of MSDIS are provided by the Missouri GIS Advisory Council.
Program Name	Missouri Spatial Data Information Service
Total Annual Program Budget	
Primary Business Use	BU 26 - Education K12 and Beyond, Basic Research
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	MSDIS supports a variety of users who maintain similarly varied interests, so it is impossible to accurately describe the smallest feature of interest, but our users are not generally interested in anything smaller than an individual building or structure. Our most common requests related to elevation data are for generalized landscapes, however we have had individuals interested in very small features, such as small docks.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required

Inland Bathy Feature Size Requirements	Response
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B		
Update Frequency	2-3 years	2-3 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	Up to 1 meter		
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Highly desirable	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Required	Required		
Classified point cloud	Required	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required	Required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required	Required		
Land use/land cover	Required	Required		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Required	Highly desirable		
Coastal and riverine structures	Required	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Missouri currently has a patchwork collection of digital elevation data derived from previous LiDAR flights at qualities levels ranging from QL1-QL3. At the time of this writing, approximately one-third of the state still lacks finished data, however we have been told that the missing geographies have been collected.	None available		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
State Repositories	Yes			
State repositories used	Missouri Spatial Data Information Service			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available		
Cost savings/cost reduction	Major	Inland bathy data not available		
Cost avoidance	Moderate	Inland bathy data not available		
Increased revenues	I don't know	Inland bathy data not available		
Mission-driven performance improvements	I don't know	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available		
Improved response or timeliness	Major	Inland bathy data not available		
Improved customer experience	Major	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Inland bathy data not available		
Environmental	Major	Inland bathy data not available		
Public safety, including life and property	Major	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	I don't know	Unable to provide		Moderate	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Major			Major								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps	Yes	Yes		
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

Montana

The State of Montana encompasses 147,000 square miles of land and approximately 1,500 square miles of water. Its landforms range in elevation from 1,800 feet to 12,799 feet. Vegetation ranges from highly forested in the west to grassland plains in the east. This vast and differing terrain calls for various requirements for enhanced elevation data. To date, a majority of the enhanced elevation collection in Montana has taken place through local and state efforts coordinated with the assistance of federal grant funding, thereby, resulting in mostly standardized data that are based on federal guidelines and specifications.

In April 2018, the Montana Land Information Advisory Council (MLIAC) approved the Montana State Library (MSL) as the state lead for elevation data. MSL leads the Montana Elevation Working Group (MEWG), which is made of experts from state, federal, local, tribal, and private organizations who use elevation data. The working group's purpose is to provide technical recommendations and guidance in the collection, maintenance, and distribution of elevation data. The MEWG released the Montana Lidar Plan in June 2019.

The Montana Lidar Plan provides a strategy for completing statewide lidar coverage in Montana. The plan provides an overview of lidar benefits and uses, a list of stakeholders and roles, an overview of past collection efforts, the status of lidar holdings, and recommended specifications for acquisition and derived products. The guiding principle of the Montana Lidar Plan is to be inclusive and maximize the number of uses and potential benefits of lidar acquisitions.

Elevation data are essential to a broad range of applications in Montana. Twenty-nine organizations and over fifty primary uses of lidar are identified in the Montana Lidar Plan. Only a small subset of organizations was invited to participate in the 3D Nation Study. Participating organizations were selected to represent a variety of the primary lidar uses in the state, including water resources and flood-risk mapping, geological hazards and analysis, transportation and infrastructure, and disaster response.

3D Nation Study participants identified 28 Mission Critical Activities (MCAs) within 23 primary Business Uses (BUs). Infrastructure and Construction Management was the most reported BU with four MCAs. Two MCAs were identified within the BU of Water Supply and Quality. Though under-represented in the survey responses, flood-risk mapping has been, and will likely continue to be, the BU with the most benefit being realized in Montana. For example, as of 2019, 75% of Montana's lidar has been collected by the Montana Department of Natural Resources and Conservation with the assistance of federal grant funding for flood-risk mapping. Lidar is required for flood-risk mapping (no other dataset is acceptable and realistic over large expanses). Lidar-derived inland bathymetry has potential to further advance flood-risk mapping and other BUs, including fisheries and riverine ecosystem management, wildlife habitat mapping, recreation, water supply and quality modeling, and geologic fault mapping.

MCAs are summarized by each responding organization:

- Tribal Government
    - Water supply: Municipal, rural, industrial, and irrigation mapping
    - Infrastructure and Construction Management
    - Renewable Energy Mapping
- Montana Bureau of Mines and Geology
    - Geological Mapping and Analysis: Elevation data are used to identify locations of faults and estimate age by offset. Canopy cover hinders current collection of faults from imagery; lidar that penetrates to bare earth is more useful. Faults should be continuous

under lakes and through wetlands, hence inland bathymetry is needed. The data are used to locate geologic formations, plan field work, and locate landslides, debris flows, block slides, etc. Approximately 90% of the state's groundwater use is for irrigation for agriculture. Elevation data are also needed for Abandoned Mine Lands identification and clean up monitoring, Superfund monitoring, and pre- and post-oil and gas development (Bakken shale development impacts to water quality and well water levels). There are 45,000 oil and gas wells in Montana.

  - Water Resources Investigation and Modeling: Elevation data are used for surface and groundwater modeling to predict development scenarios and analyze the relationship in time between aquifers and surface water. Water wells are used to estimate ground water elevations. The bureau uses elevation data to analyze the effects of development on water resources and runoff water components. Inland bathymetry is needed to estimate reservoir volume for hydropower.

- Montana State Library
  - Statewide Hydrography Mapping: The Montana State Library (MSL) collects, maintains, and disseminates statewide geographic data themes through the Montana Spatial Data Infrastructure and maintains the Montana Geographic Information Clearinghouse. MSL is the steward of the state's hydrography and elevation data. Deriving hydrography from highly accurate elevation data (lidar) is the future for detailed mapping of the state's rivers and streams. Bathymetric lidar would further enhance hydrography mapping efforts.
  - Information Access: Creation, dissemination, and maintenance of statewide, standardized spatial datasets. The current statewide elevation dataset (10-meter) does not meet state user needs.
- Montana State University
  - Undergraduate and Graduate Spatial Sciences Education and Research: The elevation data is a mission critical dataset to many of the laboratory assignments in the undergraduate and graduate spatial sciences classes where the following topics are addressed: rangeland ecology and management, snow science, ecology, biology, geology, and environmental science. It is also a valuable tool for graduate research, specifically for terrain analysis in snow science (natural and human induced avalanches), geologic hazards, rangeland ecology and biology, suitable habitat, migration pathways, precision farming, water quality and supply, and soils to name a few.
- Montana Natural Heritage Program
  - Management of Information on Biological Community Types: Map and maintain updates for land cover and wetland/ riparian thematic layers at state level. Map species distribution and develop habitat suitability models, many of which elevation is a key variable.
- Missoula County, Montana
  - Geospatial Data Management and Flood Risk Management: Counties are asked to assist other agencies (e.g., Office of Emergency Management, U.S. Army Corps of Engineers, etc.) with detailed elevation data for use in inundation mapping in flooding events and for preparing for future events.
- Montana Department of Transportation
  - Transportation Infrastructure Planning, Design, and Construction, including preliminary bridge design, stormwater modeling, cut and fill analysis for earth-moving, and building site analysis.

- Private contractors (represented by Stahly Engineering & Associates)
    - Infrastructure design, construction, maintenance, and mapping
    - Ground surveying
- Montana Department of Environmental Quality
    - DEQ's MCA reaches across a number of different programs, which include Air, Water, Land, and Energy. Various programs that benefit from lidar data (topographic or bathymetric) include but are not limited to: Mine Licensing; Oil/hazardous spill response; Abandoned Mine safety reclamation (subsidence); Tailings impoundment risk analysis; Groundwater investigations; legacy mining remediation.

As illustrated by the responses to this study, there is a pressing need for higher resolution elevation data in Montana. While attaining statewide lidar coverage is the immediate goal at hand, a challenge on the horizon for Montana is the need for updated lidar coverage in areas where the existing data are older and will no longer meet the needs of most users and stakeholders. Additionally, most lidar data in the state are Quality Level 2 (QL2), while the Montana Lidar Plan recommends QL1. QL1 data are required across areas of the state that are heavily forested, in areas of complex terrain, and in areas where geologic fault mapping and other geologic hazards may be found. The finer pulse spacing and higher pulse density of QL1 increases the potential for "hits" on feature edges. For example, a higher density point cloud leads to better detection and delineation of structures and, thus, determination of lowest adjacent grade (important for flood-risk mapping). QL1 is also important for vegetation characterization. The future national elevation data program should revisit the areas containing QL2 or lower data and capture the data as QL1 or higher. Lidar standards should include requirements for surface and vegetation characterization in addition to bare-earth elevation. Inland bathymetry is also required at QL0B. Topography and bathymetry data should be updated every 4-5 years.

The State of Montana has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

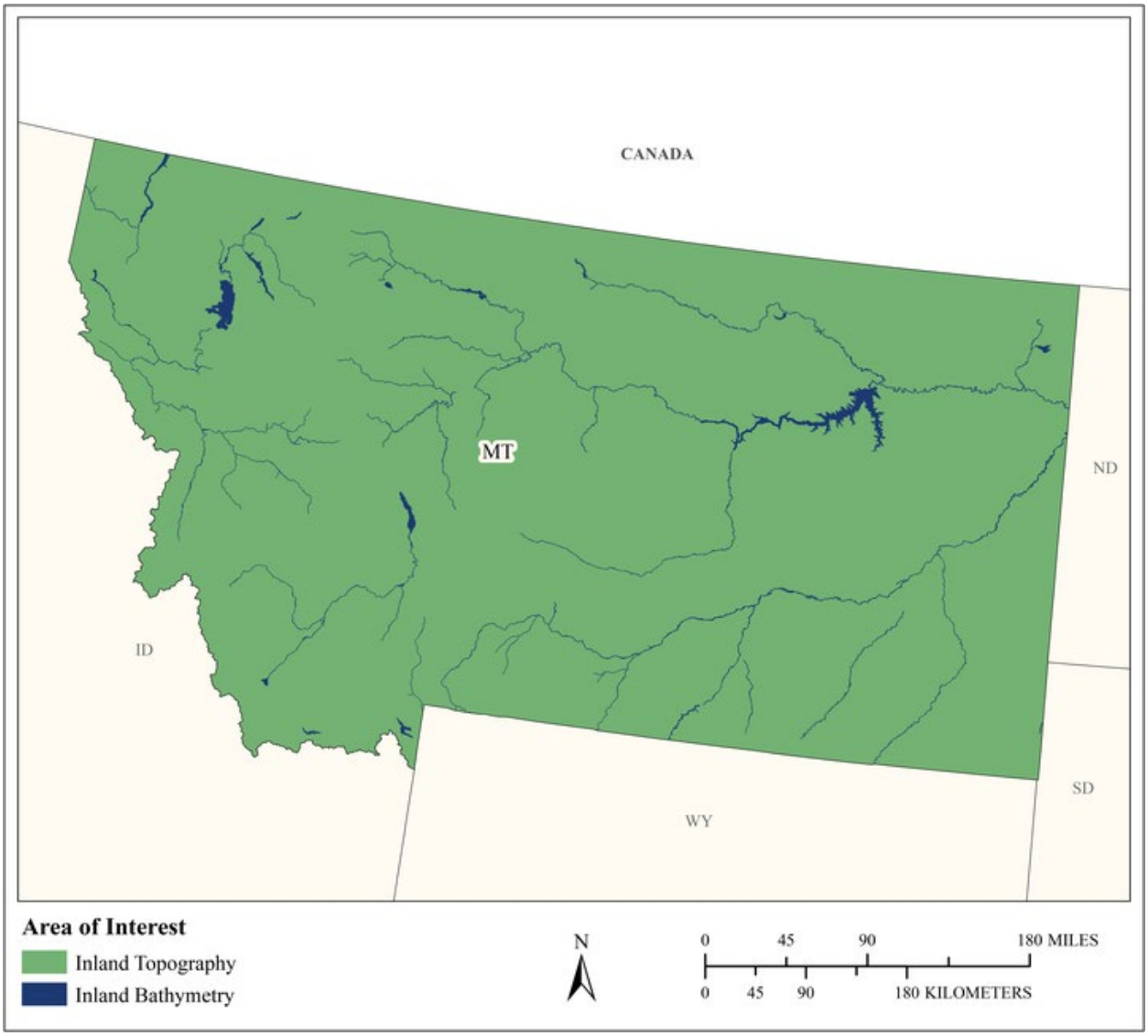
Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	Montana Bureau of Mines and Geology	1207	Water Resources Investigation and Modeling	Inland Topo	QL1 HD	4-5 years	$620,992	$578,880	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$663,847	$463,104	Major	Major	Major
BU 01 – Water Supply and Quality	Tribal	21998	Tribal Water Municipal, Rural, Industrial, and Irrigation Mapping	Inland Topo	QL1 HD	6-10 years	Unable to quantify	Unable to quantify	None	Major	I don't know
BU 02 – Riverine Ecosystem Management	Montana State Library	21552	Statewide Hydrography Mapping	Inland Topo	QL2	6-10 years	$226,078	$22,480	Major	Major	Major
				Inland Bathy	QL0B	6-10 years	$119,808	$8,448	I don't know	I don't know	I don't know
BU 04 – Forest Resource Management	State of Montana	60254	Forest Resources Management	Inland Topo	QL1	2-3 years	$581,364	$842,756	Major	Major	Major
BU 05 – Rangeland Management	State of Montana	60255	Rangeland Management	Inland Topo	QL2	Annually	Unable to quantify	Unable to quantify	Minor	Major	I don't know
BU 06 – Natural Resource Management	State of Montana	60256	Natural Resources Conservation	Inland Topo	QL1 HD	4-5 years	$5,767,304	$21,179,302	Major	Major	Major
				Inland Bathy	QL0B	6-10 years	$781,693	$35,190	Major	Major	Major
BU 07 – Wildlife and Habitat Management	Montana Natural Heritage Program, University of Montana	21754	Management of Information on Biological Community Types	Inland Topo	QL1	4-5 years	$35,026	$101,164	I don't know	I don't know	I don't know
				Inland Bathy	QL1B	4-5 years	$280,701	$169,668	I don't know	I don't know	I don't know
BU 08 – Agriculture	State of Montana	60257	Agriculture and Precision Farming	Inland Topo	QL2	2-3 years	$170,239	$134,960	Major	Major	Minor
BU 09 – Fisheries Management and Aquaculture	State of Montana	60258	Fisheries Management and Aquaculture	Inland Bathy	QL0B	6-10 years	$294,211	$133,907	Major	Major	Moderate
BU 10 – Geologic Assessment	Montana Bureau of Mines and Geology	1210	Geological Mapping and Analysis	Inland Topo	QL1 HD	4-5 years	$31,050,395	$555,593	Major	Major	Major
				Inland Bathy	QL1B	4-5 years	$411,204	$453,544	Major	Major	Major

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 11 – Geologic Resource Extraction	MT DEQ	33032	Environmental Protection	Inland Topo	QL0	2-3 years	$36,110	$23,825	Minor	Major	Moderate
				Inland Bathy	QL0B	4-5 years	Unable to quantify	$2,456	I don't know	I don't know	I don't know
BU 12 – Renewable Energy Resources	Rocky Mountain Tribal Transportation Planners	22070	Tribal Renewable Energy Mapping	Inland Topo	QL2	>10 years	Unable to quantify	Unable to quantify	None	None	None
BU 13 – Oil and Gas Resources	State of Montana	60259	Oil and Gas Resources	Inland Topo	QL1	Annually	$193,614	Unable to quantify	Minor	Major	Major
				Inland Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 14 – Cultural Resource Management	State of Montana	60260	Cultural Resources Preservation and Management	Inland Topo	QL1	4-5 years	$26,951	$23,563	Minor	Minor	Minor
BU 15 – Flood Risk Management	Missoula County, Montana	21656	Geospatial Data Management and Flood Risk Management	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
BU 15 – Flood Risk Management	State of Montana	60261	Flood Risk Management	Inland Topo	QL2	4-5 years	$20,645,166	$3,612,257	Major	Moderate	Major
				Inland Bathy	QL1B	4-5 years	$1,434,156	$1,610,189	Moderate	Moderate	Major
BU 17 – Wildfire Management	State of Montana	60262	Wildfire Management, Planning, and Response	Inland Topo	QL1	4-5 years	$1,250,000	Unable to quantify	Major	Major	Major
BU 19 – Land Navigation	State of Montana	60263	Land Navigation and Safety	Inland Topo	QL0	2-3 years	$1,904,801	$153,822	Minor	Major	Major
BU 21 – Aviation Navigation	State of Montana	60264	Aviation Navigation and Safety	Inland Topo	QL1 HD	Annually	$497,072	$619,087	Minor	Moderate	Moderate
BU 22 – Infrastructure Management	Montana State Library	21651	Creation, Dissemination, and Maintenance of Statewide Standardized Datasets	Inland Topo	QL2	6-10 years	$2,152,689	$6,334,932	Major	Major	Major
				Inland Bathy	QL0B	6-10 years	$2,226,308	$231,176	I don't know	I don't know	I don't know
BU 22 – Infrastructure Management	Montana Department of Transportation	21697	Transportation Infrastructure Planning, Design, and Construction	Inland Topo	QL2	Annually	$2,152,689	$6,334,932	Moderate	Moderate	Moderate

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 22 – Infrastructure Management	Rocky Mountain Tribal Transportation Planners	22069	Tribal Infrastructure Mapping	Inland Topo	QL0	6-10 years	$149,833	$440,930	I don't know	Major	I don't know
BU 22 – Infrastructure Management	Stahly Engineering & Associates	22507	Infrastructure Design, Construction, Maintenance, and Mapping	Inland Topo	QL1 HD	Event driven	$2,153,433	$6,334,932	I don't know	Moderate	Moderate
BU 23 – Urban and Regional Planning	State of Montana	60265	Urban and Regional Planning	Inland Topo	QL1	4-5 years	$19,781,262	$2,283,755	Moderate	Major	Major
BU 25 – Real Estate, Banking, and Insurance	State of Montana	60266	Real Estate, Banking, Mortgage, and Insurance	Inland Topo	QL1 HD	4-5 years	$2,750,000	Unable to quantify	Minor	Minor	Major
BU 26 – Education and Basic Research	State of Montana	60267	Education K12 and Beyond, Basic Research	Inland Topo	QL1 HD	2-3 years	$772,708	$1,846,997	Major	Major	Major
				Inland Bathy	QL1B	4-5 years	$202,072	Unable to quantify	Major	Major	Major
BU 27 – Recreation	State of Montana	60268	Recreation	Inland Topo	QL1	4-5 years	$132,000	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	4-5 years	$60,000	Unable to quantify	Major	Major	Moderate
BU 28 – Telecom-munications	State of Montana	60269	Telecommunications	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

MCA Title: Water Resources Investigation and Modeling



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Highly desirable		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Water resources investigation and modeling. Elevation data are used for surface and groundwater modeling to predict development scenarios and analyze the relationship in time between aquifers and surface water. Water wells are used to estimate ground water elevations. GMS groundwater modeling software is used, also ArcHydro, HEC HMS, and HEC RAS. The bureau uses elevation data to analyze the effects of development on water resources and runoff water components. Inland bathymetry is needed to estimate reservoir volume for hydropower. Seamless nationwide topo and bathy data would be extremely useful to us as an agency.
MCA Title	Water Resources Investigation and Modeling
MCA ID	1207
Organization Type	State or U.S. Territorial government
Organization Name	Montana Bureau of Mines and Geology
Sub-Agency or Division	
Organization Mission	Providing information for the sound use of Montana's geologic, mineral, and water resources.
Program Name	Ground Water Assessment Program
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 02 - Riverine Ecosystem Management
Tertiary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Sides and bottom of ditches approximately 0.5 m across and 0.5m deep. Submerged vegetation.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Less than 50 cm		
Acceptable Vertical Error	Up to 10 cm	Less than 10 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Required			Required	
Entire AOI under same environmental conditions	Highly desirable	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Highly desirable	Highly desirable		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Highly desirable		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Highly desirable		
Land use/land cover	Nice to have	Highly desirable		
Wetlands	Nice to have	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Required		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Highly desirable		
Cultural resources	Nice to have	Highly desirable		
Coastal and riverine structures	Nice to have	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	For areas that have Lidar data we use that. In MT it varies from QL0-QL3 and is very sparse. In absence of Lidar data we use 10M DEMs, which are less than ideal.	Very little to none available in state, but would be incredibly useful.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	The Montana State Library has some Lidar datasets. The Montana Bureau of Mines and Geology has others.			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	None		
Cost savings/cost reduction	Major	None		
Cost avoidance	Major	None		
Increased revenues	Moderate	None		
Mission-driven performance improvements	Major	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None		
Improved response or timeliness	Major	None		
Improved customer experience	Major	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	None		
Environmental	Major	None		
Public safety, including life and property	Major	None		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$520,992	Major	Annual dollars saved/realized	$173,664						
Time savings description	40 hrs/wk, 160/mo, 1920/yr. 80 hrs/wk, 320/mo, 3840/yr.			20/wk, 80/mo, 960/yr.								
Cost savings/cost reduction	Major	Annual dollars saved/realized	$60,000	Major	Annual dollars saved/realized	$30,000						
Cost savings/cost reduction description	Lidar acquisition for 1 project can be used for multiple projects in same area.			Currently manually create cross sections, would be large benefit/cost savings.								
Cost avoidance	Major	Annual dollars saved/realized	$40,000	Major	Annual dollars saved/realized	$20,000						
Cost avoidance description	Often we need to revisit old reports when Lidar data becomes available. Difficult to quantify. Lidar processing time is significant when completed in-house.			Difficult to estimate. Much higher accuracy over manual measurements. Large improvement over manual measurements.								
Increased revenues	None			None								
Mission-driven performance improvements	Major	Annual percent improvement	28%	Major	Annual percent improvement	17%						
Mission-driven performance improvements description	Higher potential to meet mission goals. Much better data to make decisions (ie. groundwater- surface water interaction). Higher precision models.			Much improved modeling. More accurate predictions.								
Future annual operational benefits added during validation					Annual dollars saved/ realized	$440,183						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$115,776	Major	Annual dollars saved/realized	$115,776						
Value added to products or services description	40 hrs/wk, 160/mo, 1920/yr.			40/wk, 160/mo, 1920/yr.								
Improved response or timeliness	Major	Annual dollars saved/realized	$173,664	Major	Annual dollars saved/realized	$173,664						
Improved response or timeliness description	40 hrs/wk, 160/mo, 1920/yr.			40/wk, 160/mo, 1920/yr.								
Improved customer experience	Major	Annual dollars saved/realized	$289,440	Major	Annual dollars saved/realized	$173,664						
Improved customer experience description	40 hrs/wk, 160/mo, 1920/yr. 80 hrs/wk, 320/mo, 3840/yr.			40/wk, 160/mo, 1920/yr.								
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Education or outreach description	Lidar data provides dramatic backdrops for data, and is easy to explain the benefits to laymen			Data would be widely used in recreation								
Environmental	Major			Major								
Environmental description	Critical for water resource studies			More accurate modeling/change detection								
Public safety, including life and property	Major			Major								
Public safety, including life and property description	Critical for drought and flooding studies			Better prediction of drought/flooding								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Tribal Water Municipal, Rural, Industrial, and Irrigation Mapping

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Respondent provided own shapefile, KML, or geodatabase			
Sub Area Requirements	Rocky Mountain Tribal Transportation Planners Area of Operation			

MCA Description	Response
Mission Critical Activity	Water supply: Municipal, rural, industrial and irrigation
MCA Title	Tribal Water Municipal, Rural, Industrial, and Irrigation Mapping
MCA ID	21998
Organization Type	Tribal government
Organization Name	Tribal
Sub-Agency or Division	
Organization Mission	Improve the infrastructure on reservations
Program Name	Tribal water resource department(s). Blackfeet, Fort Belknap, Fort Peck, Crow, Wind River Reservations
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 08 - Agriculture and Precision Farming
Tertiary Business Use	BU 23 - Urban and Regional Planning

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	
Tops of vegetation	
Tops of submerged structures, objects	
Tops of submerged vegetation	
Subcanopy of vegetation/understory	
River/lake bottom	
Nearshore elevation (<10 m deep)	
Sea surface	
Ocean/sea bottom (>10 m deep)	

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Enough density for 1 foot contours.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need			
Acceptable Vertical Error	Up to 10 cm			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Nice to have					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Not required			
Wetlands	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Not required			
Landmark features	Required			
Cultural resources	Not required			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	USGS Topographic survey data. 1970's vintage			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know			
Cost savings/cost reduction	I don't know			
Cost avoidance	I don't know			
Increased revenues	I don't know			
Mission-driven performance improvements	I don't know			

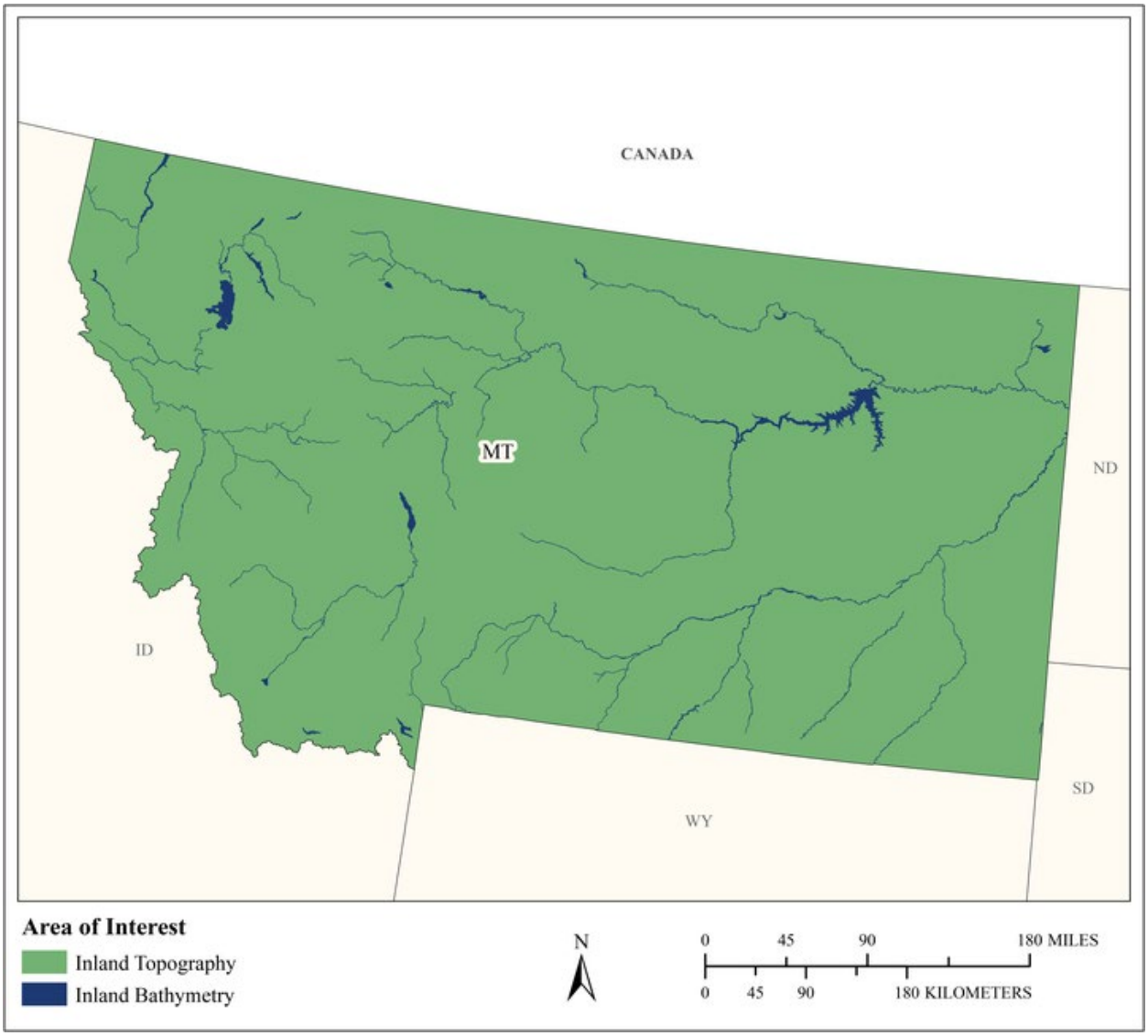
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know			
Improved response or timeliness	I don't know			
Improved customer experience	I don't know			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know			
Environmental	I don't know			
Public safety, including life and property	I don't know			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Time savings description	Tribal trust land ownership (allotments) can have hundreds of land owners for a single parcel. To survey, permission must be acquired taking weeks and sometime months. Accurate topographic data would allow for feasibility studies and preliminary engineering without visits to the field. Currently Rocky Mountain tribes don't have a highly accurate datum. Some tribes have major projects others minor, it varies.											
Cost savings/cost reduction	Major	Unable to provide										
Cost savings/cost reduction description	Some tribes have major projects others minor, it varies.											
Cost avoidance	Minor	Unable to provide										
Increased revenues	Major	Unable to provide										
Increased revenues description	Data will enhance feasibility studies for moving projects from concept to reality.											
Mission-driven performance improvements	Major	Unable to provide										
Mission-driven performance improvements description	Program is based on hydraulics; having elevation models is critical.											
Other operational benefits	Major	Unable to provide										
Other operational benefits description	An accurate DTM is necessary for accurate ortho-rectified photos. Ortho-rectifying photos.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	None											
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None											
Environmental	Major											
Environmental description	Communication between programs will be greatly enhanced											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Statewide Hydrography Mapping



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Nice to have		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Hydrography Mapping. Create and maintain a digital, spatial representation of the streams, rivers, lakes, wetlands, and other water features of Montana. Update NHD using lidar (as state NHD steward). Statewide lidar would significantly improve statewide hydro and elevation mapping.
MCA Title	Statewide Hydrography Mapping
MCA ID	21552
Organization Type	State or U.S. Territorial government
Organization Name	Montana State Library
Sub-Agency or Division	
Organization Mission	The Montana State Library (MSL) helps all organizations, communities, and Montanans thrive through excellent library resources and services. Montana State Library staff support State GIS Coordination to ensure investment in GIS is expanded, strengthened, and utilized. MSL collects, maintains, and disseminates statewide geographic data themes through the Montana Spatial Data Infrastructure and maintains the Montana Geographic Information Clearinghouse. MSL is the steward of the state's elevation data.
Program Name	Water Information System Natural Resource Information System Montana Spatial Data Infrastructure Montana Land Plan statewide GIS coordination
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	BU 01 - Water Supply and Quality
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	New channels and old channels, for example: rip rap

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Not required
51 - 100 ft	Nice to have

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B		
Update Frequency	6-10 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 5 meters	I don't know		
Acceptable Vertical Error	Up to 1 meter	I don't know		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Not required			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Not required			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Not required			Nice to have	
DEM for entire AOI needs to be seamless	Required	Not required			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have		
DTM	Required	Nice to have		
DEM	Required	Nice to have		
Raw point cloud data	Nice to have	Not required		
Classified point cloud	Nice to have	Not required		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Highly desirable	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required	Nice to have		
Land use/land cover	Highly desirable	Nice to have		
Wetlands	Required	Required		
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Nice to have		
Landmark features	Highly desirable	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Required	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	10m NED. This dataset is mostly inadequate for deriving hydrography, but is occasionally somewhat helpful. 5m IFSAR has been tested and is sufficient in complex terrain (high relief) but is inadequate for flatter terrain.	Some data from FWS, not readily available from other sources		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State Repositories				
State repositories used				
Other	Yes			
Other description	Project specific LiDAR collections (some state, County, Federal)			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None	Inland bathy data not available		
Cost savings/cost reduction	None	Inland bathy data not available		
Cost avoidance	None	Inland bathy data not available		
Increased revenues	None	Inland bathy data not available		
Mission-driven performance improvements	Minor	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	Inland bathy data not available		
Improved response or timeliness	None	Inland bathy data not available		
Improved customer experience	Minor	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Inland bathy data not available		
Environmental	None	Inland bathy data not available		
Public safety, including life and property	None	Inland bathy data not available		

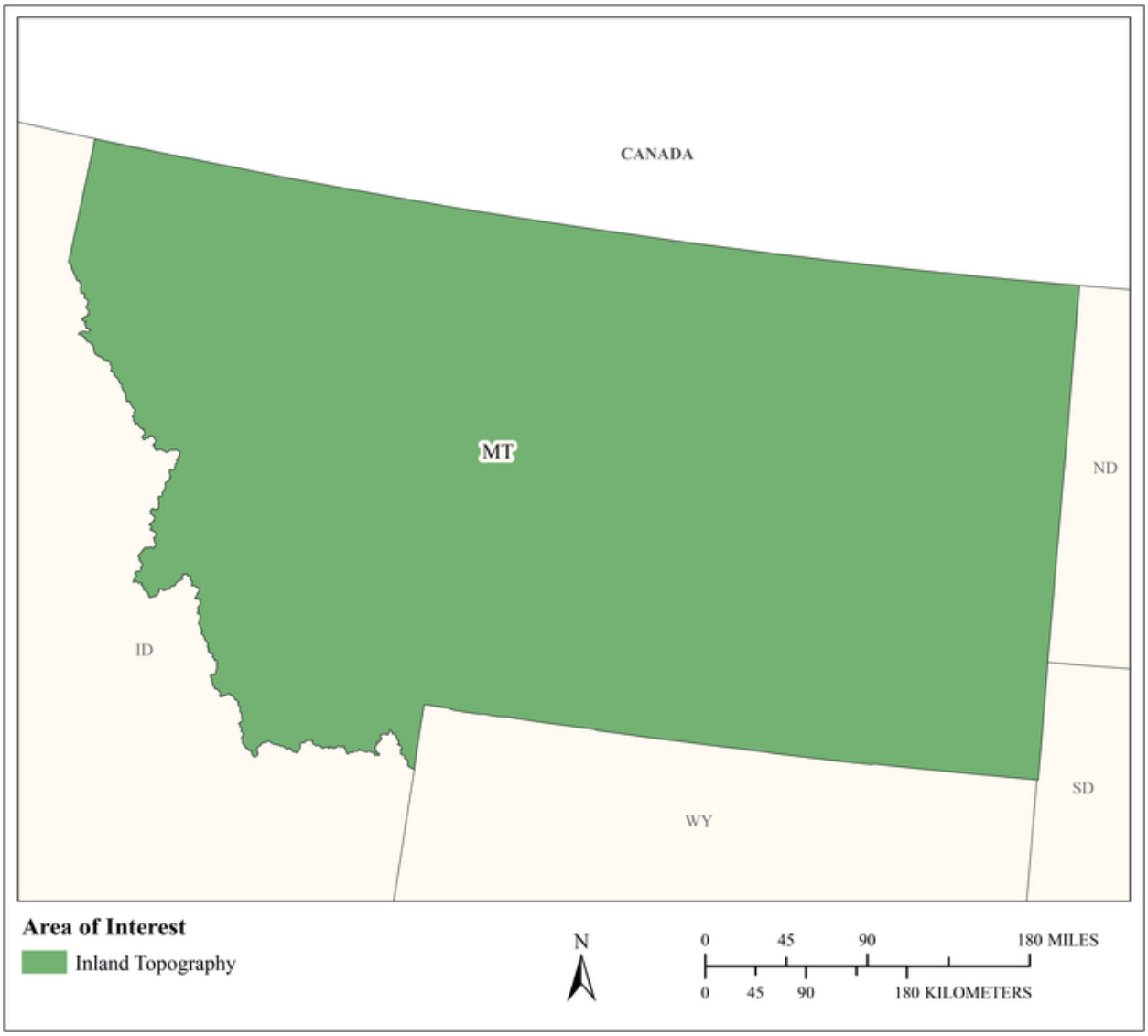
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$49,446	I don't know	Unable to provide							
Time savings description	Processing will be more streamlined but this may introduce additional complexities. Time savings assumed but we have no way of estimating. We spend approximately 1040 hours fixing inconsistencies in the NHD; statewide LiDAR could potentially cut this in half or more. We don't do field visits; having this data should allow better mapping without field visits. Availability of high-resolution elevation data varies immensely; we currently have to look at multiple sources; statewide LiDAR is potentially a single source. We currently spend approximately 1500 hours digitizing hydro lines and conflating to NHD; statewide hydro breaklines would potentially greatly reduce digitization.											
Cost savings/cost reduction	None			I don't know	Unable to provide							
Cost avoidance	Moderate	Unable to provide		I don't know	Unable to provide							
Cost avoidance description	High-resolution elevation data is currently not readily available...much processing is necessary to get and use it.											
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide							
Increased revenues description	New products, improved products could generate more interest; potentially lead to private investment; interest from legislature.											
Mission-driven performance improvements	I don't know	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements description	We know it will increase performance but have no metrics to measure.											
Future annual operational benefits added during validation		Annual dollars saved/ realized	$176,632		Annual dollars saved/ realized	$119,808						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	None			I don't know	Unable to provide							
Improved response or timeliness	Major	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness description	Boundary determinations; improved quality control. Having a current, standard hydro dataset should allow for more rapid response (for example, after an oil spill... time of travel). Would be able to answer questions that we currently cannot. For example channel migration zone and flood mapping; current data is too coarse or out of date for this type of analysis. Current datasets are out of date; providing current accurate data is mission core.											
Improved customer experience	Major	Unable to provide		I don't know	Unable to provide							

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Improved customer experience description	Currently only have 10m statewide.											
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$22,480		Annual dollars saved/ realized	$8,448						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			I don't know								
Education or outreach description	Currently only have 10m statewide											
Environmental	Major			I don't know								
Environmental description	Currently only have 10m statewide											
Public safety, including life and property	Major			I don't know								
Public safety, including life and property description	Currently only have 10m statewide											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Forest Resources Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Forest health assessment. Determination of standing inventory of forest resources. Prescribed burn planning. Analysis of carbon stocks for trade. Harvest systems planning.
MCA Title	Forest Resources Management
MCA ID	60254
Organization Type	State or U.S. Territorial government
Organization Name	State of Montana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Highly desirable			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

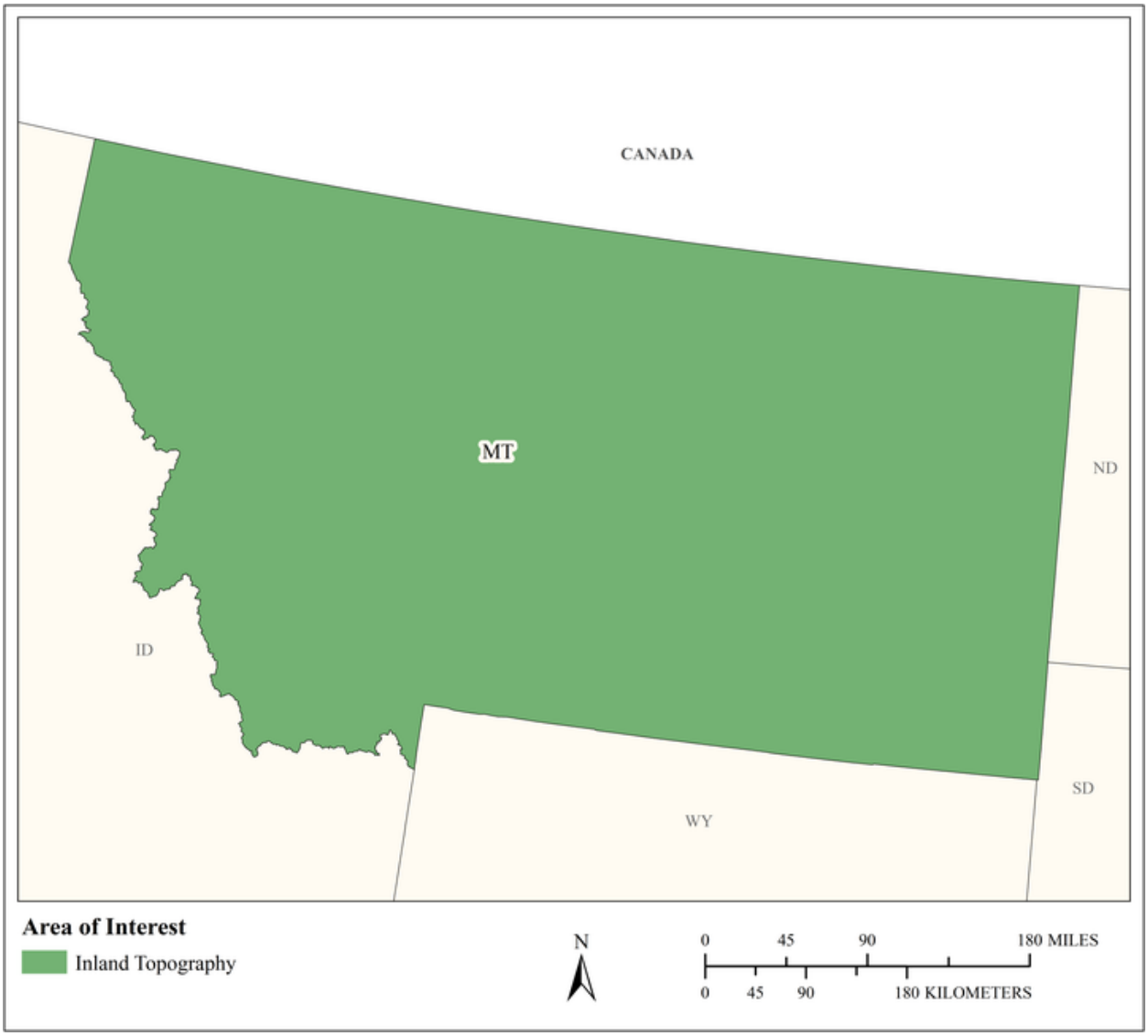
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$581,364									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$842,756									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Rangeland Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Assessment of rangeland health. Mapping for soil erosion potential due to grazing.
MCA Title	Rangeland Management
MCA ID	60255
Organization Type	State or U.S. Territorial government
Organization Name	State of Montana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 05 - Rangeland Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Highly desirable			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Not required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None			
Cost savings/cost reduction	None			
Cost avoidance	None			
Increased revenues	None			
Mission-driven performance improvements	None			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None			

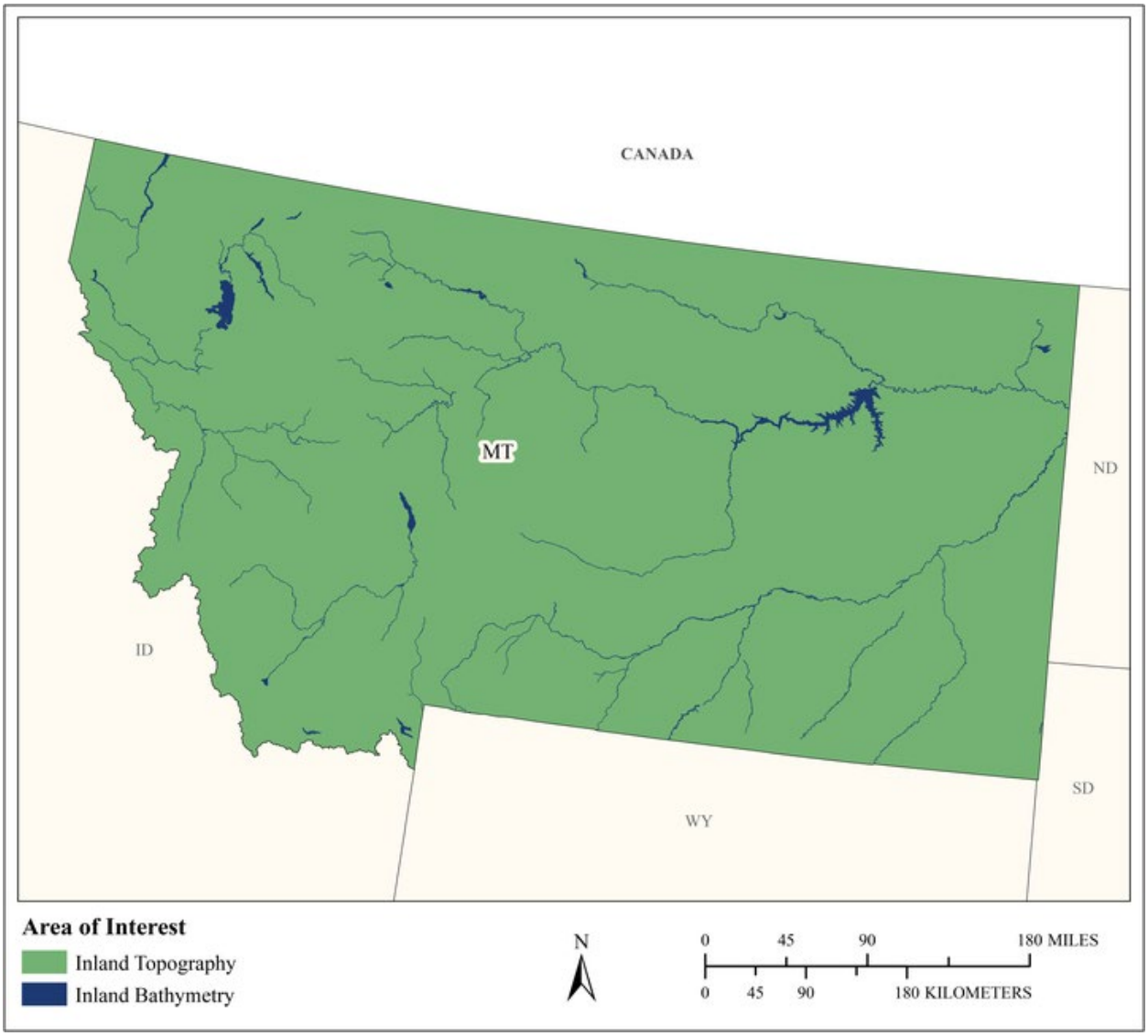
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	None			
Improved customer experience	None			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	None			
Public safety, including life and property	None			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	None											
Cost avoidance	Minor	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Natural Resources Conservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation engineering. Soils and wetlands mapping and characterization. Modeling of biological and ecological systems. Erosion control. Rainfall penetration studies, impervious surfaces. Assessment of blue carbon stocks.
MCA Title	Natural Resources Conservation
MCA ID	60256
Organization Type	State or U.S. Territorial government
Organization Name	State of Montana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B		
Update Frequency	4-5 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Highly desirable			Required	
Entire AOI under same environmental conditions	Required	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Required	Required		
Classified point cloud	Required	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Required		
Land use/land cover	Required	Required		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Moderate		
Increased revenues	Minor	Minor		
Mission-driven performance improvements	Major	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		

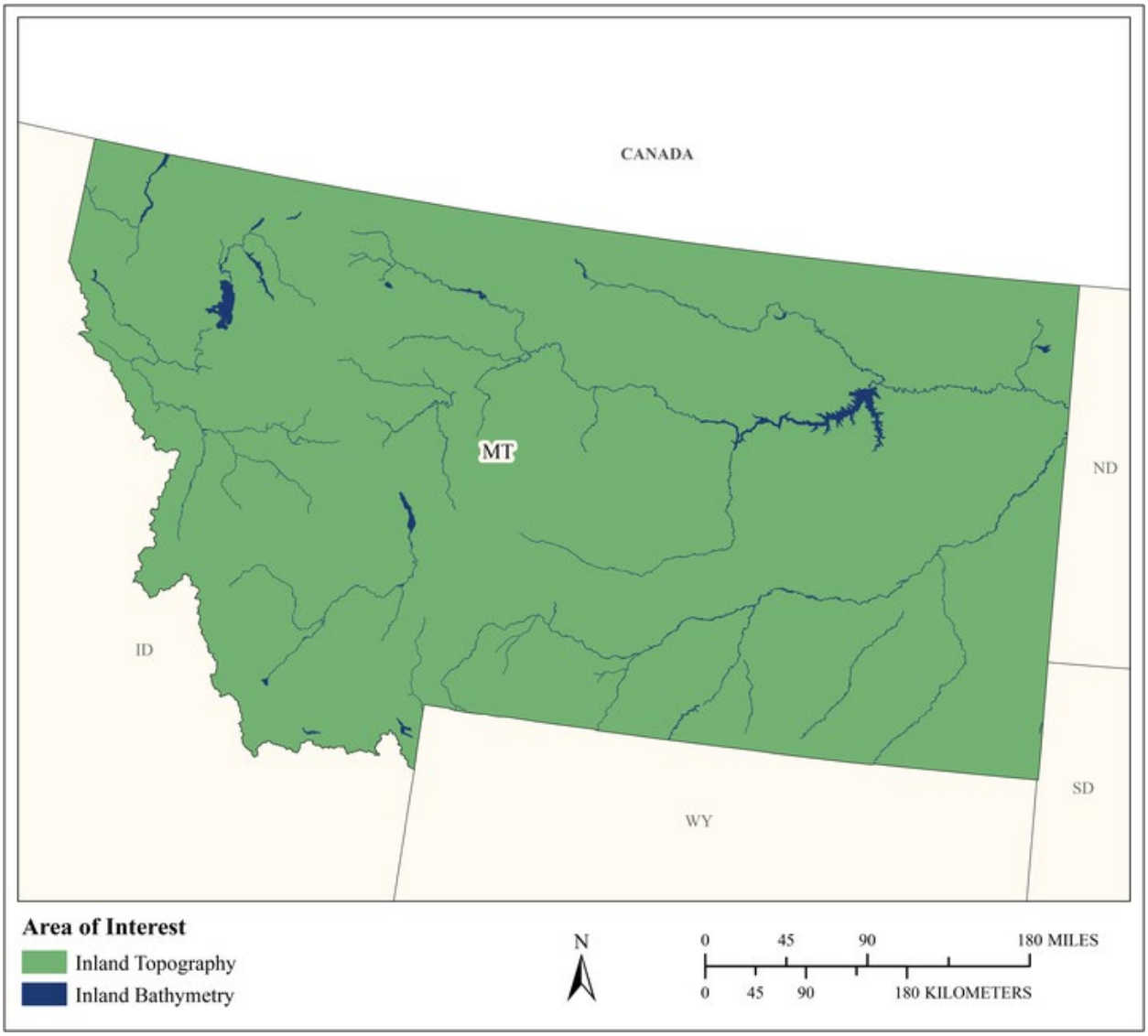
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major		
Improved customer experience	Major	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate		
Environmental	Major	Major		
Public safety, including life and property	Major	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$5,767,304		Annual dollars saved/ realized	$781,693						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$21,179,302		Annual dollars saved/ realized	$35,190						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Major			Major								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Management of Information on Biological Community Types



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Map and maintain updates for land cover and wetland/ riparian thematic layers at state level.
MCA Title	Management of Information on Biological Community Types
MCA ID	21754
Organization Type	State or U.S. Territorial government
Organization Name	Montana Natural Heritage Program, University of Montana
Sub-Agency or Division	
Organization Mission	Provide reliable, objective information and expertise to support stewardship of native species and habitats, emphasizing those of conservation concern.
Program Name	The Montana Natural Heritage Program
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	BU 04 - Forest Resources Management
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	We are interested in point density of 8 to 10 points per meter square for mapping sparse, low stature vegetation communities

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required

Inland Bathy Feature Size Requirements	Response
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need		
Acceptable Vertical Error	Up to 30 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed	To MHW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Required			Required	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	30 cm	30 cm			30 cm	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Highly desirable	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Required	Required		
Classified point cloud	Highly desirable	Highly desirable		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required	Required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Required	Required		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	10 m and 30 m DEM	None		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	All MSDI layers			
Other	Yes			
Other description	USFWS - NWI mapping			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Inland bathy data not available		
Cost savings/cost reduction	Moderate	Inland bathy data not available		
Cost avoidance	Minor	Inland bathy data not available		

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	Minor	Inland bathy data not available		
Mission-driven performance improvements	Minor	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	Inland bathy data not available		
Improved response or timeliness	Minor	Inland bathy data not available		
Improved customer experience	Minor	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Inland bathy data not available		
Environmental	Moderate	Inland bathy data not available		
Public safety, including life and property	Minor	Inland bathy data not available		

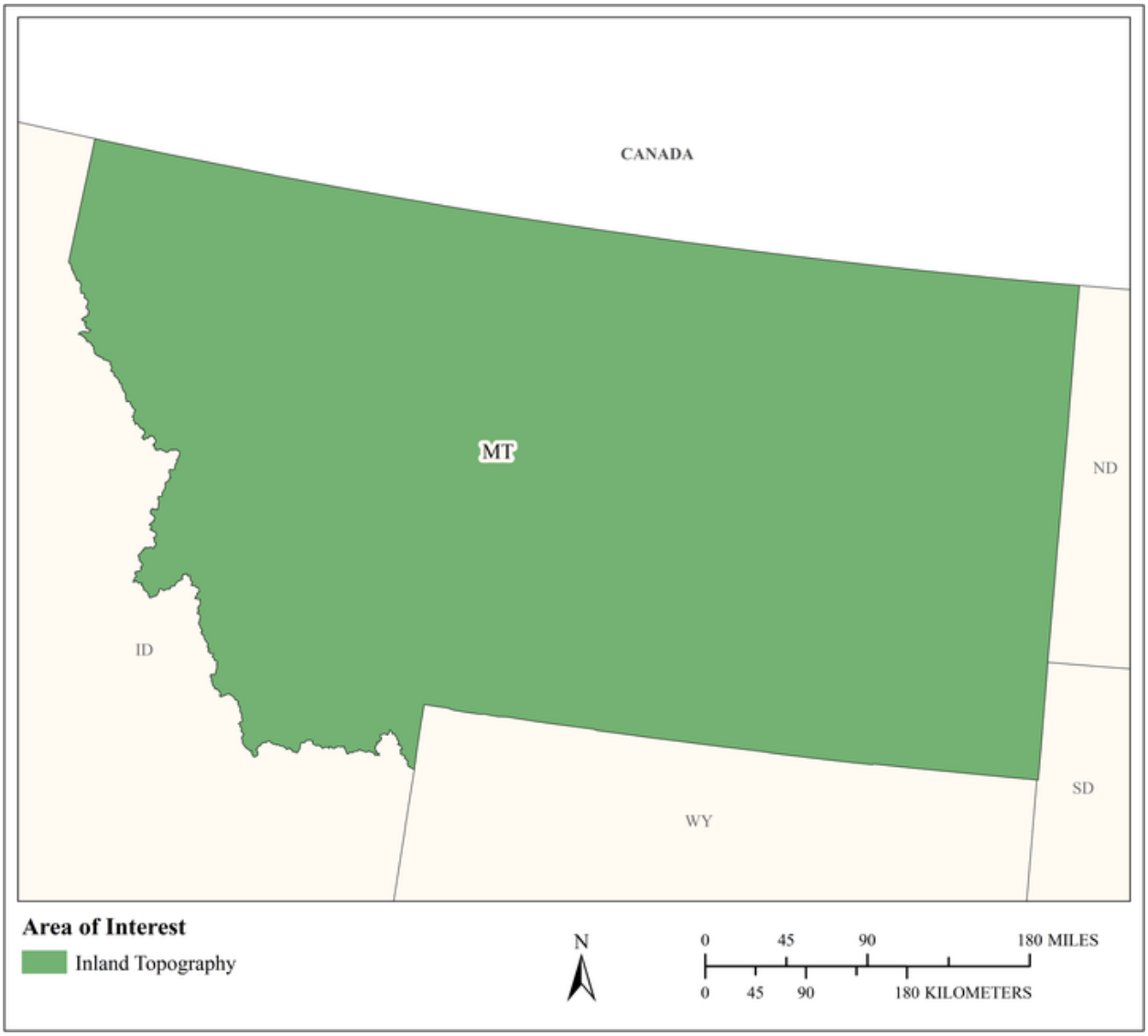
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Time savings description	Processing time could offset land cover classification inaccuracies. Validation and tuning of wetland and land cover mapping. Could be helpful on map validation end or to generate a more useful land cover layer. Could be used as validation data to reduce classification errors. Improved efficiency in mapping wetlands, riparian habitat, and land cover. Would address need to cross walk several state layers to same scale etc.			Processing time could offset land cover classification inaccuracies. Validation and tuning of wetland and land cover mapping. Could be helpful on map validation end or to generate a more useful land cover layer. Could be used as validation data to reduce classification errors. Improved efficiency in mapping wetlands, riparian habitat, and land cover. Would address need to cross walk several state layers to same scale etc.								
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide							
Cost savings/cost reduction description	Cost-share savings would likely be major and provide for statewide continuity (vs. tiles here and there different years and seasons).			Cost-share savings would likely be major and provide for statewide continuity (vs. tiles here and there different years and seasons).								
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide							
Cost avoidance description	Processing point cloud data for topo products would be substantial; some value added products would involve our own processing so unprocessed and classified point cloud data will also be valuable.											
Increased revenues	Moderate	Unable to provide		Moderate	Unable to provide							
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide							
Mission-driven performance improvements description	Moderate to major.			Moderate to major.								
Future annual operational benefits added during validation		Annual dollars saved/ realized	$35,026		Annual dollars saved/ realized	$280,701						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Value added to products or services description	Greatly improved and more useful and current products. Increased use and value for partners and database end users.			Greatly improved and more useful and current products. Increased use and value for partners and database end users.								
Improved response or timeliness	I don't know	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness description	Ability to provide regular revisions if lidar coverage is repeat.			Ability to provide regular revisions if coverage is repeat.								
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide							
Improved customer experience description	Greater potential to develop customized tools for land managers.			Greater potential to develop customized tools for land managers.								
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$101,164		Annual dollars saved/ realized	$169,668						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know								

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Environmental	I don't know	I don't know		
Public safety, including life and property	I don't know	I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps	Yes	Yes		
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Agriculture and Precision Farming



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Farm pond design. Irrigation system design. Detailed site analysis to support precision farming. Analysis of farm sedimentation and runoff. Calibration of fertilizer application, fertilizer management, and irrigation planning. Optimized terraforming.
MCA Title	Agriculture and Precision Farming
MCA ID	60257
Organization Type	State or U.S. Territorial government
Organization Name	State of Montana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 08 - Agriculture and Precision Farming
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

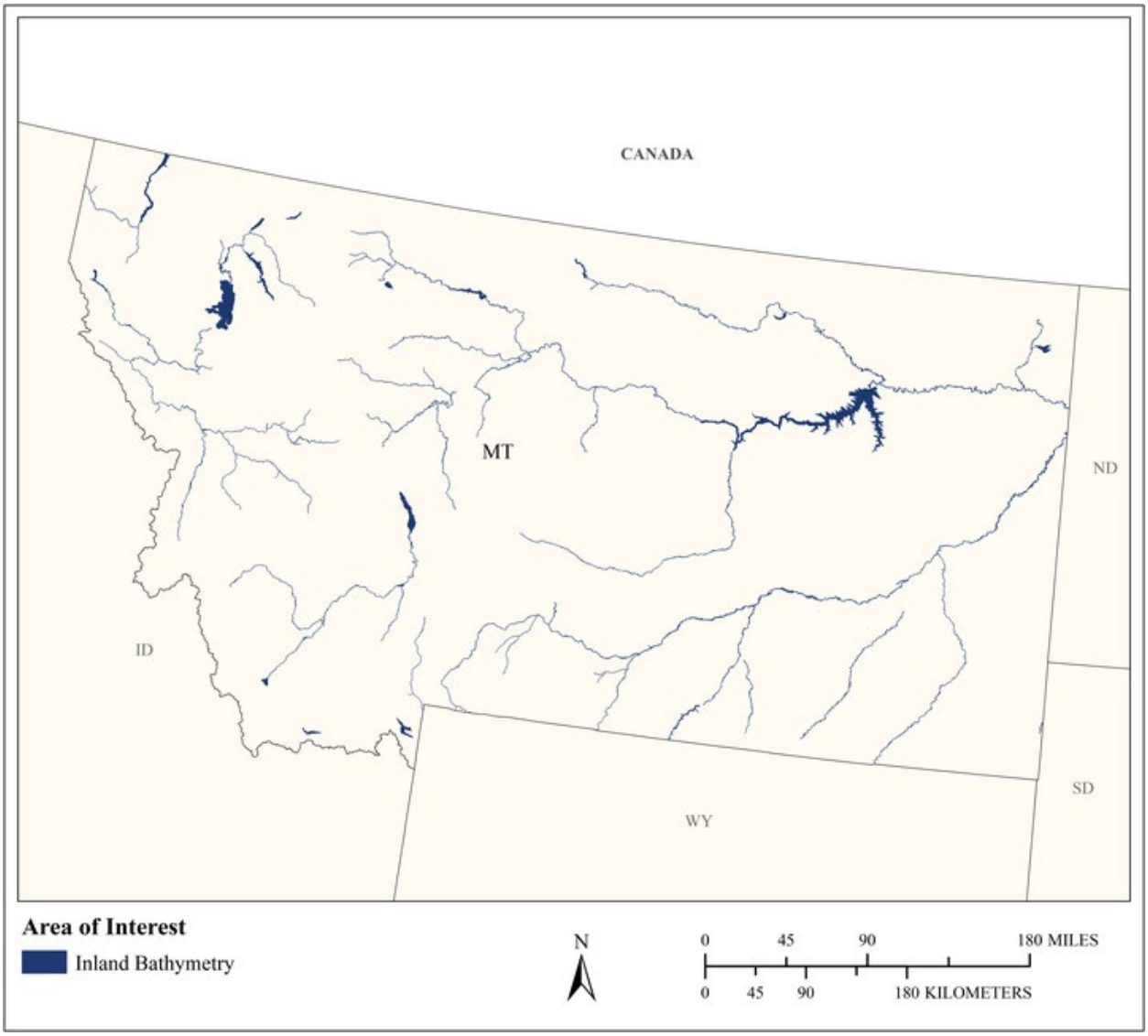
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$170,239									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$134,960									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Minor											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Fisheries Management and Aquaculture



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type		Required		
Geographic Area Requirements		One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Management of fisheries. Sustainable aquaculture.
MCA Title	Fisheries Management and Aquaculture
MCA ID	60258
Organization Type	State or U.S. Territorial government
Organization Name	State of Montana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Nice to have
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order		QL0B		
Update Frequency		6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error		Up to 2 meters		
Acceptable Vertical Error		Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season		Highly desirable				
Entire AOI under same environmental conditions		Highly desirable				
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless		Highly desirable				
DEM for entire AOI needs to be seamless		Required				
Amount of acceptable vertical manipulation to achieve spatial seamlessness		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM		Highly desirable		
DTM		Highly desirable		
DEM		Required		
Raw point cloud data		Nice to have		
Classified point cloud		Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform		Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening		Highly desirable		
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery		Nice to have		
Ground control/ground truthing		Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery		Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data		Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates		Highly desirable		
Land use/land cover		Highly desirable		
Wetlands		Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features		Required		
Bridges/culverts		Highly desirable		
Landmark features		Nice to have		
Cultural resources		Nice to have		
Coastal and riverine structures		Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings		Major		
Cost savings/cost reduction		Moderate		
Cost avoidance		Moderate		
Increased revenues		Moderate		
Mission-driven performance improvements		Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services		Major		

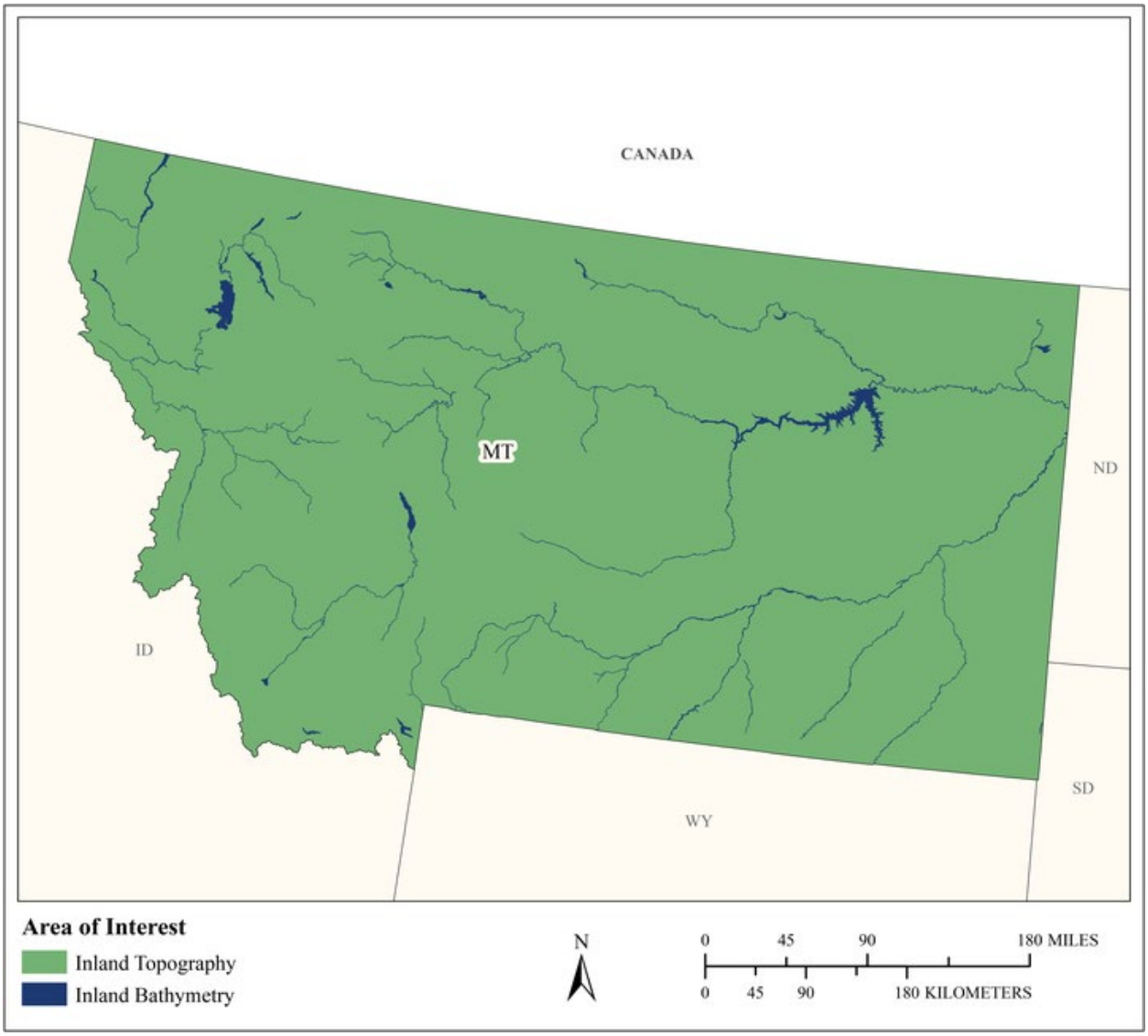
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness		Major		
Improved customer experience		Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach		Minor		
Environmental		Moderate		
Public safety, including life and property		Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings				Major	Unable to provide							
Cost savings/cost reduction				Major	Unable to provide							
Cost avoidance				Major	Unable to provide							
Increased revenues				None								
Mission-driven performance improvements				Major	Unable to provide							
Future annual operational benefits added during validation					Annual dollars saved/ realized	$294,211						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services				Major	Unable to provide							
Improved response or timeliness				Major	Unable to provide							
Improved customer experience				Major	Unable to provide							
Future annual customer service benefits added during validation					Annual dollars saved/ realized	$133,907						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach				Major								
Environmental				Major								
Public safety, including life and property				Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours		Yes		
Hillshades		Yes		
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geological Mapping and Analysis



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Geological mapping and analysis. Elevation data are used to identify locations of faults and estimate age by offset. Canopy cover hinders current collection of faults from imagery, lidar that penetrates to bare earth is more useful. Faults should be continuous under lakes and through wetlands, hence inland bathy is needed. The data are used to locate geologic formations, plan field work, and locate landslides, debris flows, block slides, etc. Approximately 90% of the state's groundwater use is for irrigation for agriculture. Elevation data are also needed for Abandoned Mine Lands identification and clean up monitoring, Superfund monitoring, and pre- and post-oil and gas development (Bakken shale development impacts to water quality and well water levels). There are 45,000 oil and gas wells in Montana. For this critical mission area, topographic lidar is critical and inland bathymetric data are useful.
MCA Title	Geological Mapping and Analysis
MCA ID	1210
Organization Type	State or U.S. Territorial government
Organization Name	Montana Bureau of Mines and Geology
Sub-Agency or Division	
Organization Mission	Providing information for the sound use of Montana's geologic, mineral, and water resources.
Program Name	State Map Natural Hazards Program
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 11 - Geologic Resource Mining and Extraction
Tertiary Business Use	BU 01 - Water Supply and Quality

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Fault offsets of >30 cm

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL1B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Less than 50 cm		
Acceptable Vertical Error	Up to 10 cm	Up to 20 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required			Not required	
Entire AOI under same environmental conditions	Highly desirable	Not required			Not required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Nice to have		
Classified point cloud	Highly desirable	Highly desirable		
Edited/cube XYZ		Not required		
Full waveform	Highly desirable	Nice to have		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Not required	Not required		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Not required		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required	Required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Nice to have	Nice to have		
Wetlands	Nice to have	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Highly desirable		
Bridges/culverts	Nice to have	Not required		
Landmark features	Nice to have	Not required		
Cultural resources	Nice to have	Not required		
Coastal and riverine structures	Nice to have	Not required		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Lidar where present (QL0-QL3), 10M DEM where not. 10M DEMs insufficient for geologic contact delineation and fault detection	Very little to none available for MT.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Montana State Library and Montana Bureau of Mines and Geology have some Lidar datasets.			
Data that meet my needs are not available		Yes		

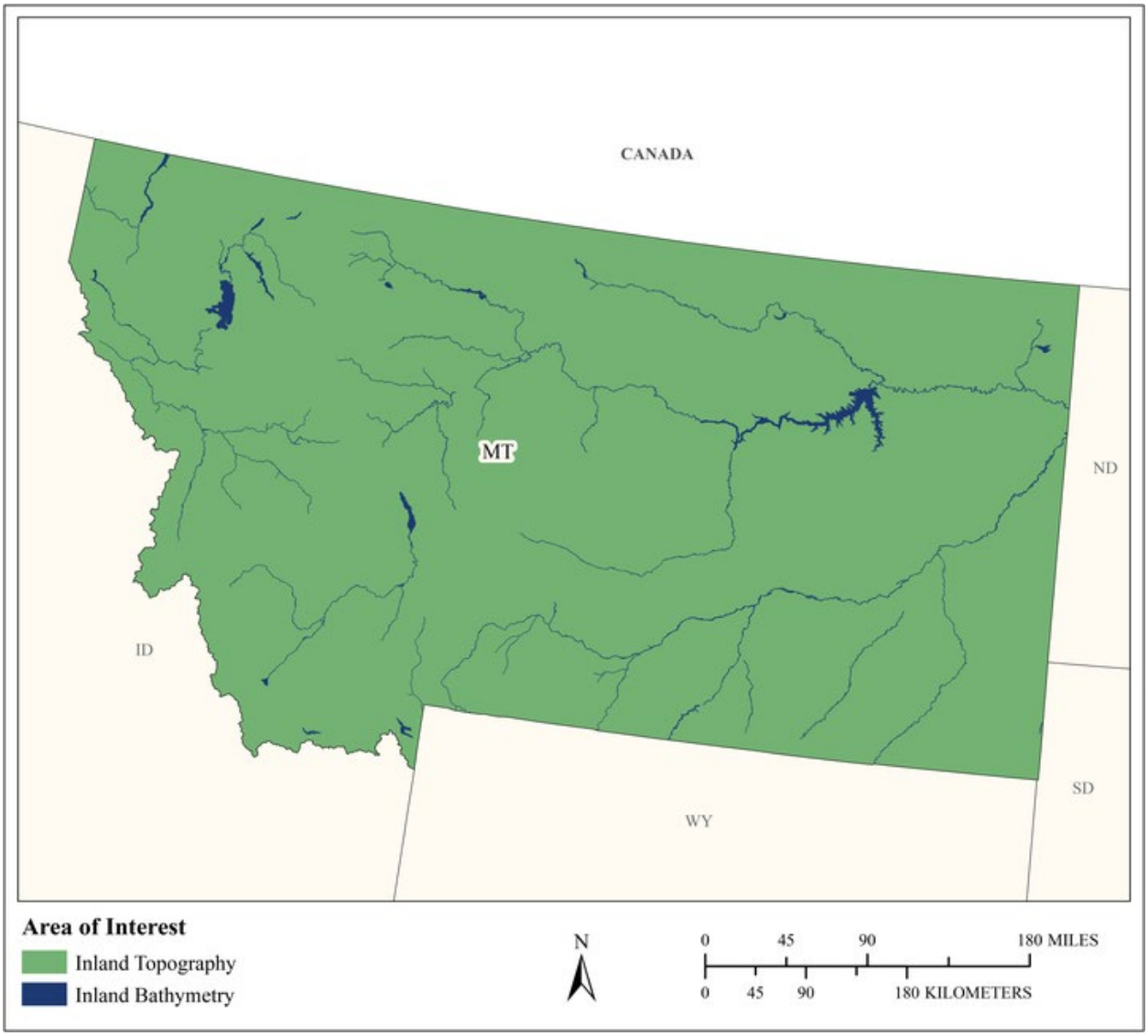
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available		
Cost savings/cost reduction	Major	Inland bathy data not available		
Cost avoidance	Major	Inland bathy data not available		
Increased revenues	Moderate	Inland bathy data not available		
Mission-driven performance improvements	Major	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available		
Improved response or timeliness	Major	Inland bathy data not available		
Improved customer experience	Major	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Inland bathy data not available		
Environmental	Major	Inland bathy data not available		
Public safety, including life and property	Major	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$578,880	Moderate	Annual dollars saved/realized	$16,884						
Time savings description	40/wk, 160/mo, 1920/yr. 80/wk, 320/mo, 3840/yr. 160/wk, 640/mo, 7680/yr.			Estimate.								
Cost savings/cost reduction	Major	Annual dollars saved/realized	$60,000	Minor	Annual dollars saved/realized	$10,000						
Cost savings/cost reduction description	Lidar for other projects can be used for geologic mapping/hazards.											
Cost avoidance	Major	Annual dollars saved/realized	$40,000	Minor	Annual dollars saved/realized	$20,000						
Cost avoidance description	Have to revisit previous mapping when Lidar becomes available. Difficult to quantify. Lidar processing time significant when completed in-house.			Difficult to estimate.								
Increased revenues	None			None								
Mission-driven performance improvements	Major	Annual percent improvement	37%	Major	Annual percent improvement	13%						
Mission-driven performance improvements description	Fault identification. Contact delineation in dense canopy. Better idea of natural hazards present.			Ability to map areas inaccessible previously. Tracing geological contacts across waterbodies. Improved mapping.								
Future annual operational benefits added during validation		Annual dollars saved/ realized	$30,371,515		Annual dollars saved/ realized	$364,320						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$115,776	Moderate	Annual dollars saved/realized	$4,522						
Value added to products or services description	40/wk, 160/mo, 1920/yr.			Estimate.								
Improved response or timeliness	Major	Annual dollars saved/realized	$231,552	Major	Annual dollars saved/realized	$75,375						
Improved response or timeliness description	40/wk, 160/mo, 1920/yr.			Estimate.								
Improved customer experience	Major	Annual dollars saved/realized	$173,664	Moderate	Annual dollars saved/realized	$21,105						
Improved customer experience description	40/wk, 160/mo, 1920/yr.			Estimate.								
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$34,601		Annual dollars saved/ realized	$352,541						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Education or outreach description	Educating public on presence of natural hazards			Educate public								
Environmental	Major			Major								
Environmental description	Change detection			Habitat								
Public safety, including life and property	Major			Major								
Public safety, including life and property description	Historic/potential landslides, fault detection			Fault detection under waterbodies might help protect safety/infrastructure								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours				
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Environmental Protection



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	DEQ's Critical Mission Activity reaches across a number of different programs, which include Air, Water, Land and Energy. Various programs include, but are not limited to: -Mine Licensing -Oil/hazardous spill response -Abandoned Mine safety reclamation (subsidence) -Tailings impoundment risk analysis -Ground Water issues -Stream/river Legacy mining remediation
MCA Title	Environmental Protection
MCA ID	33032
Organization Type	State or U.S. Territorial government
Organization Name	MT DEQ
Sub-Agency or Division	
Organization Mission	The Montana Department of Environmental Quality is charged with protecting a clean and healthy environment as guaranteed to our citizens by our State Constitution. Our ultimate goal is to protect public health and to maintain Montana's high quality of life for current and future generations.
Program Name	We have 4 major divisions at DEQ: Air, Water, Land and Energy. Mineral extraction licensing (under Land) is one of the largest components so I will consider that to be Mission Critical. DEQ works to protect the land from contamination in order to provide Montanans with a clean and healthy state. Our mining and waste permitting programs minimize impacts to the environment. Where contamination is discovered, our remediation programs provide the oversight and support services to conduct effective cleanup activities.
Total Annual Program Budget	
Primary Business Use	BU 11 - Geologic Resource Mining and Extraction
Secondary Business Use	BU 01 - Water Supply and Quality
Tertiary Business Use	BU 02 - Riverine Ecosystem Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Cultural resources (Stone rings, cairns, Drive lines)

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Other	Nice to have
Other description	Settling/water treatment ponds
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL0B		
Update Frequency	2-3 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI	Stream data will require more frequent updates than mineral extraction areas.			
Acceptable Horizontal Error	I don't know	Less than 50 cm		
Acceptable Vertical Error	Less than 5 cm	Up to 20 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial	Partial		
Cross section/transect requirement	Less than 5 cm accuracy is desirable for stream crossing, Storm water permit, and stream remediation analysis across all major and minor streams in MT.	Unknown		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required

Hydrologic Processing Required	Response
No Treatment	Highly desirable

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Nice to have			Nice to have	
DEM for entire AOI needs to be seamless	Highly desirable	Nice to have			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have		
DTM	Required	Nice to have		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Nice to have	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Highly desirable		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required	Highly desirable		
Ground control/ground truthing	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Required		
Land use/land cover	Required	Not required		
Wetlands	Required	Highly desirable		
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Highly desirable	Nice to have		
Landmark features	Required	Highly desirable		
Cultural resources	Highly desirable	Nice to have		
Coastal and riverine structures	Required	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Varies, but it's generally 5-8 years old.	Only what is available from the State Library		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI	Yes			
Open Topography				
NOAA nautical charts		Yes		
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	Montana State Library	Montana State Library		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	I don't know		
Cost savings/cost reduction	Major	I don't know		
Cost avoidance	Major	I don't know		

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	None	I don't know		
Mission-driven performance improvements	Moderate	I don't know		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know	I don't know		
Improved response or timeliness	I don't know	I don't know		
Improved customer experience	I don't know	I don't know		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	I don't know		
Environmental	Moderate	I don't know		
Public safety, including life and property	Major	I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$9,407	I don't know	Unable to provide							
Time savings description	Depending on location, any site visit may be an entire day of travel due to the size of the state. Hrs per project.											
Cost savings/cost reduction	Minor	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction description	DEQ does little data acquisition. Not likely to have an effect on these expenditures.											
Cost avoidance	Moderate	Unable to provide		I don't know	Unable to provide							
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Moderate	Unable to provide		I don't know	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$26,703									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	Major	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness description	Unknown, but could be significant based on an individual event.											
Improved customer experience	Minor	Unable to provide		I don't know	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$23,825		Annual dollars saved/ realized	$2,456						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			I don't know								
Environmental	Major			I don't know								
Public safety, including life and property	Moderate			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps	Yes	Yes		
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Tribal Renewable Energy Mapping

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Respondent provided own shapefile, KML, or geodatabase			
Sub Area Requirements	Rocky Mountain Tribal Transportation Planners Area of Operation			

MCA Description	Response
Mission Critical Activity	Renewable Energy - Wind
MCA Title	Tribal Renewable Energy Mapping
MCA ID	22070
Organization Type	Tribal government
Organization Name	Rocky Mountain Tribal Transportation Planners
Sub-Agency or Division	
Organization Mission	Improve infrastructure
Program Name	Rocky Mountain Tribal Transportation Programs
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	BU 13 - Oil and Gas Resources
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Groups of trees, buildings

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	>10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 50 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required					
Entire AOI under same environmental conditions	Not required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Not required					
DEM for entire AOI needs to be seamless	Not required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Not required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Nice to have			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Highly desirable			
Wetlands	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Not required			
Bridges/culverts	Not required			
Landmark features	Not required			
Cultural resources	Not required			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Not available			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None			
Cost savings/cost reduction	None			
Cost avoidance	None			
Increased revenues	None			
Mission-driven performance improvements	None			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None			

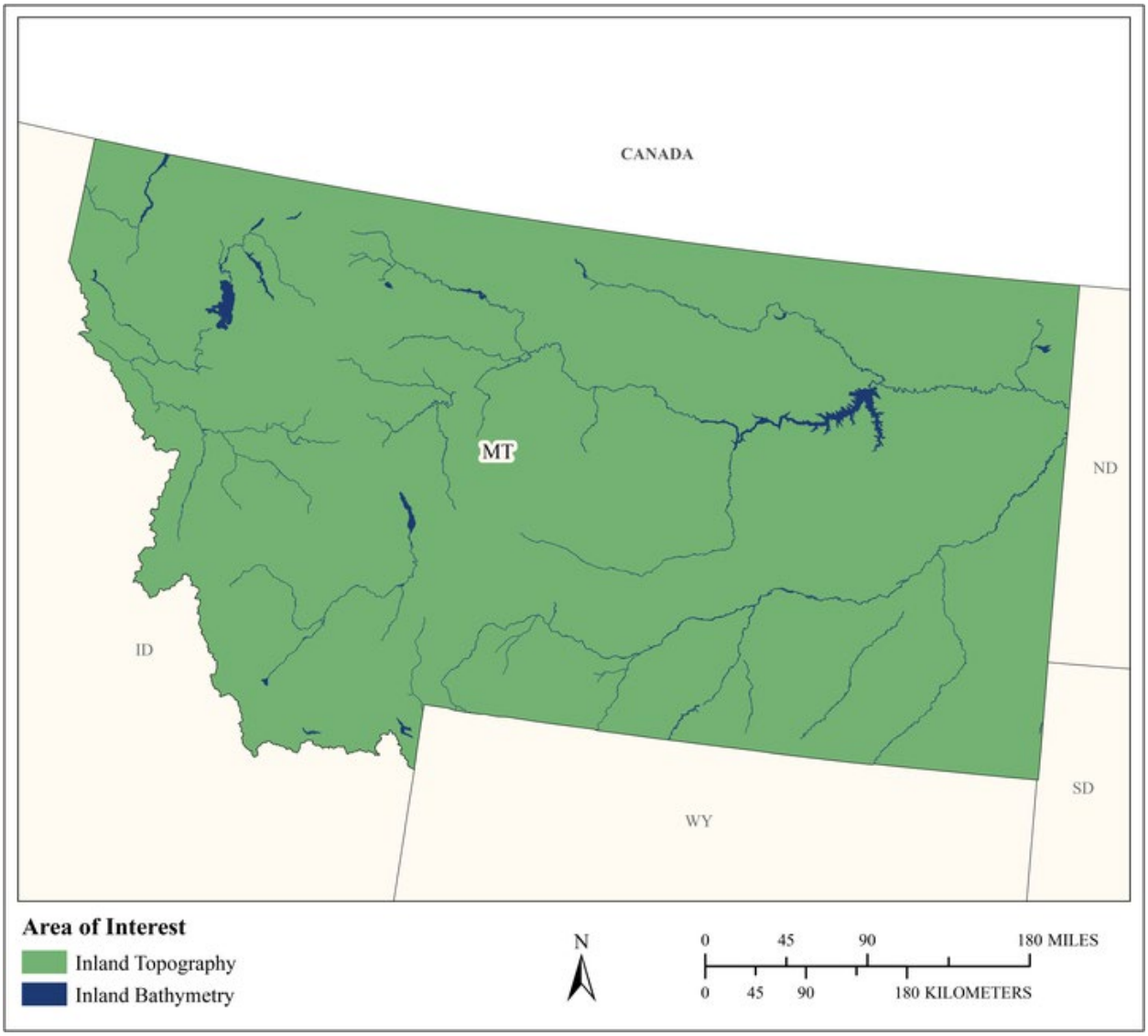
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	None			
Improved customer experience	None			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	None			
Public safety, including life and property	None			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Time savings description	Concept to 30% design time frame reduced significantly.											
Cost savings/cost reduction	None											
Cost avoidance	None											
Increased revenues	Moderate	Unable to provide										
Increased revenues description	Feasibility study for new energy self sufficiency.											
Mission-driven performance improvements	Major	Unable to provide										
Mission-driven performance improvements description	Feasibility study will be more accurate.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Value added to products or services description	Allow for wind energy analysis.											
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	None											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None											
Environmental	None											
Public safety, including life and property	None											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Oil and Gas Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Oil and gas exploration and production. Pipeline and route selection. Facility siting to mitigate geologic hazards. Construction planning. Environmental impact assessment and mitigation. Regulatory compliance.
MCA Title	Oil and Gas Resources
MCA ID	60259
Organization Type	State or U.S. Territorial government
Organization Name	State of Montana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 13 - Oil and Gas Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B		
Update Frequency	Annually	2-3 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Required			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Required			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Required			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level			Up to triple the required TVU at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Highly desirable		
Raw point cloud data	Highly desirable	Nice to have		
Classified point cloud	Nice to have	Nice to have		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Not required		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Highly desirable	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Highly desirable		
Land use/land cover	Nice to have	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Highly desirable		
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Highly desirable		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Nice to have	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	I don't know		
Cost savings/cost reduction	Minor	I don't know		
Cost avoidance	Minor	I don't know		
Increased revenues	None	I don't know		
Mission-driven performance improvements	Minor	I don't know		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	I don't know		

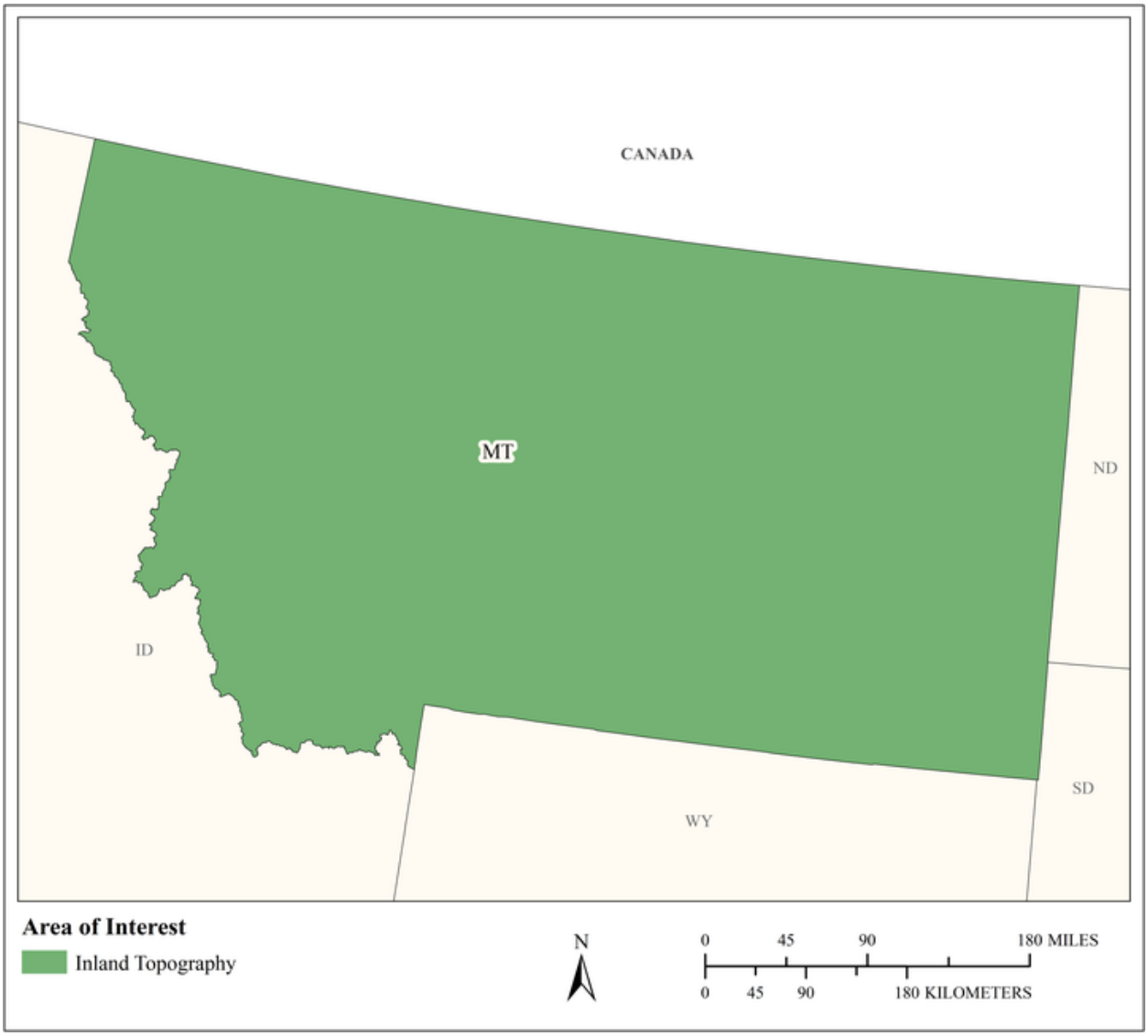
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	I don't know		
Improved customer experience	Moderate	I don't know		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	I don't know		
Environmental	Minor	I don't know		
Public safety, including life and property	Minor	I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		I don't know	Unable to provide							
Cost avoidance	Moderate	Unable to provide		I don't know	Unable to provide							
Increased revenues	None			I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$193,614									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	Major	Unable to provide		I don't know	Unable to provide							
Improved customer experience	Moderate	Unable to provide		I don't know	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			I don't know								
Environmental	Major			I don't know								
Public safety, including life and property	Major			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Cultural Resources Preservation and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Discovery and analysis of underwater archaeological and historical cultural sites. Site protection and preservation planning. Discovery and analysis of Native American and other historical cultural sites and subsistence activities.
MCA Title	Cultural Resources Preservation and Management
MCA ID	60260
Organization Type	State or U.S. Territorial government
Organization Name	State of Montana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Nice to have					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have					
DEM for entire AOI needs to be seamless	Nice to have					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Moderate			
Cost avoidance	Minor			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			

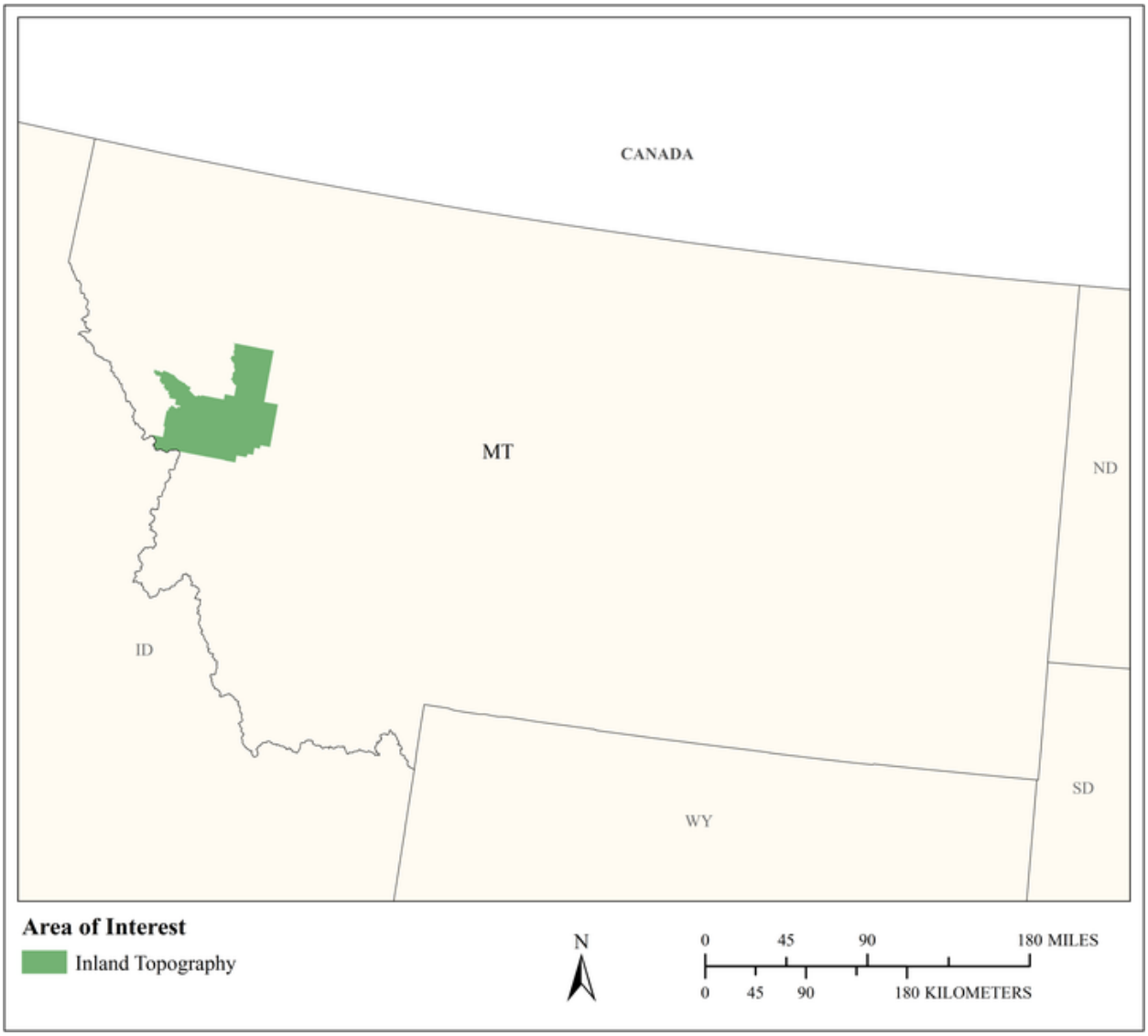
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Cost savings/cost reduction	Minor	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Moderate	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$26,951									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$23,563									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	Minor											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Geospatial Data Management and Flood Risk Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements	Missoula County, MT			

MCA Description	Response
Mission Critical Activity	We have been in need to assist other agencies (Office of Emergency Management, Army Corps of Engineers, etc.) with providing detailed elevation data for use in inundation mapping in flooding events and for pre-planning future events.
MCA Title	Geospatial Data Management and Flood Risk Management
MCA ID	21656
Organization Type	Regional, County, City, or other local government
Organization Name	Missoula County, Montana
Sub-Agency or Division	
Organization Mission	The GIS (Geographic Information Systems) department is part of the IT/IS department and administered by the GIS Manager. The department is responsible for maintaining the integrity of geographic data that represent critical county infrastructure. The data is digitized from various sources including filed survey plats, deeds and resolutions and is suitable for displaying and querying in specialized mapping/cartographic software programs that are used throughout the county offices. A portion of this data includes the county road network, address/structure points, and cadastral features such as parcels, easements, rights-of-way and surveys. The GIS department also assigns new addresses and road names based on request from public petitions to provide logical location data for Enhanced 911 services.
Program Name	We help support the Office of Emergency Management during major flooding events. There is no specific name for the program.
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 30 - Maritime and Land Boundary Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Any ground feature that can be detected and added as a geographic feature for cataloging and analysis purposes would be of great use.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm			
Acceptable Vertical Error	Up to 30 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Nice to have					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			
Other	Highly desirable			
Other description	Building Features			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	The best, most recent data is from ~2001 that produces fairly decent renderings. It is only a small portion of Missoula County and is of good use for the area but limited overall.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Montana State Library			
Data that meet my needs are not available				

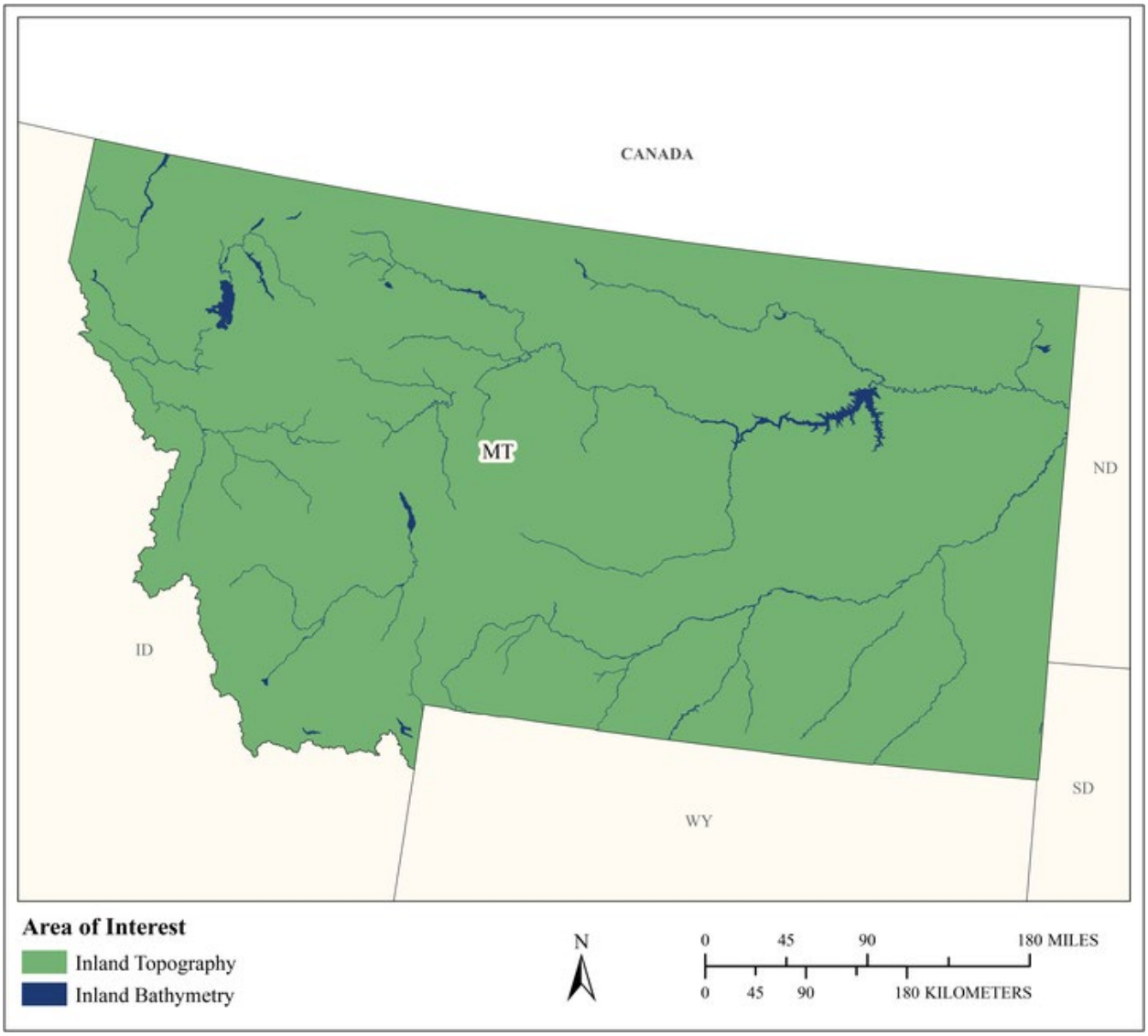
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Minor			
Cost avoidance	I don't know			
Increased revenues	I don't know			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Flood Risk Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Flood risk modeling and mapping of riverine and coastal areas. Dam/dike/levee safety analysis. Emergency management. Flood forecasts.
MCA Title	Flood Risk Management
MCA ID	60261
Organization Type	State or U.S. Territorial government
Organization Name	State of Montana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Required	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Required	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	Major	Moderate		
Increased revenues	Minor	Minor		
Mission-driven performance improvements	Major	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		

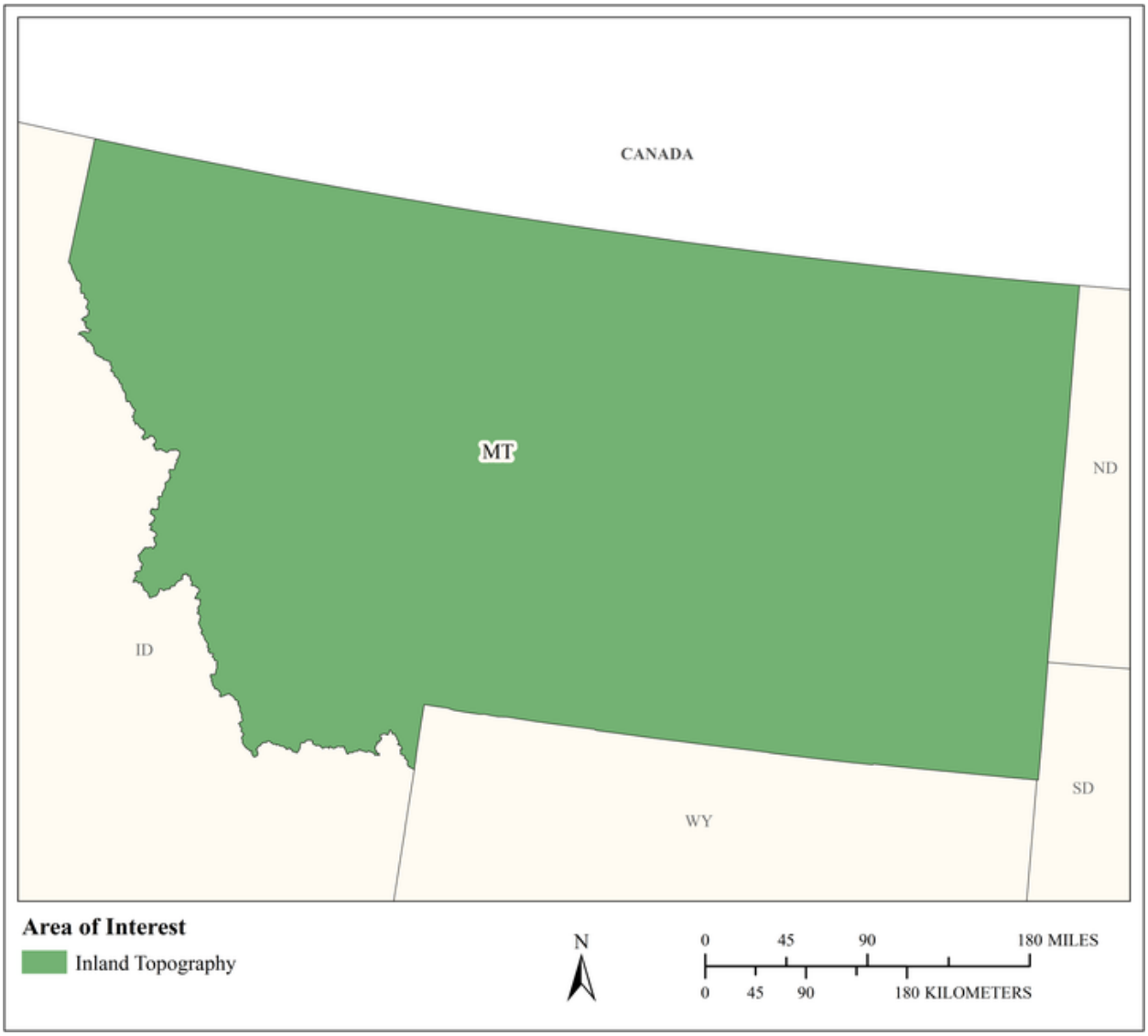
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor		
Improved customer experience	Major	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor		
Environmental	Major	Moderate		
Public safety, including life and property	Major	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		None								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$20,645,166		Annual dollars saved/ realized	$1,434,156						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$3,612,257		Annual dollars saved/ realized	$1,610,189						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate								
Environmental	Moderate			Moderate								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Wildfire Management, Planning, and Response



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of forest fuel and fire susceptibility. Fire behavior modeling to support wildfire suppression activities. Wildland/urban interface building identification. Post fire analysis to determine landslide prone areas.
MCA Title	Wildfire Management, Planning, and Response
MCA ID	60262
Organization Type	State or U.S. Territorial government
Organization Name	State of Montana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 17 - Wildfire Management, Planning, and Response
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

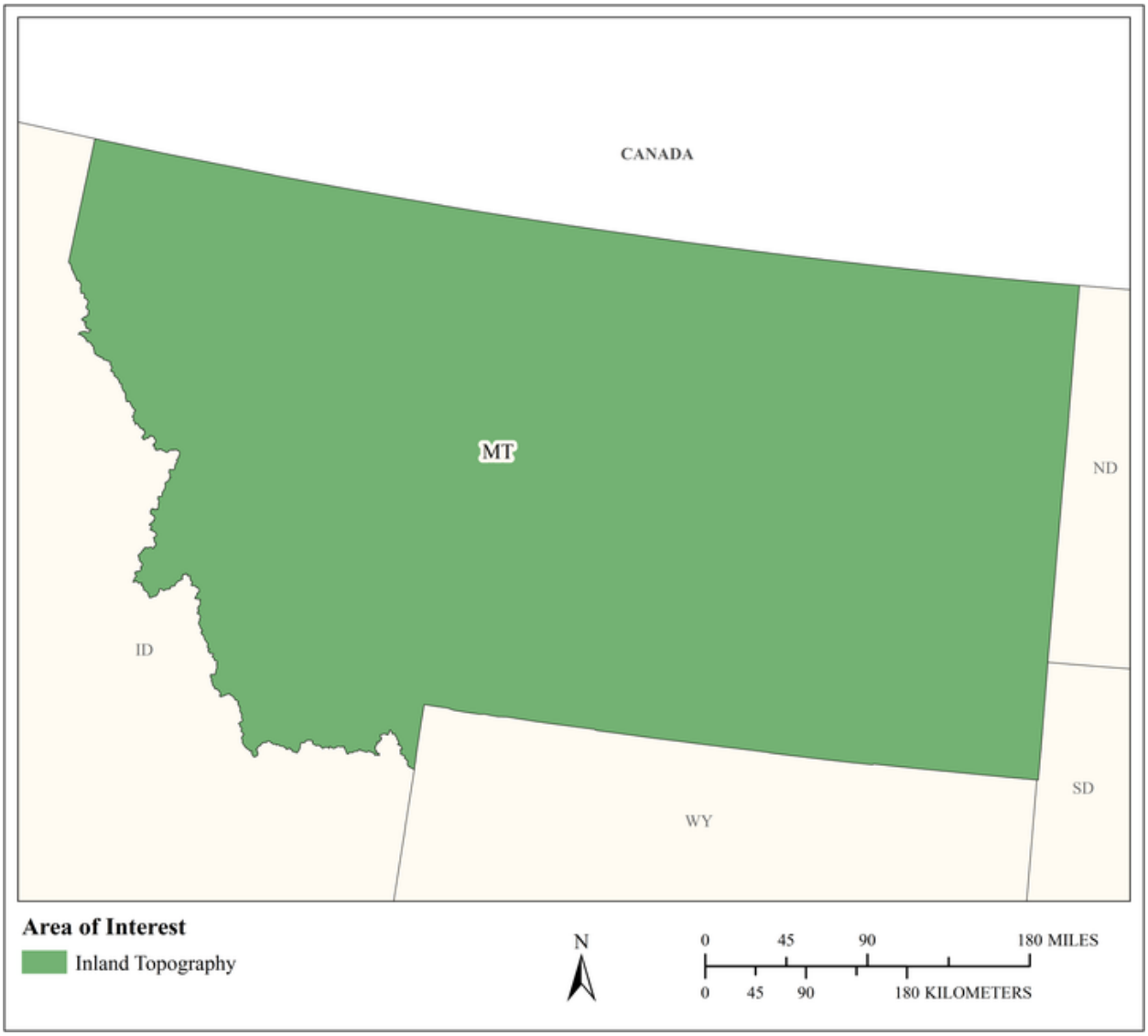
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,250,000									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Land Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Road and railroad route selection and maintenance. Slope analysis for autonomous cars. GPS navigation visualization.
MCA Title	Land Navigation and Safety
MCA ID	60263
Organization Type	State or U.S. Territorial government
Organization Name	State of Montana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 19 - Land Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

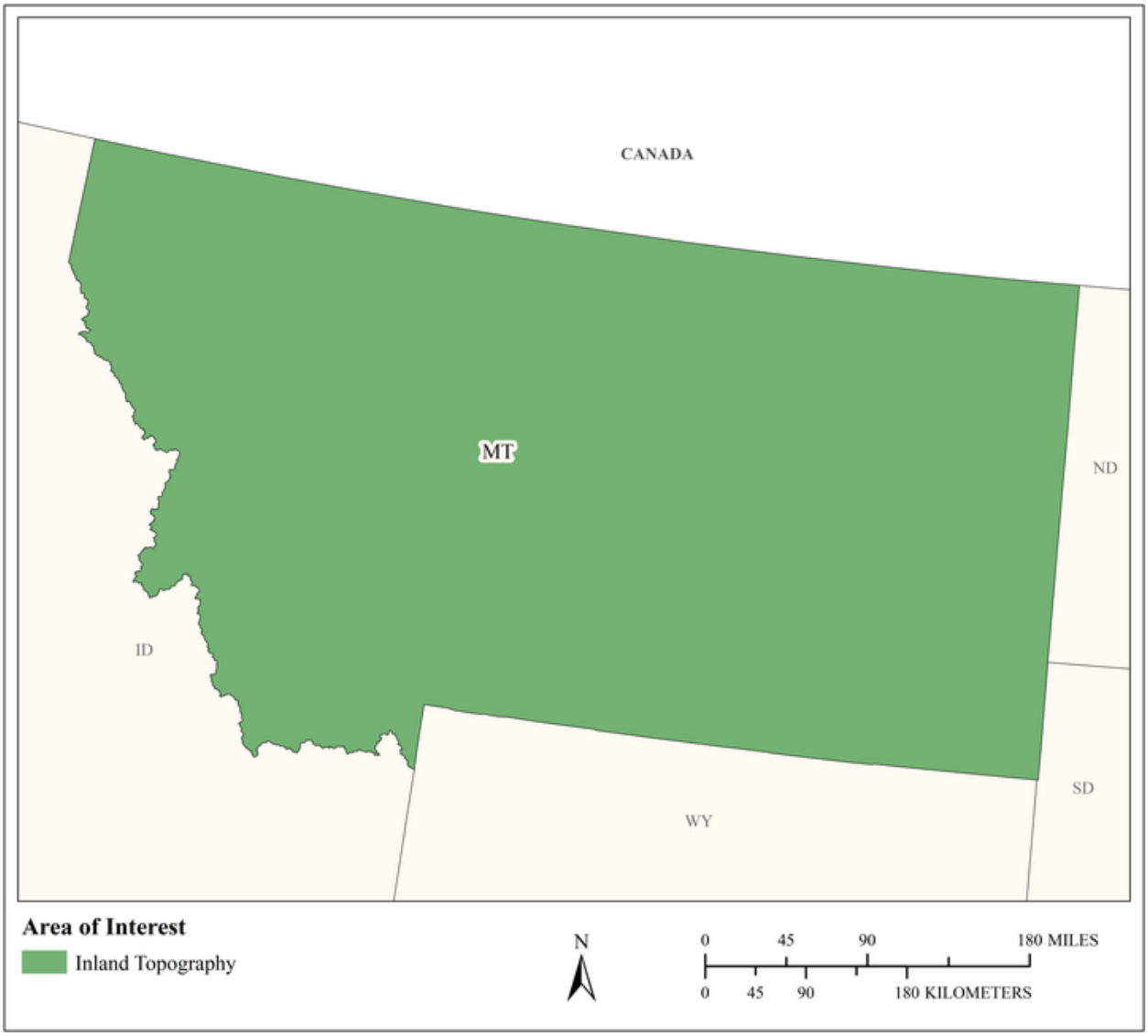
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Moderate			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Moderate	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,904,801									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$153,822									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Aviation Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of in-flight hazards and path obstructions. Aeronautical charting. Runway construction and repair.
MCA Title	Aviation Navigation and Safety
MCA ID	60264
Organization Type	State or U.S. Territorial government
Organization Name	State of Montana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 21 - Aviation Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes			
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Major			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

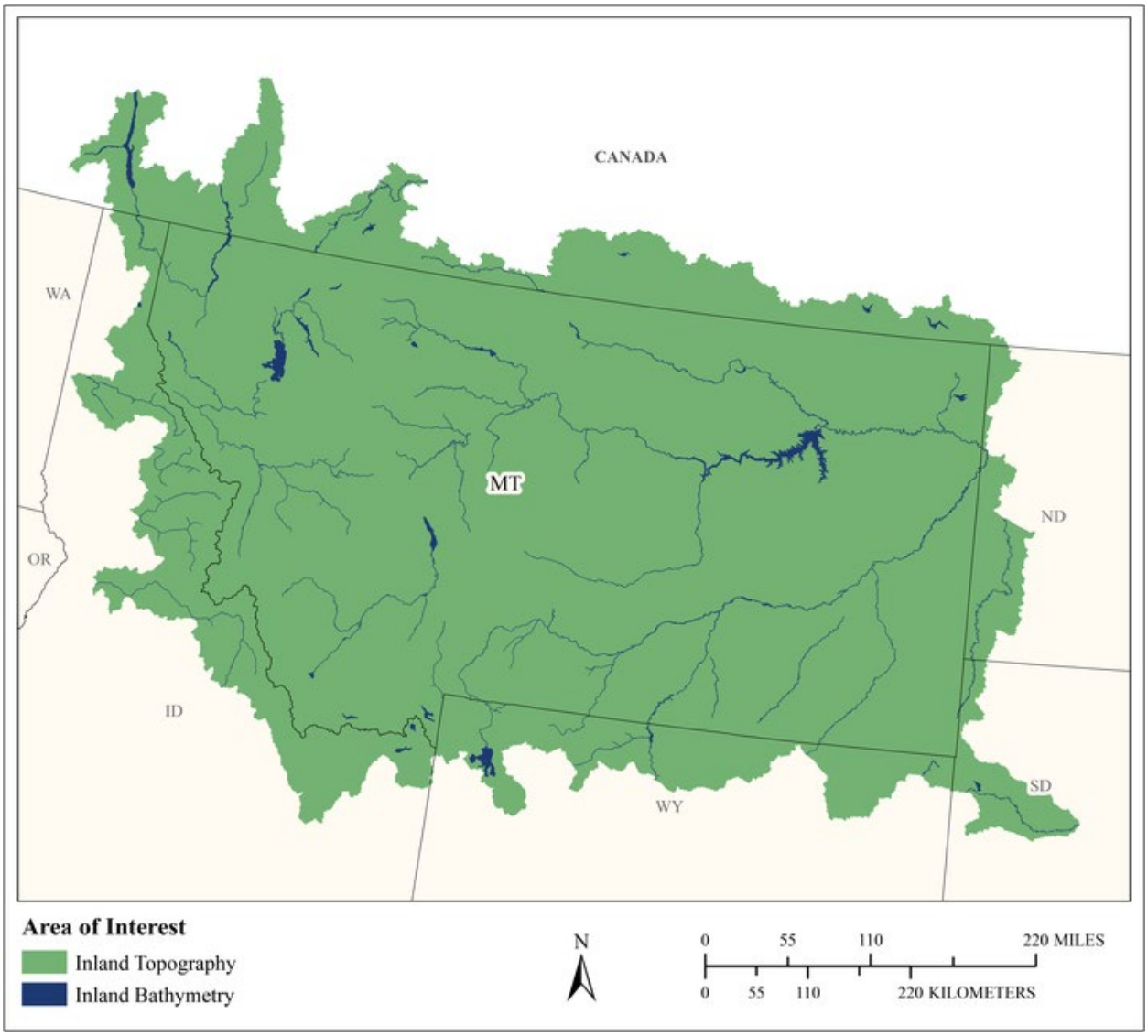
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$497,072									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$619,087									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Moderate											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Creation, Dissemination, and Maintenance of Statewide Standardized Datasets



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Highly desirable		
Geographic Area Requirements	One or more Hydrologic Units (HUC8s)	One or more Hydrologic Units (HUC8s)		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Information Access. Elevation data are needed for the GIS library for Montana to meet state user needs. The library maintains and publishes standardized data layers for statewide use. We would also benefit from an enhanced 3D coverage of Montana to assign z-values to our road network. We currently do this using the statewide coverage of the 10-meter DEM. However, certain programs such as our annual Fuel Tax program (where funds are distributed to counties and cities based on road mileages) would greatly benefit from enhanced vertical data.
MCA Title	Creation, Dissemination, and Maintenance of Statewide Standardized Datasets
MCA ID	21651
Organization Type	State or U.S. Territorial government
Organization Name	Montana State Library
Sub-Agency or Division	
Organization Mission	Creation, dissemination, and maintenance of statewide standardized datasets to improve the human and environmental condition.
Program Name	Montana Spatial Data Infrastructure, Natural Resource Information System, Montana Land Plan, Montana Land Information Act Grant Program, Montana Natural Heritage Program, Water Information System
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 26 - Education K12 and Beyond, Basic Research
Tertiary Business Use	BU 23 - Urban and Regional Planning

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Headgates, shrubbery, small dock, small dams

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Not required
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B		
Update Frequency	6-10 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Highly desirable

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Not required			Highly desirable	
Entire AOI under same environmental conditions	Nice to have	Not required			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Not required			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Not required			Highly desirable	
Other	Highly desirable					
Other description	Align collection units with hydrologic units					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer				Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have		
DTM	Required	Nice to have		
DEM	Required	Nice to have		
Raw point cloud data	Highly desirable	Not required		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Classified point cloud	Highly desirable	Not required		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Not required		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Required	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Nice to have		
Ground control/ground truthing	Highly desirable	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Highly desirable	Nice to have		
Wetlands	Highly desirable	Required		
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Highly desirable	Nice to have		
Landmark features	Highly desirable	Nice to have		
Cultural resources	Highly desirable	Nice to have		
Coastal and riverine structures	Highly desirable	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	10 meter NED	None available		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available		Yes		

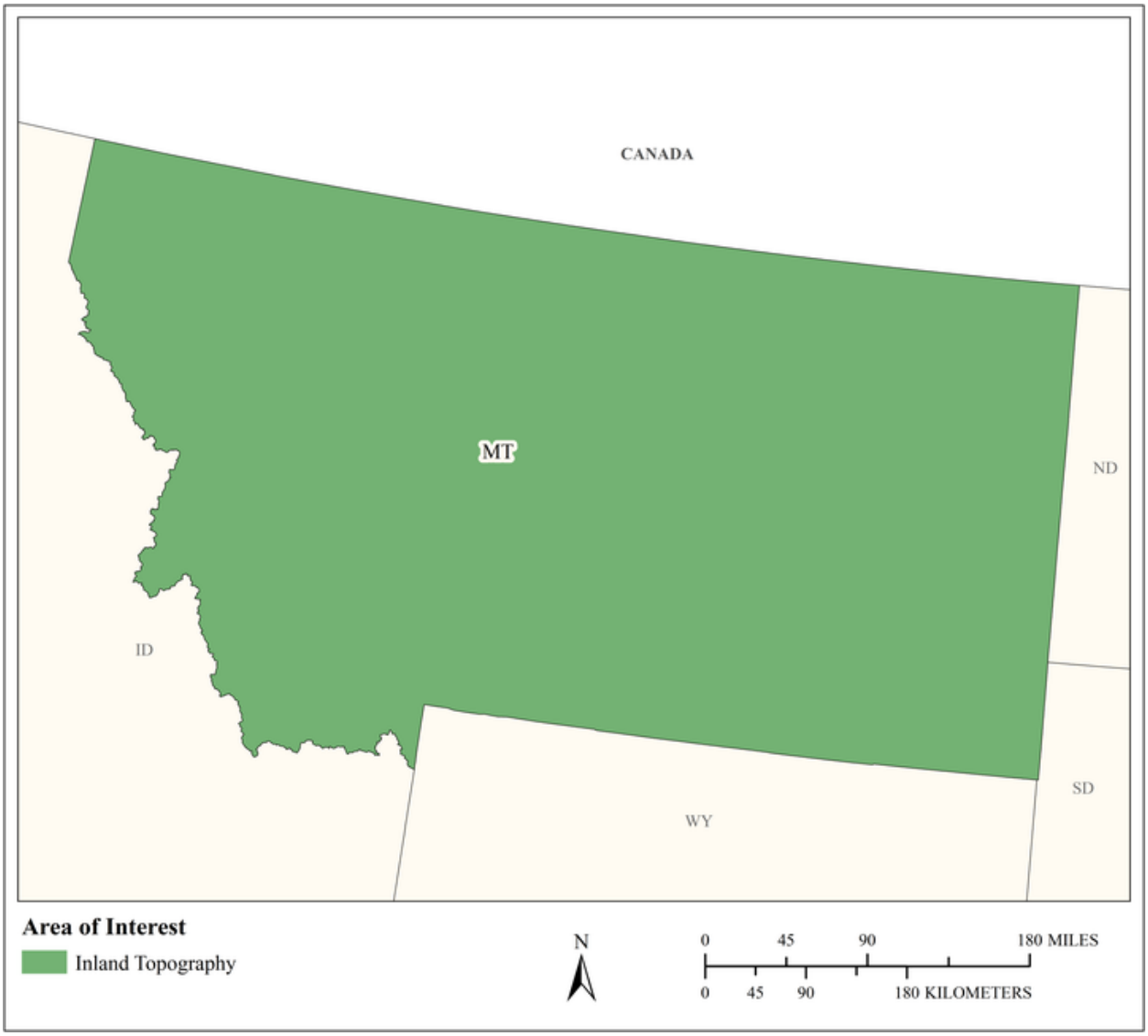
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None	Inland bathy data not available		
Cost savings/cost reduction	None	Inland bathy data not available		
Cost avoidance	None	Inland bathy data not available		
Increased revenues	None	Inland bathy data not available		
Mission-driven performance improvements	None	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None	Inland bathy data not available		
Improved response or timeliness	None	Inland bathy data not available		
Improved customer experience	None	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	Inland bathy data not available		
Environmental	None	Inland bathy data not available		
Public safety, including life and property	None	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide							
Time savings description	Should reduce field visits; however, we do not have the data to estimate this savings. We know there will be a direct benefit; however, we do not have the data to estimate the savings.											
Cost savings/cost reduction	Moderate	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction description	Given that we do not have the data available to test this, we are unable to make an estimate.											
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide							
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,152,689		Annual dollars saved/ realized	$2,226,308						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	Major	Unable to provide		I don't know	Unable to provide							
Improved customer experience	Major	Unable to provide		I don't know	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$6,334,932		Annual dollars saved/ realized	$231,176						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			I don't know								
Environmental	Major			I don't know								
Public safety, including life and property	Major			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps	Yes	Yes		
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes	Yes		
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Transportation Infrastructure Planning, Design, and Construction



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Bridge design and construction. Stormwater modeling. Cut and fill analysis for earth-moving. Building site analysis. Road infrastructure. Transportation Planning.
MCA Title	Transportation Infrastructure Planning, Design, and Construction
MCA ID	21697
Organization Type	State or U.S. Territorial government
Organization Name	Montana Department of Transportation
Sub-Agency or Division	
Organization Mission	Our guiding mission is to serve the public by providing a transportation system and services that emphasize quality, safety, cost effectiveness, economic vitality and sensitivity to the environment.
Program Name	Construction. Planning. Wetland Mitigation.
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 23 - Urban and Regional Planning
Tertiary Business Use	BU 07 - Wildlife and Habitat Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	Bridge, culvert, guardrail, delineator.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI	QL2 is sufficient for planning and initial design, final design and construction requires survey grade data.			
Acceptable Horizontal Error	Up to 1 meter			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Vertical Error	I don't know			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Nice to have			
Wetlands	Required			
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	For construction projects, the topographic data is surveyed. For wetland/riverine projects, the topographic data is LIDAR or collected in the field using GPS. For planning projects that involve assigning a z-value to road networks, 10 meter DEMs are used.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	Moderate			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Moderate			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,152,689									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$6,334,932									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Moderate											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Tribal Infrastructure Mapping

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Respondent provided own shapefile, KML, or geodatabase			
Sub Area Requirements	Rocky Mountain Tribal Transportation Planners Area of Operation			

MCA Description	Response
Mission Critical Activity	Infrastructure and Construction Management
MCA Title	Tribal Infrastructure Mapping
MCA ID	22069
Organization Type	Tribal government
Organization Name	Rocky Mountain Tribal Transportation Planners
Sub-Agency or Division	
Organization Mission	Improve tribal infrastructure
Program Name	Rocky Mountain Tribal Transportation Program
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 19 - Land Navigation and Safety
Tertiary Business Use	BU 15 - Flood Risk Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Curbs, manhole lids

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Not required			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	None available			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None			
Cost savings/cost reduction	None			
Cost avoidance	None			
Increased revenues	None			
Mission-driven performance improvements	None			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None			

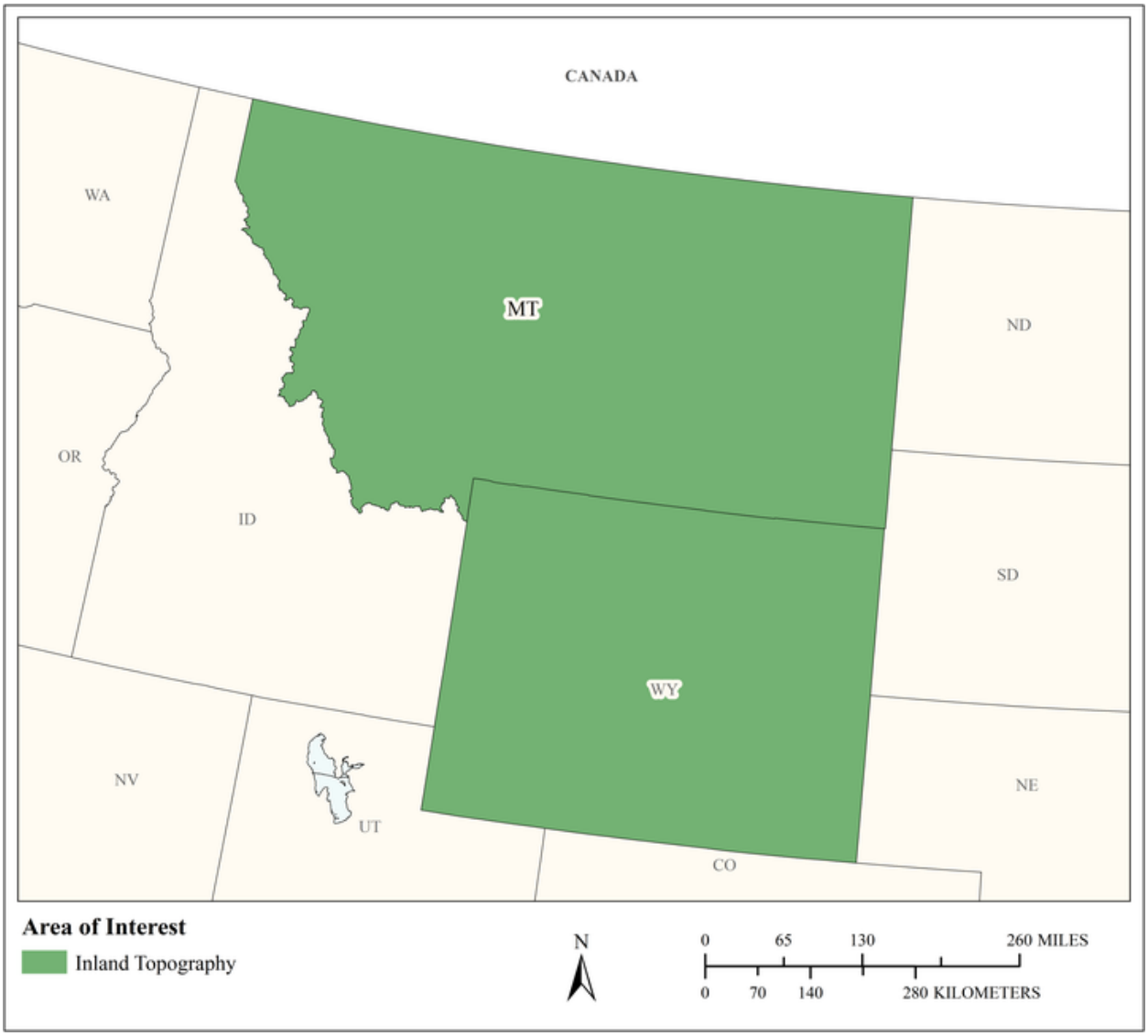
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	None			
Improved customer experience	None			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	None			
Public safety, including life and property	None			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Time savings description	Ability to develop 30% plans without field work. 30% plan development reduced from months to days. Communication greatly enhanced. Tribal trust land often has 100s of owners, access requires 50% plus one. Getting approval takes weeks and sometimes months.											
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	None											
Increased revenues	Major	Unable to provide										
Increased revenues description	Allow for feasibility of new services.											
Mission-driven performance improvements	Major	Unable to provide										
Mission-driven performance improvements description	Will be able to move projects through planning phase more effectively.											
Future annual operational benefits added during validation		Annual dollars saved/ realized	$149,833									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Value added to products or services description	Flood plain mapping; currently no mapping exists.											
Improved response or timeliness	Major	Unable to provide										
Improved response or timeliness description	No flood hazard maps exist - greatly needed.											
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$440,930									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	Major											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Infrastructure Design, Construction, Maintenance, and Mapping



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Infrastructure design, construction, maintenance, and mapping.
MCA Title	Infrastructure Design, Construction, Maintenance, and Mapping
MCA ID	22507
Organization Type	Private or Commercial
Organization Name	Stahly Engineering & Associates
Sub-Agency or Division	
Organization Mission	Stahly Engineering & Associates is committed to sustainable growth driven by exceptional professional services to communities and clients. Our company will deliver services through efficient, innovative, and practical methods to meet specific goals and objectives using technically based solutions. We value our employees, provide opportunities, and match team strengths to project needs.
Program Name	Engineering and Land Surveying
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Sign, curb, road lines

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	Event driven only – Data need to coincide with a specific event.			
Event type(s)	A new project.			
Quality Level and/or update frequency variability across AOI	Area of study specific, different requirements for different areas of study.			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Nice to have			
Raw point cloud data	Nice to have			
Classified point cloud	Not required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Survey grade collected features.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	Internal			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know			
Cost savings/cost reduction	I don't know			
Cost avoidance	I don't know			
Increased revenues	I don't know			

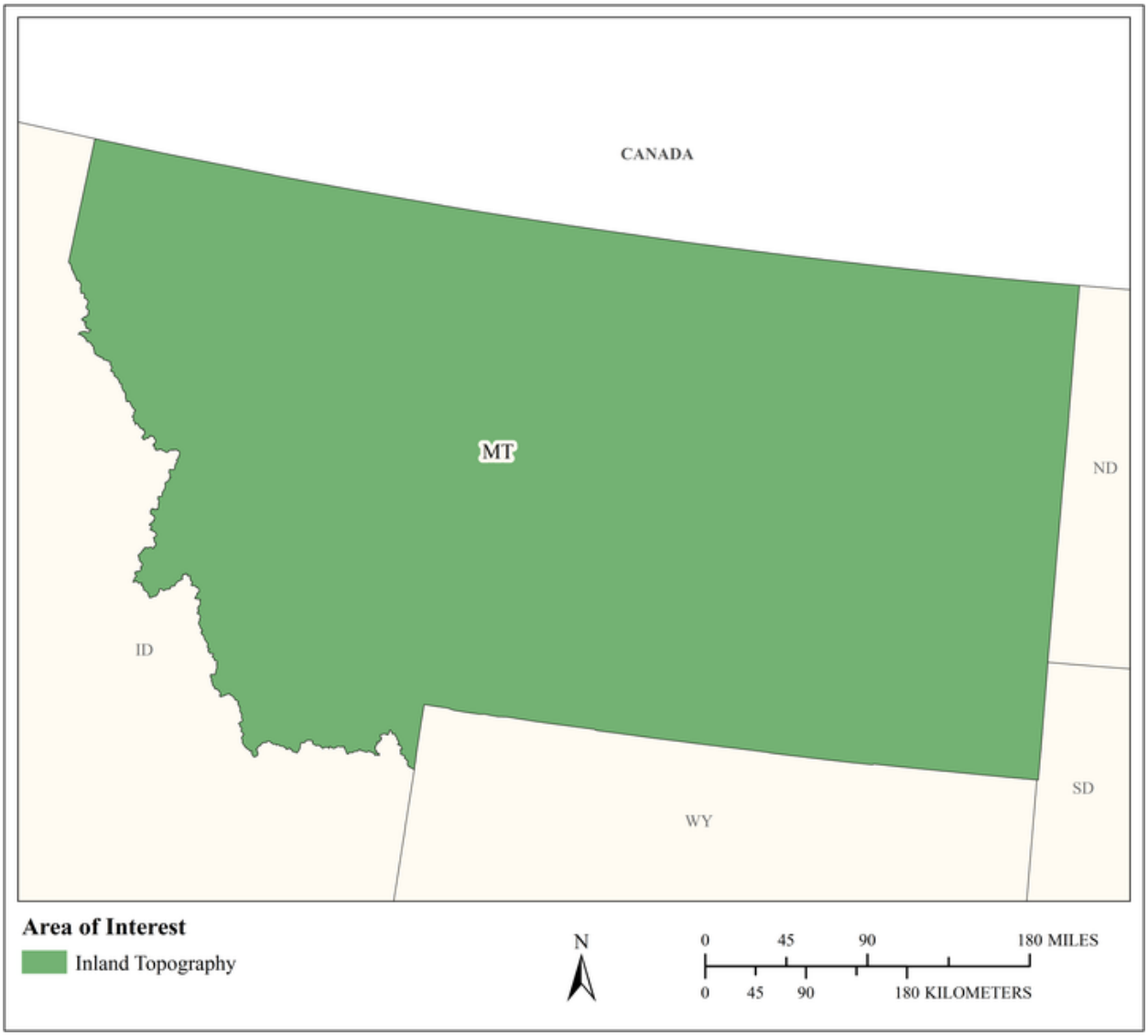
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Mission-driven performance improvements	I don't know			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know			
Improved response or timeliness	I don't know			
Improved customer experience	I don't know			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know			
Environmental	I don't know			
Public safety, including life and property	I don't know			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$36,180									
Time savings description	Fewer field visits would be required.											
Cost savings/cost reduction	I don't know	Unable to provide										
Cost avoidance	I don't know	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	I don't know	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,117,253									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide										
Improved response or timeliness	I don't know	Unable to provide										
Improved customer experience	I don't know	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$6,334,932									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	Moderate											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades				
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Urban and Regional Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Land development and zoning. Municipal mapping of building footprints and elevations. Port resilience planning. Parks and transportation planning. Virtual city creation. Urban ecology planning.
MCA Title	Urban and Regional Planning
MCA ID	60265
Organization Type	State or U.S. Territorial government
Organization Name	State of Montana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Required			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

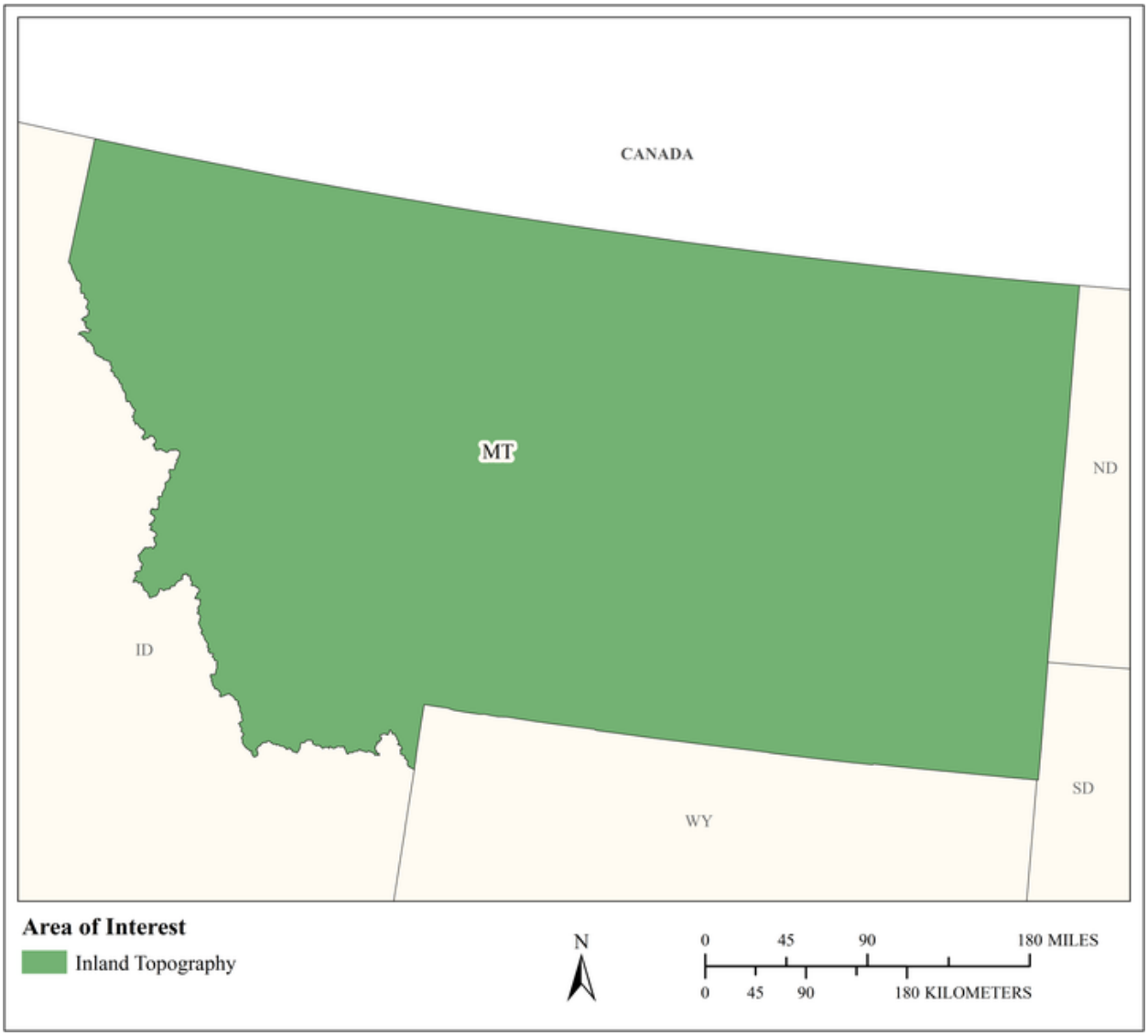
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$19,781,262									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$2,283,755									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Real Estate, Banking, Mortgage, and Insurance



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Assessment of risk for natural hazards (e.g., sinkholes, flooding) to inform insurance policy rates and the determination of mandatory insurance. Building permit compliance.
MCA Title	Real Estate, Banking, Mortgage, and Insurance
MCA ID	60266
Organization Type	State or U.S. Territorial government
Organization Name	State of Montana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 25 - Real Estate, Banking, Mortgage, and Insurance
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

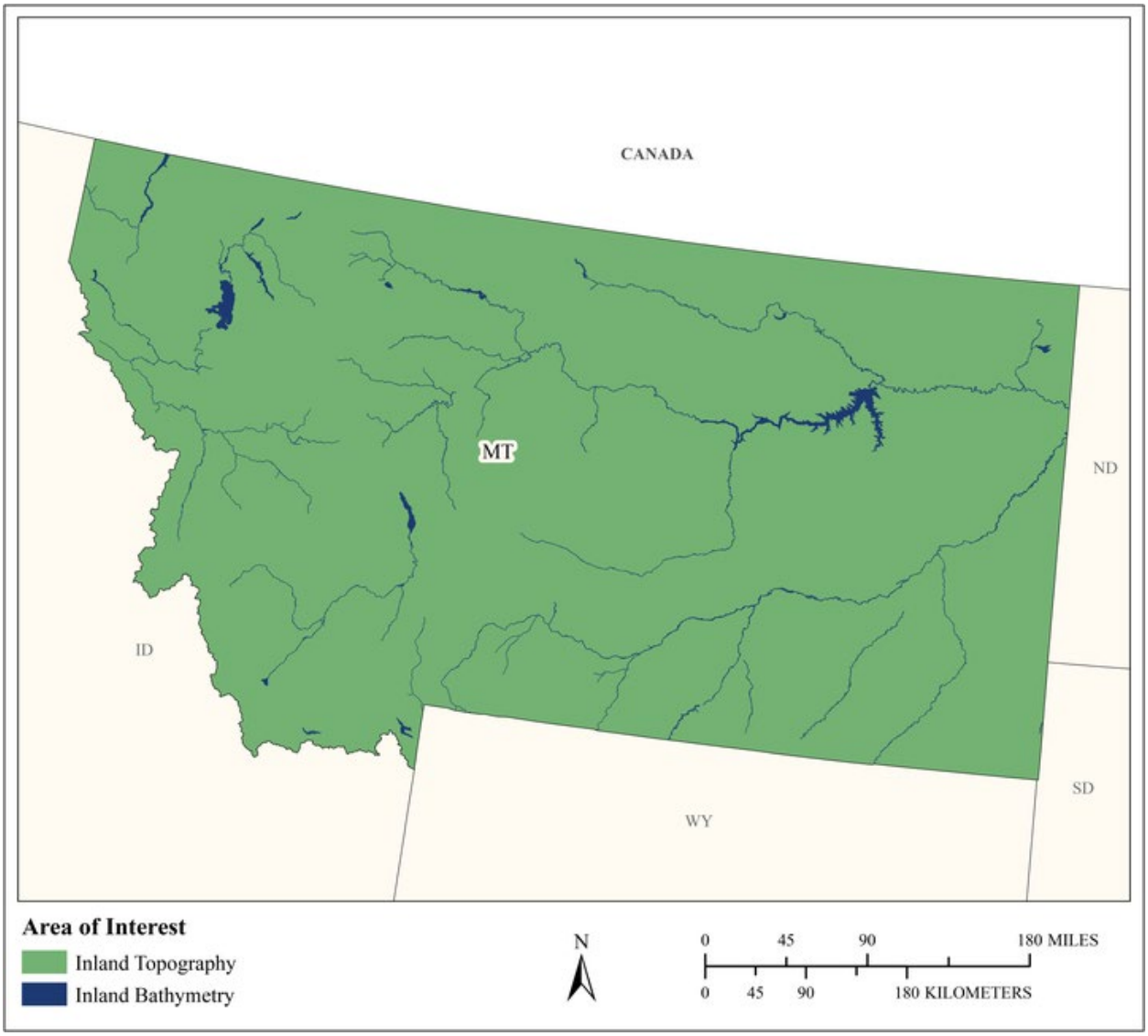
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Moderate			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,750,000									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Education K12 and Beyond, Basic Research



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Development of 3-D visualizations to help students understand the Earth they live on. Understanding of continental-scale climate change impacts. Ocean science. Ocean education. Scientific research. Data dissemination. Development of training simulators.
MCA Title	Education K12 and Beyond, Basic Research
MCA ID	60267
Organization Type	State or U.S. Territorial government
Organization Name	State of Montana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 26 - Education K12 and Beyond, Basic Research
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL1B		
Update Frequency	2-3 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Required			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Required			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Required	Required		
Classified point cloud	Required	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Highly desirable		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Required		
Land use/land cover	Required	Highly desirable		
Wetlands	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	Major	Minor		
Increased revenues	Minor	None		
Mission-driven performance improvements	Major	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		

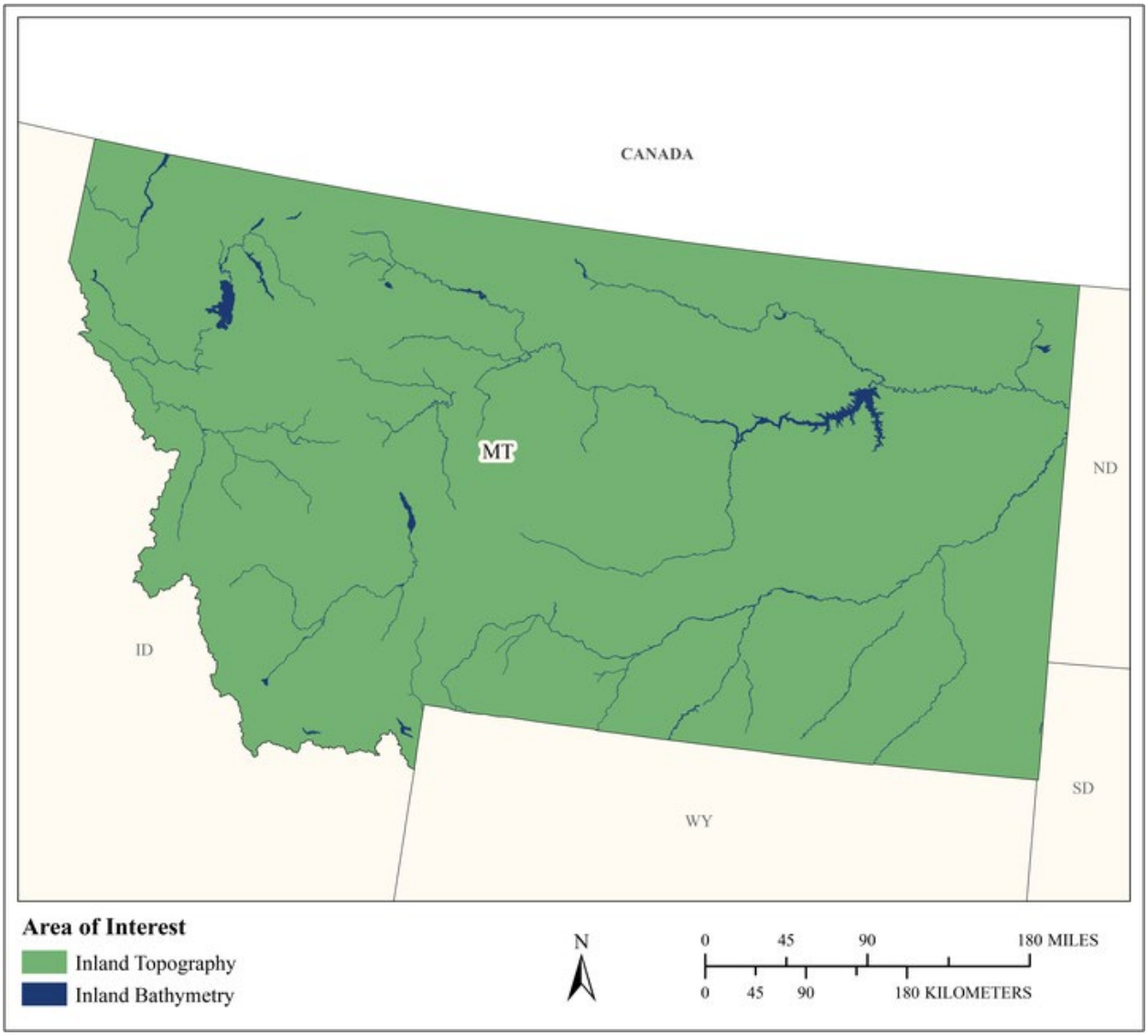
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor		
Improved customer experience	Major	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major		
Environmental	Major	Minor		
Public safety, including life and property	Major	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$772,708		Annual dollars saved/ realized	$202,072						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,846,997									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Major			Major								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Recreation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Planning and development of recreational facilities such as rafting, boating, swimming, diving, and fishing areas; ski slopes; and golf courses. Location- based products and services such as maps and guides. Tourism. Trail and vista site planning. Orienteering.
MCA Title	Recreation
MCA ID	60268
Organization Type	State or U.S. Territorial government
Organization Name	State of Montana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 27 - Recreation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required			Not required	
Entire AOI under same environmental conditions	Required	Not required			Not required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have			Nice to have	
DEM for entire AOI needs to be seamless	Required	Nice to have			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required		
DTM	Nice to have	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Highly desirable	Highly desirable		
Edited/cube XYZ		Highly desirable		
Full waveform	Not required	Nice to have		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Nice to have		
Ground control/ground truthing	Nice to have	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Highly desirable		
Land use/land cover	Nice to have	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Not required	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor		
Cost savings/cost reduction	Moderate	Minor		
Cost avoidance	Major	Minor		
Increased revenues	None	Minor		
Mission-driven performance improvements	Major	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor		

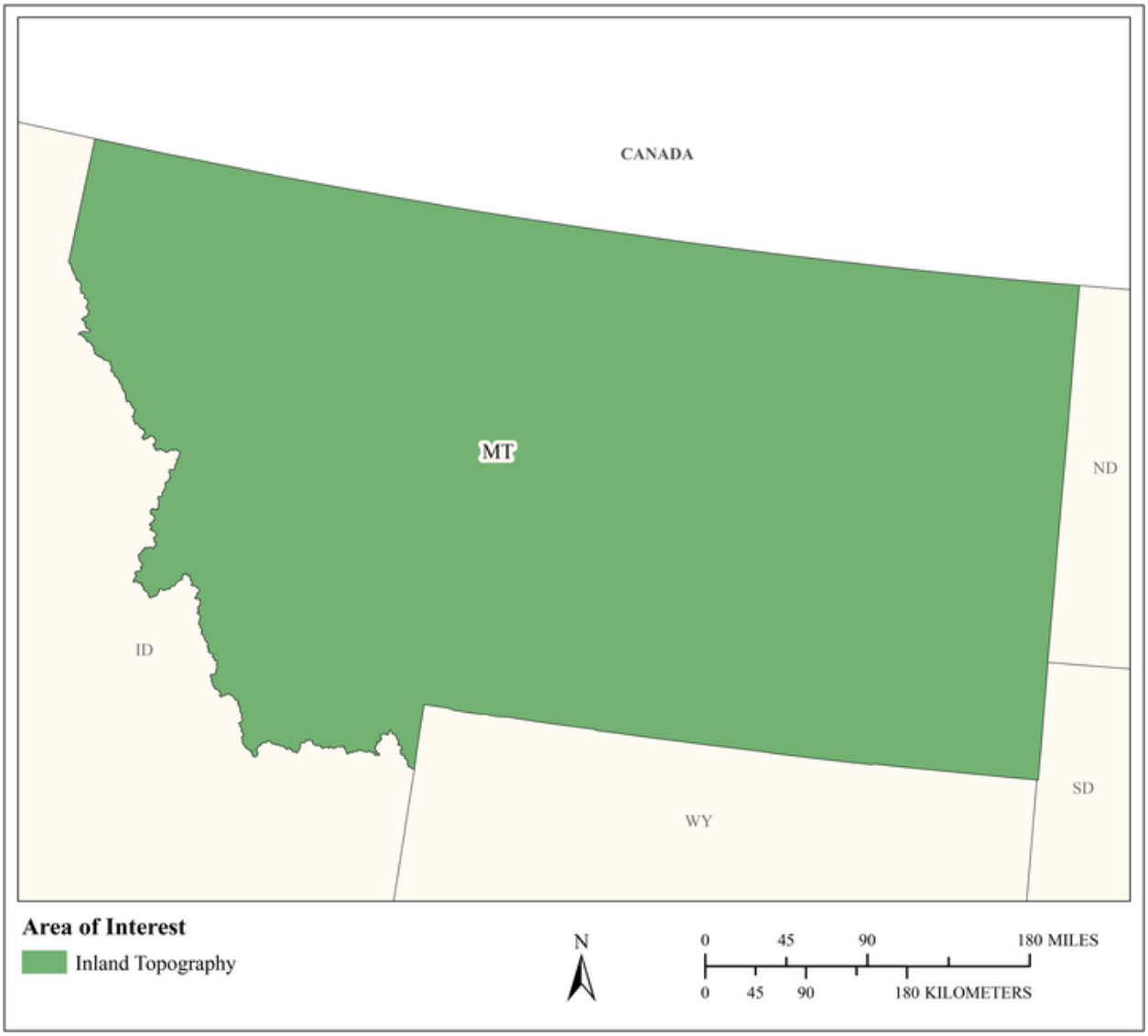
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	Minor		
Improved customer experience	Moderate	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor		
Environmental	Major	Minor		
Public safety, including life and property	Major	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	None			Moderate	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$132,000		Annual dollars saved/ realized	$60,000						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Minor	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major								
Environmental	Moderate			Major								
Public safety, including life and property	Moderate			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Telecommunications



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Telecommunication tower site selection. Design of radio and radar systems. Interference analysis. Path profiles. Undersea telecommunication route selection and deployment.
MCA Title	Telecommunications
MCA ID	60269
Organization Type	State or U.S. Territorial government
Organization Name	State of Montana
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 28 - Telecommunications
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Highly desirable			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

Nebraska

Current status of elevation data for Nebraska

Nebraska has complete statewide lidar coverage as of 2017. This was accomplished through funding at various times and intervals from the following organizations: Natural Resource Conservation Service (NRCS) Nebraska State Office, U.S. Geological Survey (USGS), Federal Emergency Management Agency (FEMA), various state agencies, Nebraska Natural Resource Districts (NRDs), and local government entities. The Nebraska Information Technology Commission Elevation Standard (http://nitc.ne.gov/standards/3-203.pdf) sets the standard for lidar collection in the state.

Importance of elevation data to Nebraska

There are many uses for lidar data by a wide variety of federal, state, and local governments, non-government organizations, and private entities. Some examples include using the DEM to create a hillshade to identify historic features, using the DEM to design structures to help agriculture, or floodplain determination and flood inundation analysis. The quality of the data can be used in machine-controlled construction equipment. The data can be used for modeling regarding surface and groundwater interactions along with wetland determination.

High-level summary of elevation data requirements

Currently Quality Level 1 (QL1) inland topography is sufficient for the state, though QL2 may suffice in rural areas. Several stakeholders require QL1B inland bathymetry. Elevation data should be updated every 4-5 years.

High-level summary of benefits that would come from higher resolution elevation data

Most stakeholders indicate that they will receive moderate to major future benefits if their data requirements are met but did not provide specific cost and time savings. Respondents who were able to provide specifics indicated they would receive annual time savings ranging between 8 and 240 hours and could see 50% annual improvement in their ability to carry out their mission.

A higher level of resolution could be beneficial in urban areas with building footprints and 3D modeling by assisting major construction projects and helping with autonomous vehicles. In rural areas better data could help with encroachment of eastern red cedar and other invasive species if a hyperspectral sensor is used. Elevation data can also be used in agriculture construction projects with the information used by computers in the construction equipment. Higher quality data could be helpful with a more exact wetland delineation.

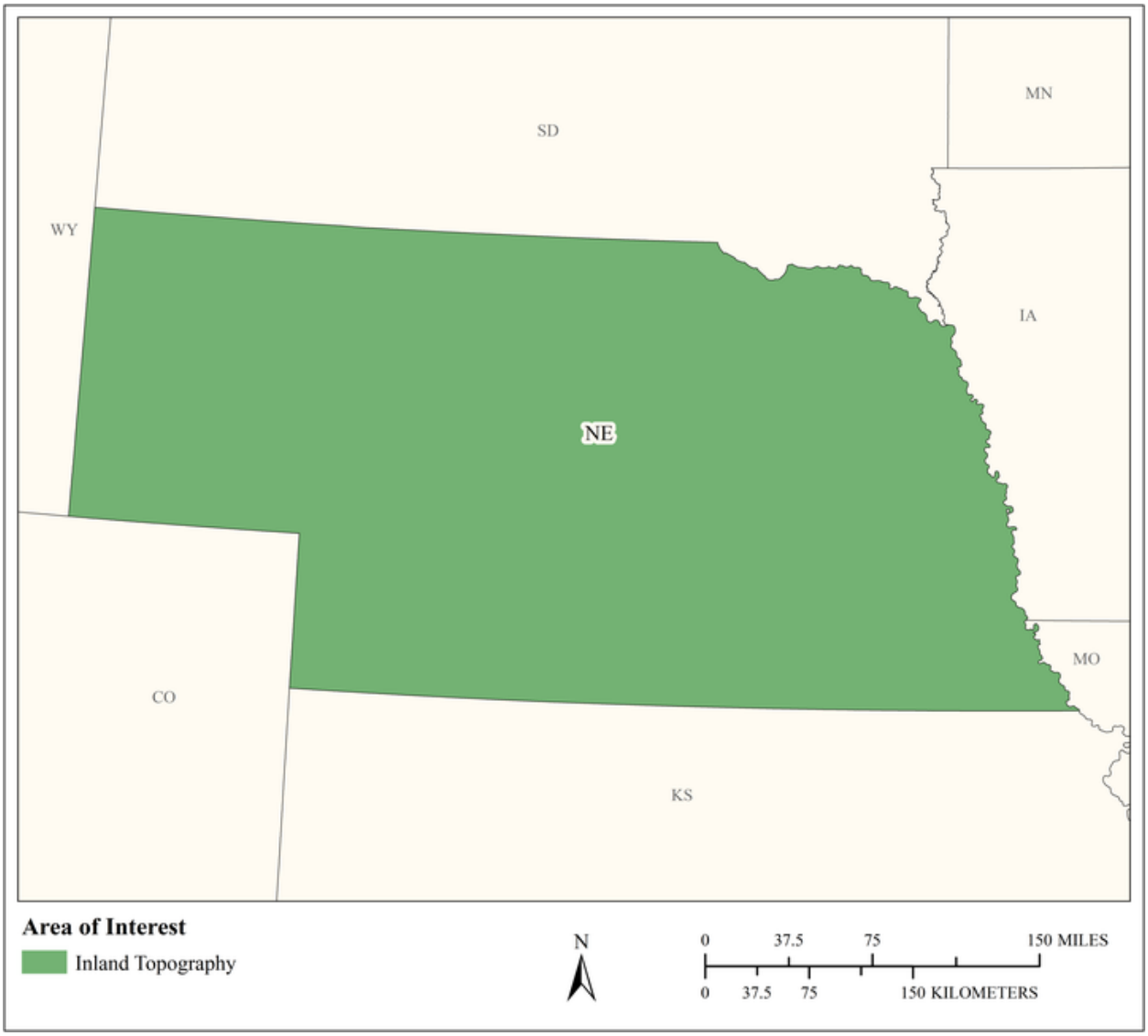
The State of Nebraska has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	Nebraska Dept. of Environmental Quality	21710	Water Quality Planning, Monitoring, and Project Development	Inland Topo	QL2	6-10 years	$428,889	$114,879	Minor	Moderate	I don't know
BU 02 – Riverine Ecosystem Management	University of Nebraska	1322	Surface and Ground Water Modeling and Mapping	Inland Topo	QL2	>10 years	$3,135	$7,959	Major	Moderate	Minor
				Inland Bathy	QL2B	>10 years	$6,030	$2,170	Moderate	Minor	I don't know
BU 04 – Forest Resource Management	State of Nebraska	60270	Forest Resources Management	Inland Topo	QL1	2-3 years	$305,836	$443,346	Major	Major	Major
BU 05 – Rangeland Management	State of Nebraska	60271	Rangeland Management	Inland Topo	QL2	Annually	Unable to quantify	Unable to quantify	Minor	Major	I don't know
BU 06 – Natural Resource Management	Nebraska Office of the CIO	21900	Geospatial Data Coordination	Inland Topo	QL2	4-5 years	$1,516,993	$5,570,863	Major	Major	Major
				Inland Bathy	QL1B	6-10 years	$205,611	$9,256	Major	Major	Major
BU 06 – Natural Resource Management	Nebraska Natural Resources Districts	22236	Natural Resources Management	Inland Topo	QL2	4-5 years	$1,516,993	$5,570,863	Major	Major	Major
				Inland Bathy	QL1B	Event driven	$205,611	$9,256	Major	Major	Major
BU 07 – Wildlife and Habitat Management	Nebraska Game and Parks Commission	22383	Stewardship and Management of the State's Fish, Wildlife, Park, and Outdoor Recreation Resources	Inland Topo	QL2	(a) 2-3 years (b) Annually	$18,426	$53,219	I don't know	I don't know	Moderate
				Inland Bathy	QL1B	2-3 years	$147,667	$89,256	I don't know	I don't know	Moderate
BU 08 – Agriculture	State of Nebraska	60272	Agriculture and Precision Farming	Inland Topo	QL2	2-3 years	$89,557	$70,998	Major	Major	Minor
BU 12 – Renewable Energy Resources	State of Nebraska	60273	Renewable Energy Resources	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	None
BU 14 – Cultural Resource Management	State of Nebraska	60274	Cultural Resources Preservation and Management	Inland Topo	QL1	4-5 years	$14,178	$12,396	Minor	Minor	Minor

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 15 – Flood Risk Management	Nebraska Department of Natural Resources	21772	Flood Risk Management	Inland Topo	QL2	6-10 years	$4,824	Unable to quantify	Minor	Minor	Major
BU 17 – Wildfire Management	State of Nebraska	60275	Wildfire Management, Planning, and Response	Inland Topo	QL1	4-5 years	$415,603	Unable to quantify	Major	Major	Major
BU 18 – Homeland Security	State of Nebraska	60276	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management	Inland Topo	QL2	4-5 years	$2,281,909	$40,331	Major	Moderate	Major
				Inland Bathy	QL0B	4-5 years	$642,643	$41,001	Major	Moderate	Major
BU 19 – Land Navigation	State of Nebraska	60277	Land Navigation and Safety	Inland Topo	QL0	2-3 years	$1,002,052	$80,920	Minor	Major	Major
BU 23 – Urban and Regional Planning	State of Nebraska	60278	Urban and Regional Planning	Inland Topo	QL1	4-5 years	$20,812,527	$2,402,815	Moderate	Major	Major
BU 24 – Health and Human Services	State of Nebraska	60279	Health and Human Services	Inland Topo	QL1	6-10 years	$27,600	$3	Moderate	Moderate	Major
BU 27 – Recreation	State of Nebraska	60280	Recreation	Inland Topo	QL1	4-5 years	$17,749	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	4-5 years	$10,689	Unable to quantify	Major	Major	Moderate
BU 28 – Telecom-munications	State of Nebraska	60281	Telecommunications	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

MCA Title: Water Quality Planning, Monitoring, and Project Development



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Water quality improvement and water pollution prevention and control.
MCA Title	Water Quality Planning, Monitoring, and Project Development
MCA ID	21710
Organization Type	State or U.S. Territorial government
Organization Name	Nebraska Dept. of Environmental Quality
Sub-Agency or Division	
Organization Mission	To develop comprehensive programs for the prevention, control, and abatement of new or existing pollution of the air, waters, and land of the state.
Program Name	Water quality planning, monitoring, and project development
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	Small watersheds, about 1 - 49 sq mi

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Not required			
Landmark features	Not required			
Cultural resources	Not required			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	30 m and 10 m DEMs			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	University of Nebraska Conservation and Survey Division, State of Nebraska OCIO			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			

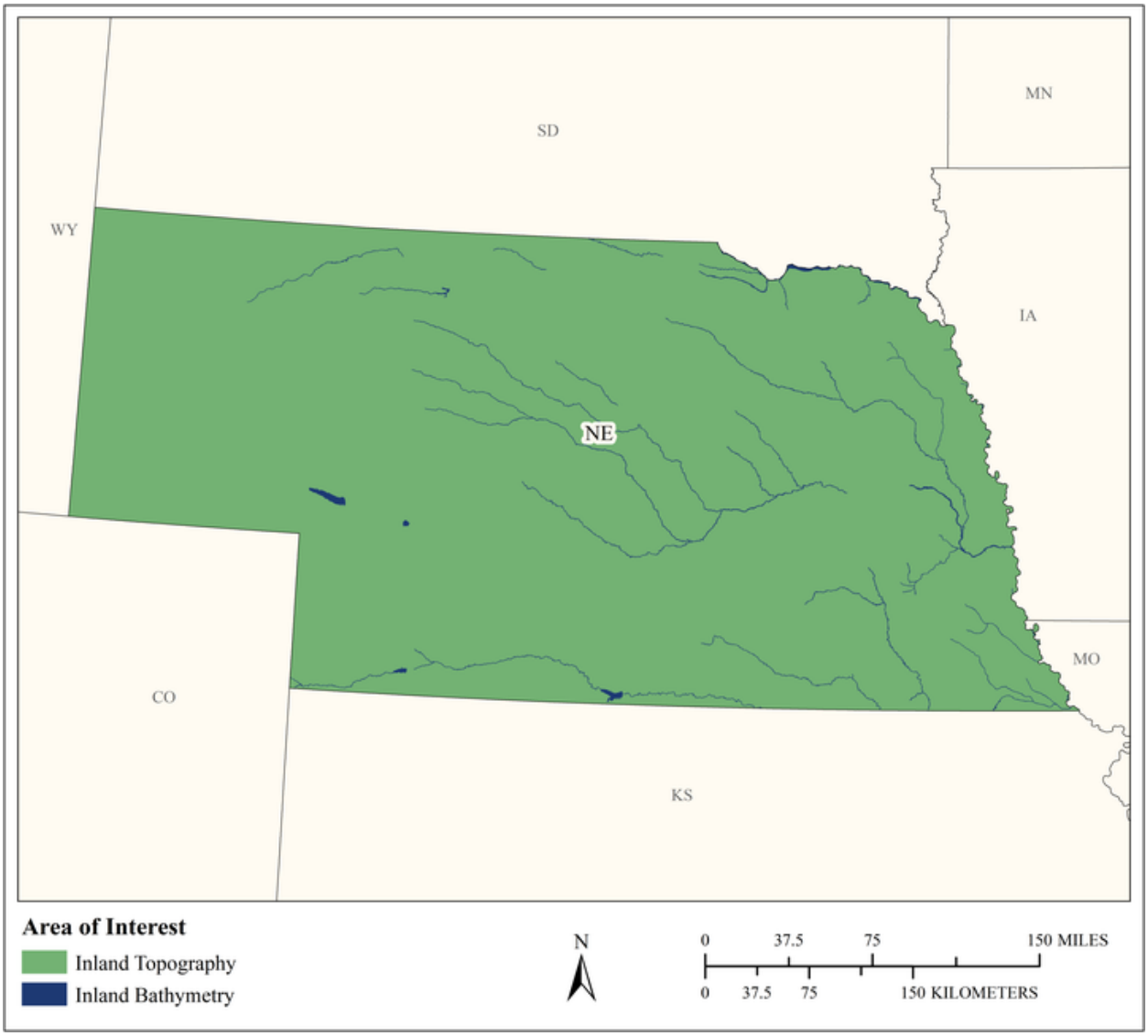
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Mission-driven performance improvements	Minor			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			
Improved response or timeliness	Minor			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know			
Environmental	Minor			
Public safety, including life and property	I don't know			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	None											
Cost avoidance	Minor	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Moderate	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$428,889									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$114,879									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Moderate											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades				
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Surface and Ground Water Modeling and Mapping



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Stream/groundwater interaction analysis, modeling and mapping.
MCA Title	Surface and Ground Water Modeling and Mapping
MCA ID	1322
Organization Type	Office of the State Geologist
Organization Name	University of Nebraska
Sub-Agency or Division	
Organization Mission	The Conservation and Survey Division, the natural resource survey component of the School of Natural Resources, is a unique, multi-disciplinary research, service and data-collection organization established by state statute in 1921. The Division's mission is to investigate and record information about Nebraska's geologic history, its rock and mineral resources, the quantity and quality of its water resources, land cover and other aspects of its geography, as well as the nature, distribution and uses of its soils.
Program Name	Water Resources Survey
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	BU 08 - Agriculture and Precision Farming
Tertiary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Stream thalweg, streambed morphology

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have

Inland Bathy Feature Size Requirements	Response
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B		
Update Frequency	>10 years and certain events.	>10 years and certain events.		
Event type(s)	Stream corridors could be updated after flood event	Stream corridors could be updated after flood event		
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need		
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm		
How far onshore needed				
How far down the beach profile needed	To MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Highly desirable
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Not required			Not required	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have			Nice to have	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Not required		
DTM	Nice to have	Not required		
DEM	Required	Highly desirable		
Raw point cloud data	Highly desirable	Nice to have		
Classified point cloud	Highly desirable	Nice to have		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Nice to have		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Nice to have	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Nice to have	Not required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Highly desirable	Nice to have		
Wetlands	Highly desirable	Nice to have		
Estuaries				
Inland surface water features	Highly desirable	Highly desirable		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	1 and 2 meter LiDAR-derived DEMs (QL3 and QL2), some hydro-flattened, some not hydro-flattened	None		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	State of Nebraska OCIO			
Data that meet my needs are not available		Yes		

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available		
Cost savings/cost reduction	I don't know	Inland bathy data not available		
Cost avoidance	Moderate	Inland bathy data not available		
Increased revenues	None	Inland bathy data not available		
Mission-driven performance improvements	Moderate	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available		
Improved response or timeliness	Moderate	Inland bathy data not available		
Improved customer experience	Moderate	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Inland bathy data not available		
Environmental	Minor	Inland bathy data not available		
Public safety, including life and property	I don't know	Inland bathy data not available		

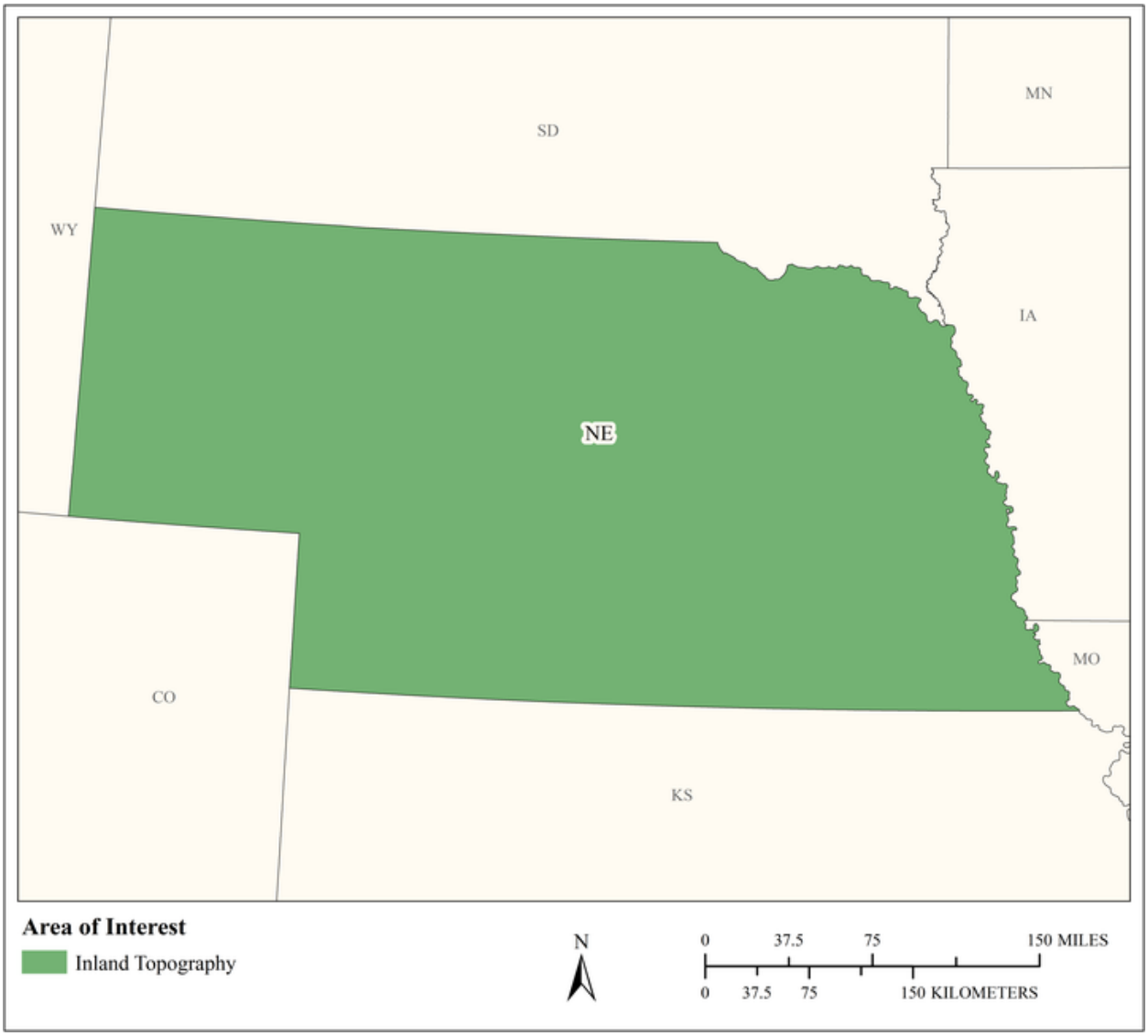
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$3,136	Moderate	Annual dollars saved/realized	$6,030						
Time savings description	Will require initial investment (time) to set up databases, but once it's up, will save time. Using remote sensing will save field time by requiring fewer field visits, but require different field time to validate remote sensing results. Could save as many as three field reconnaissance days. Will save time on traditional reviews, but will require additional time for new reviews relating to change in data sources.			Hours saved by automating thalweg elevation assignment in models.								
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide							
Cost avoidance	I don't know	Unable to provide		Major	Unable to provide							
Cost avoidance description	This is a recognized benefit, but behavior often doesn't change until a hazard is realized, or a disaster occurs. Accuracy of data will be improved, but unsure how to estimate costs associated with academic errors.											
Increased revenues	Moderate	Unable to provide		Moderate	Unable to provide							
Increased revenues description	This allows the development of new research projects, which may highlight a need and increase the amount of research funding available. Indirect effect on agriculture, possibly impacting economics.			Research new models and model types.								
Mission-driven performance improvements	Major	Annual percent improvement	50%	Minor	Unable to provide							
Mission-driven performance improvements description	Uncertain - decisions are often poorly correlated with technical knowledge. Compelling visuals help improve outcomes. Excellent tool to further the mission.			Likely help visualize surface/ground water interaction.								
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide		Moderate	Unable to provide							
Value added to products or services description	More realistic/detailed models should improve products offered.			Will add new model types and level of spatial discretization. Definite increase in accuracy, uncertain of value added.								
Improved response or timeliness	Minor	Annual dollars saved/realized	$724	Moderate	Annual dollars saved/realized	$965						
Improved response or timeliness description	More accurate reflection of current conditions. Simple office visits can often replace site visits of customer queries.			Fewer site visits.								
Improved customer experience	Major	Annual dollars saved/realized	$7,236	Moderate	Annual dollars saved/realized	$1,206						
Improved customer experience description	This will likely have associated costs (time and money).			This will likely cost hours rather than save them.								
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate								
Education or outreach description	Will vastly improve the ability to convey/illustrate ideas to the public			Improved visualization								

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Environmental	Moderate	Minor		
Environmental description	Understanding interaction of surface/ground water should help management decisions	Better management decisions		
Public safety, including life and property	Minor	I don't know		
Public safety, including life and property description	May have some (uncertain) benefit			

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Forest Resources Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Forest health assessment. Determination of standing inventory of forest resources. Prescribed burn planning. Analysis of carbon stocks for trade. Harvest systems planning.
MCA Title	Forest Resources Management
MCA ID	60270
Organization Type	State or U.S. Territorial government
Organization Name	State of Nebraska
Sub-Agency or Division	Nebraska Forest Service
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Highly desirable			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	State of Nebraska OCIO			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

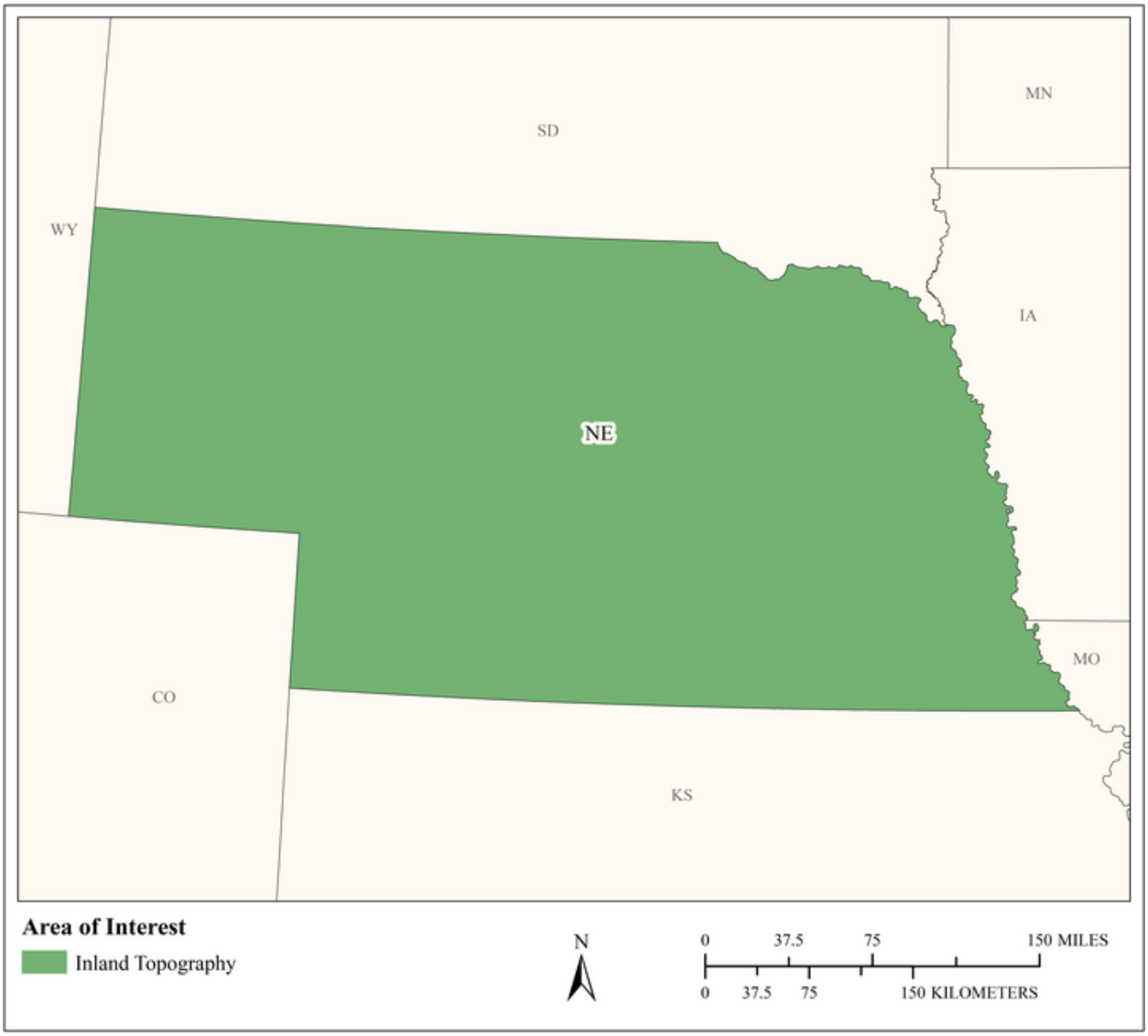
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$305,836									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$443,346									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Rangeland Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Assessment of rangeland health. Mapping for soil erosion potential due to grazing.
MCA Title	Rangeland Management
MCA ID	60271
Organization Type	State or U.S. Territorial government
Organization Name	State of Nebraska
Sub-Agency or Division	Nebraska Forest Service
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 05 - Rangeland Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Highly desirable			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Not required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	State of Nebraska OCIO			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None			
Cost savings/cost reduction	None			
Cost avoidance	None			
Increased revenues	None			
Mission-driven performance improvements	None			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None			

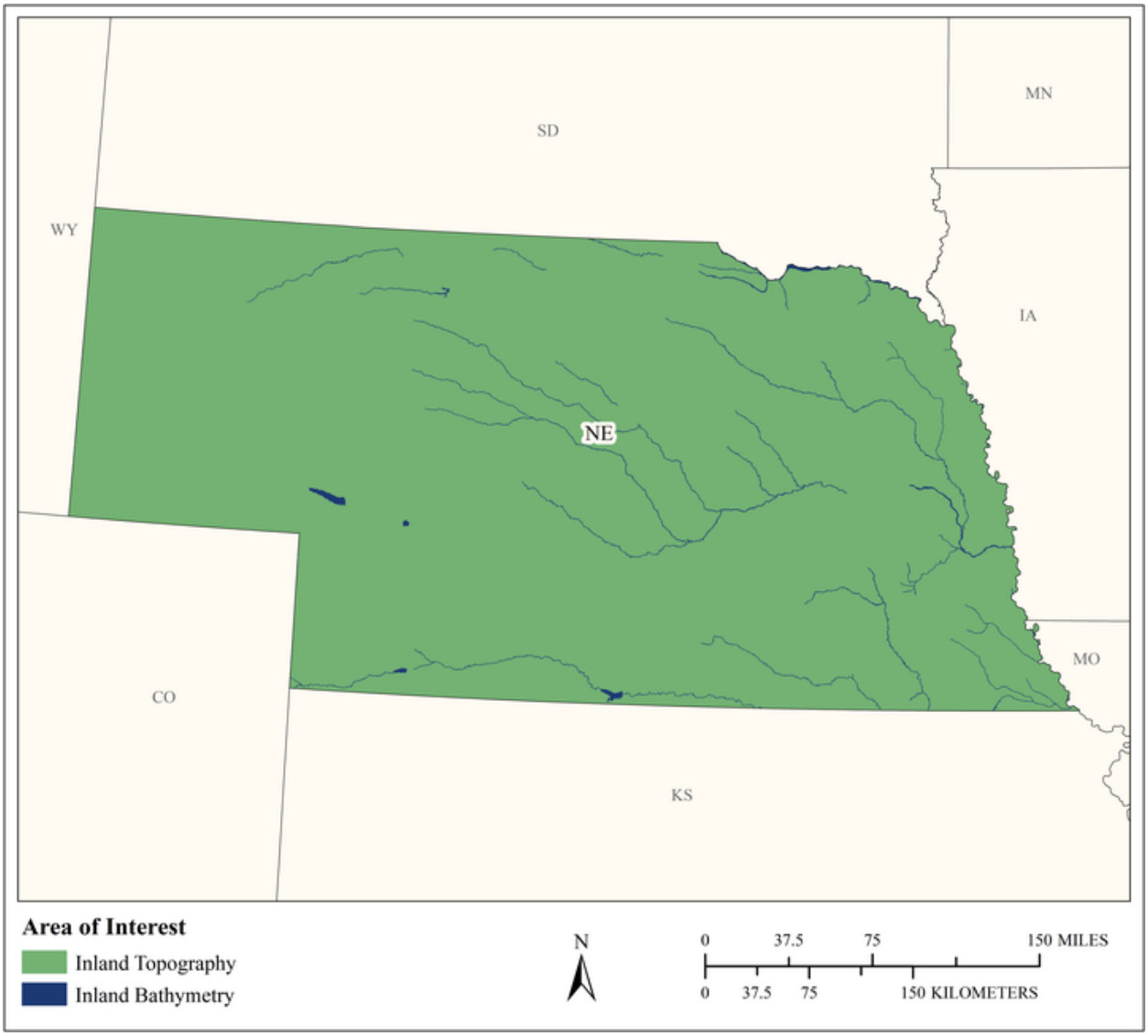
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	None			
Improved customer experience	None			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	None			
Public safety, including life and property	None			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	None											
Cost avoidance	Minor	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Geospatial Data Coordination



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	My agency does not have a specific mission critical activity. I would help agencies with their mission critical activities. Support all state, Natural Resources Districts, local agency data requirements with geospatial data coordination. Inland bathymetry is needed for reservoir calculations and sedimentation analysis.
MCA Title	Geospatial Data Coordination
MCA ID	21900
Organization Type	State or U.S. Territorial government
Organization Name	Nebraska Office of the CIO
Sub-Agency or Division	
Organization Mission	My position is in the Office of the CIO and I am responsible for coordinating GIS activities and resources among state agencies and in cooperation with Federal and local entities
Program Name	As I said- I assist other agencies and do not have any direct mission critical activities
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Tertiary Business Use	BU 01 - Water Supply and Quality

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Oregon trail tracks, historical sites

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B		
Update Frequency	4-5 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	I don't know		
Acceptable Vertical Error	Up to 20 cm	I don't know		
How far onshore needed				
How far down the beach profile needed	To MHW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Highly desirable			Required	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Required	Required		
Classified point cloud	Highly desirable	Required		
Edited/cube XYZ		Highly desirable		
Full waveform	Nice to have	Highly desirable		
Bathymetric Attributed Grid (BAG)		Required		
Breaklines required for standard hydro-flattening	Highly desirable	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Required		
Land use/land cover	Highly desirable	Required		
Wetlands	Highly desirable	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Required		
Bridges/culverts	Highly desirable	Required		
Landmark features	Nice to have	Highly desirable		
Cultural resources	Nice to have	Required		
Coastal and riverine structures	Not required	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We have QL 3 and QL 2 for the state of Nebraska	Rudimentary bathymetric data. Game and Parks does have some but not sure of how it is collected		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	State of Nebraska OCIO	Game and Parks		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Major	Moderate		
Cost avoidance	Major	Moderate		
Increased revenues	Moderate	Moderate		

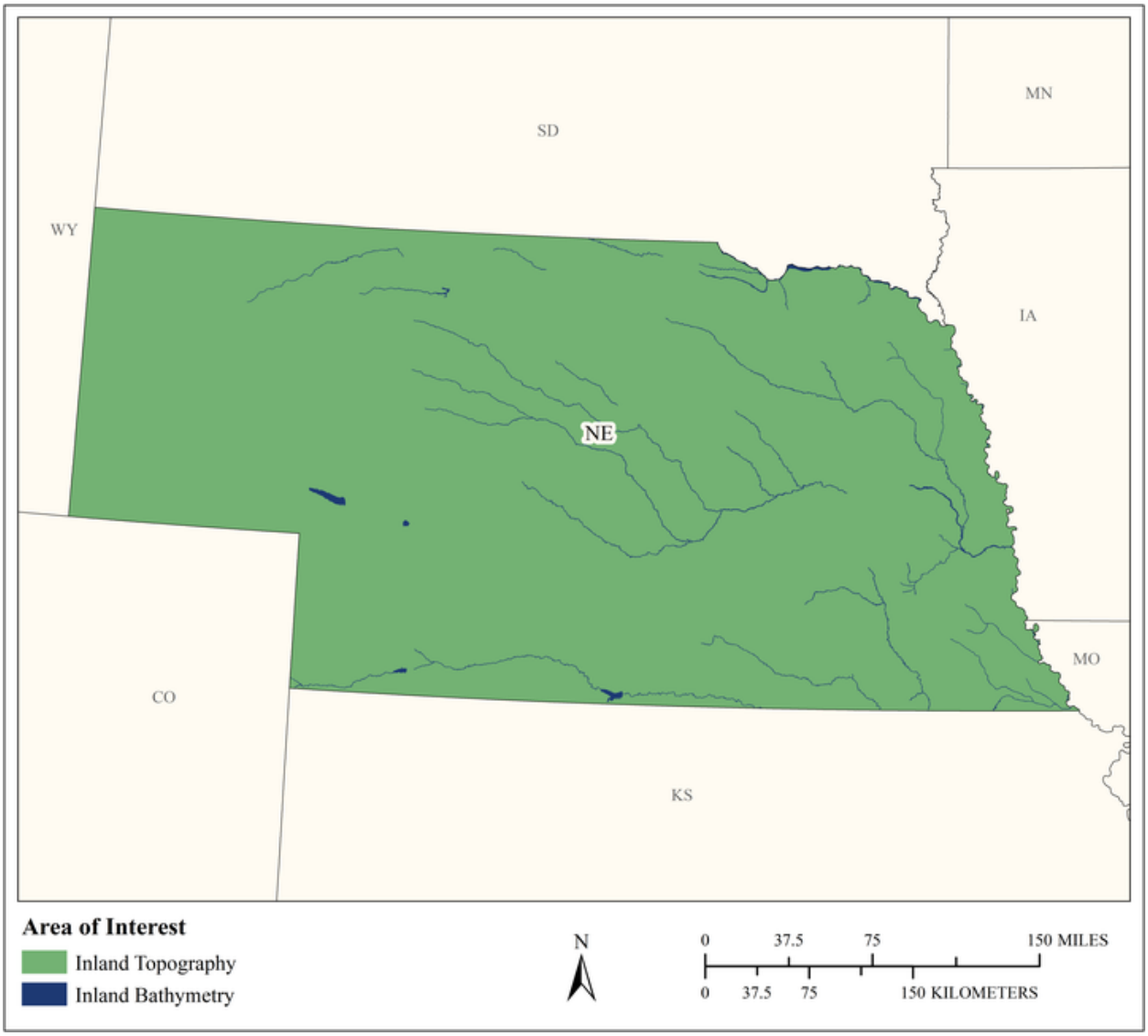
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Mission-driven performance improvements	Major	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate		
Improved response or timeliness	Moderate	Moderate		
Improved customer experience	Moderate	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate		
Environmental	Moderate	Moderate		
Public safety, including life and property	Moderate	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		I don't know	Unable to provide							
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide							
Increased revenues	Minor	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,516,993		Annual dollars saved/ realized	$205,611						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide							
Other customer service benefits	Major	Unable to provide		Moderate	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$5,570,863		Annual dollars saved/ realized	$9,256						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Major			Major								
Public safety, including life and property	Major			Major								
Other												
Other benefits	Major			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Natural Resources Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Natural resources management. Elevation data and color infrared imagery are collected by the district and used for siting new dam locations and managing aquifer recharge sites (monthly). Bathymetry is needed to calculate lake volumes (monthly) and for retiming of water capture back to river. 1 meter DEMs are needed for small areas. Elevation data are also needed for new agricultural irrigation development: We use elevation data as a tool to help identify areas of land that have historically or the potential for new irrigation development. We have rules and regulations that specify the use of lidar data to determine if proposed new irrigation development will be allowed. BU 27 – Recreation would be an additional Business Use.
MCA Title	Natural Resources Management
MCA ID	22236
Organization Type	Regional, County, City, or other local government
Organization Name	Nebraska Natural Resources Districts
Sub-Agency or Division	
Organization Mission	Protecting and conserving natural resources. Natural Resources Districts were created to solve flood control, soil erosion, irrigation run-off, and groundwater quantity and quality issues. Nebraska's NRDs are involved in a wide variety of projects and programs to conserve and protect the state's natural resources. NRDs are charged under state law with 12 areas of responsibility including flood control, groundwater management and many others.
Program Name	Natural resources management
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	BU 01 - Water Supply and Quality
Tertiary Business Use	BU 04 - Forest Resources Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Small dam structures. We also move groundwater rights around on a daily basis and one acre is a commonly used threshold for us. Compliance issues with new irrigation development also have a one acre threshold.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B		
Update Frequency	4-5 years and certain events.	Event driven only – Data need to coincide with a specific event.		
Event type(s)	Flood, new project, new dam	Flood, new project, new dam		
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter		
Acceptable Vertical Error	Up to 30 cm	Up to 20 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial	Partial		
Cross section/transect requirement	Up to 30 cm.	Up to 30 cm		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Required			Required	
Entire AOI under same environmental conditions	Required	Required			Required	
Other	Nice to have					
Other description	Crop heights (leaf on)					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required		
DTM	Highly desirable	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Required	Required		
Classified point cloud	Required	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Not required		
Bathymetric Attributed Grid (BAG)		Nice to have		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Nice to have		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required	Required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Required	Required		
Wetlands	Required	Required		
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	DEM, LiDAR, Airborne Electromagnetic (AEM) Collected via helicopter: 300-400m flight lines, builds hydrogeologic framework, identifies geology to 500ft depth, similar to ground penetrating radar	LiDAR		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			

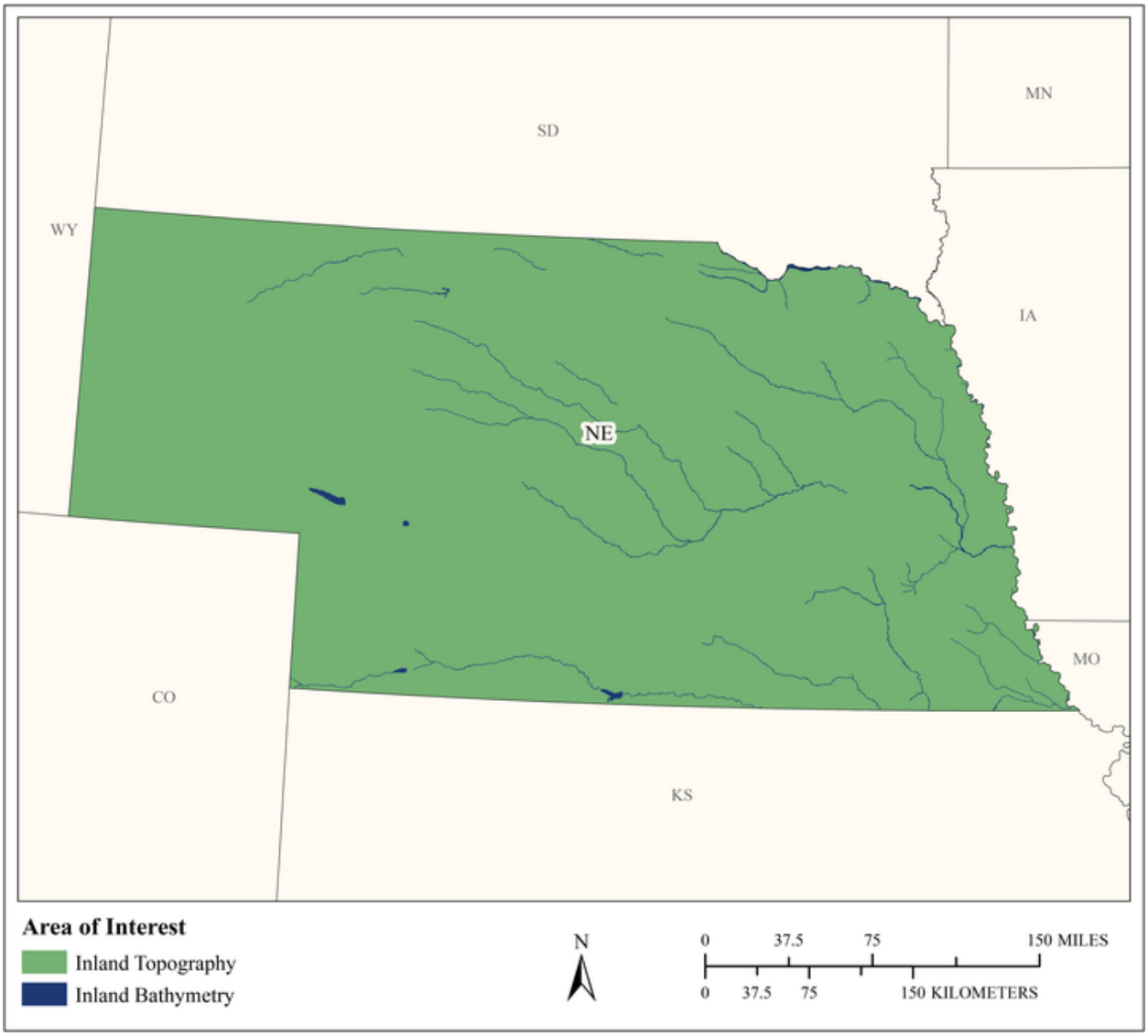
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
State repositories used	State of Nebraska DNR			
Other	Yes	Yes		
Other description	NRCS	NRCS		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Major		
Increased revenues	Major	Major		
Mission-driven performance improvements	Major	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		
Improved response or timeliness	Major	Major		
Improved customer experience	Major	Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major		
Environmental	Major	Major		
Public safety, including life and property	Major	Major		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Major	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,516,993		Annual dollars saved/ realized	$205,611						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$5,570,863		Annual dollars saved/ realized	$9,256						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Major			Major								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps	Yes	Yes		
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes	Yes		
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Stewardship and Management of the State's Fish, Wildlife, Park, and Outdoor Recreation Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Area split by varying quality level or update frequency	One or more states, territories, or counties		
Sub Area Requirements	Nebraska			

MCA Description	Response
Mission Critical Activity	Through planning and management practices, provide stewardship over land and water to keep habitat healthy and viable. Also through various hunting and fishing regulations, maintain a viable healthy population of game and fish species for the future generations to enjoy. In addition park facilities are also developed to provide further recreation for public lands and waters in the state of Nebraska. Bathymetry is needed for volume calculations of lakes and reservoirs for sedimentation and rotenone calculations. Topography is needed for buildings, vegetation, and parks.
MCA Title	Stewardship and Management of the State's Fish, Wildlife, Park, and Outdoor Recreation Resources
MCA ID	22383
Organization Type	State or U.S. Territorial government
Organization Name	Nebraska Game and Parks Commission
Sub-Agency or Division	
Organization Mission	The mission of the Nebraska Game and Parks Commission is stewardship of the state's fish, wildlife, park, and outdoor recreation resources in the best long-term interests of the people and those resources.
Program Name	Nebraska Game and Parks Commission
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	BU 09 - Fisheries Management and Aquaculture
Tertiary Business Use	BU 27 - Recreation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	By Property Area
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	It would definitely be worth capturing park facilities we have at our various parks. This may include boat ramps, docks, restrooms, cabins, etc. Underwater identification of bodies.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B		
Update Frequency	(a) 2-3 years (b) Annually	2-3 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI	In the eastern part of Nebraska we may build new reservoirs or add additional park facilities to meet the demands of a higher population. Annual in eastern part of the state, 2-3 years elsewhere. Dividing line is Knox to Nuckolls counties (N to S)			
Acceptable Horizontal Error	Up to 1 meter	I don't know		
Acceptable Vertical Error	Up to 1 meter	I don't know		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Highly desirable

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable		
DTM	Highly desirable	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Highly desirable	Highly desirable		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Highly desirable		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Nice to have		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Highly desirable		
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Highly desirable		
Cultural resources	Nice to have	Highly desirable		
Coastal and riverine structures	Nice to have	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	The use of aerial and satellite imagery is being used with terrain. We have also used older models to know habitat types, but this is old and out of date.	Some old data of unknown origins and quality		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	State of Nebraska OCIO			
Other	Yes	Yes		
Other description	ESRI	ESRI		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know	I don't know		

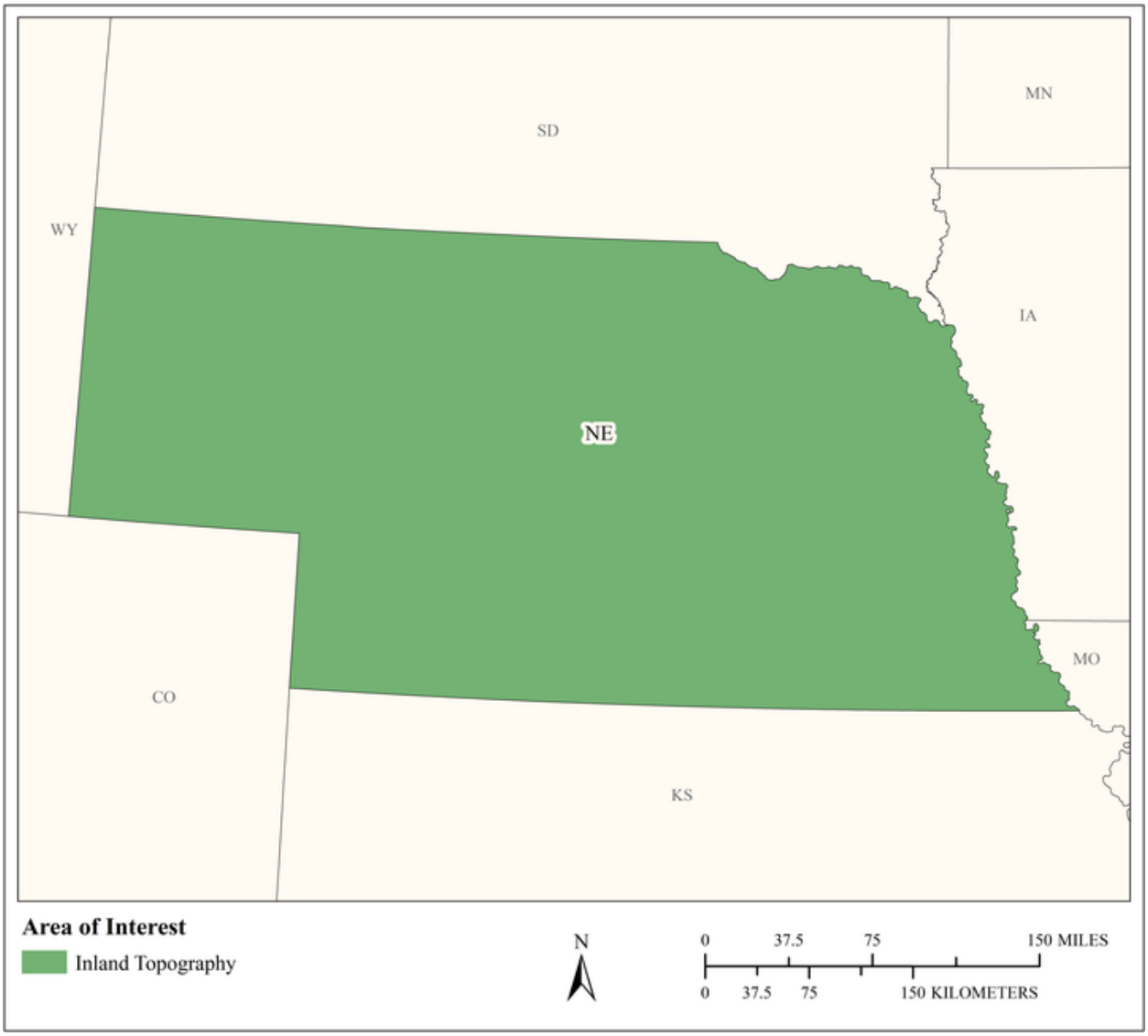
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost savings/cost reduction	I don't know	I don't know		
Cost avoidance	I don't know	I don't know		
Increased revenues	I don't know	I don't know		
Mission-driven performance improvements	I don't know	I don't know		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor		
Improved response or timeliness	I don't know	I don't know		
Improved customer experience	Moderate	I don't know		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	I don't know		
Environmental	I don't know	I don't know		
Public safety, including life and property	I don't know	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction	I don't know	Unable to provide		Moderate	Unable to provide							
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide							
Increased revenues	Minor	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	I don't know	Unable to provide		Moderate	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$18,426		Annual dollars saved/ realized	$147,667						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	I don't know	Unable to provide		I don't know	Unable to provide							
Improved customer experience	Moderate	Unable to provide		I don't know	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$53,219		Annual dollars saved/ realized	$89,256						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know								
Environmental	I don't know			I don't know								
Public safety, including life and property	Moderate			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes	Yes		
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Agriculture and Precision Farming



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Farm pond design. Irrigation system design. Detailed site analysis to support precision farming. Analysis of farm sedimentation and runoff. Calibration of fertilizer application, fertilizer management, and irrigation planning. Optimized terraforming.
MCA Title	Agriculture and Precision Farming
MCA ID	60272
Organization Type	State or U.S. Territorial government
Organization Name	State of Nebraska
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 08 - Agriculture and Precision Farming
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	State of Nebraska OCIO			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

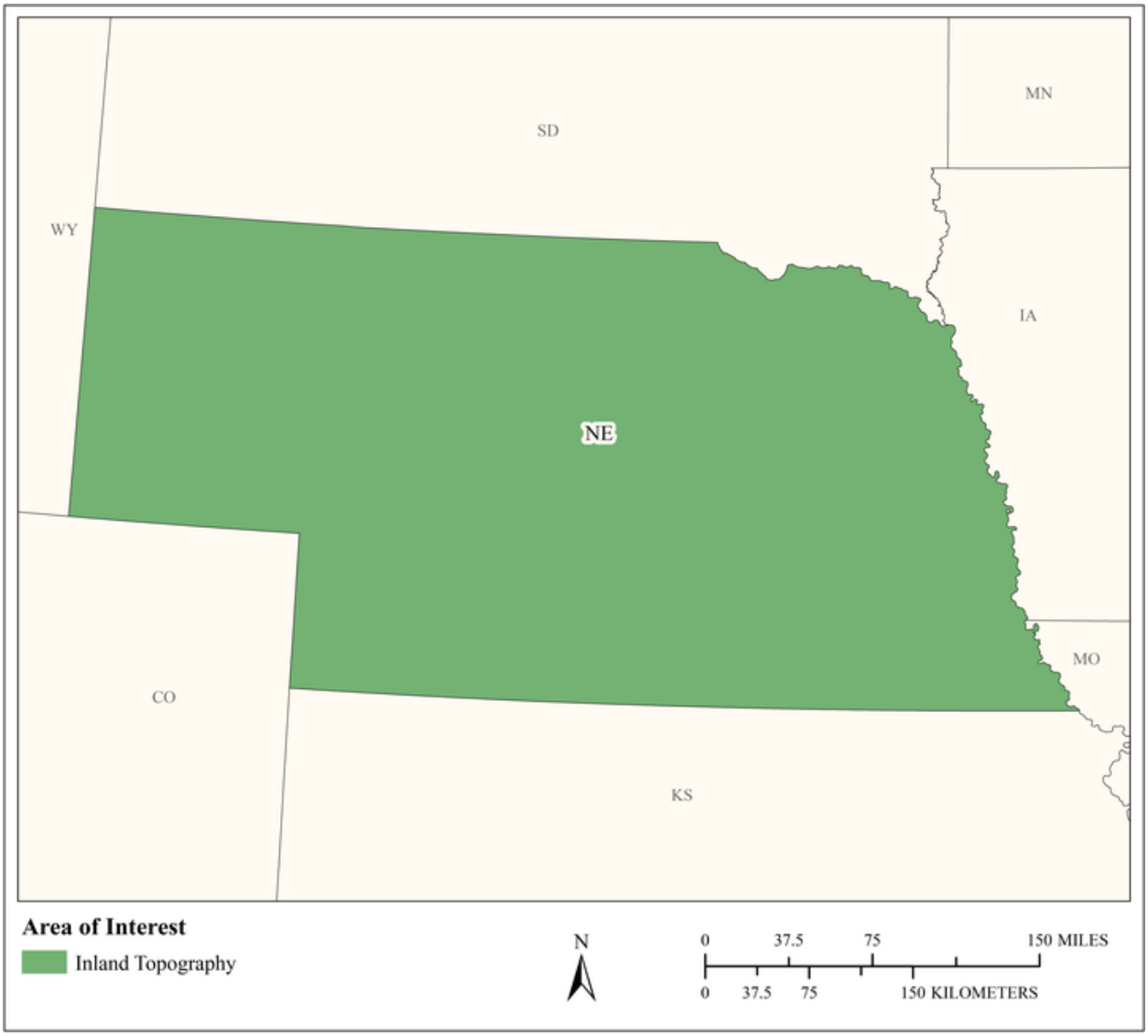
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$89,557									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$70,998									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Minor											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Renewable Energy Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Alternate energy development – solar, tidal, wind, wave, and ocean current. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Low head power potential for hydropower.
MCA Title	Renewable Energy Resources
MCA ID	60273
Organization Type	State or U.S. Territorial government
Organization Name	State of Nebraska
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Not required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	State of Nebraska OCIO			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Minor			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor			

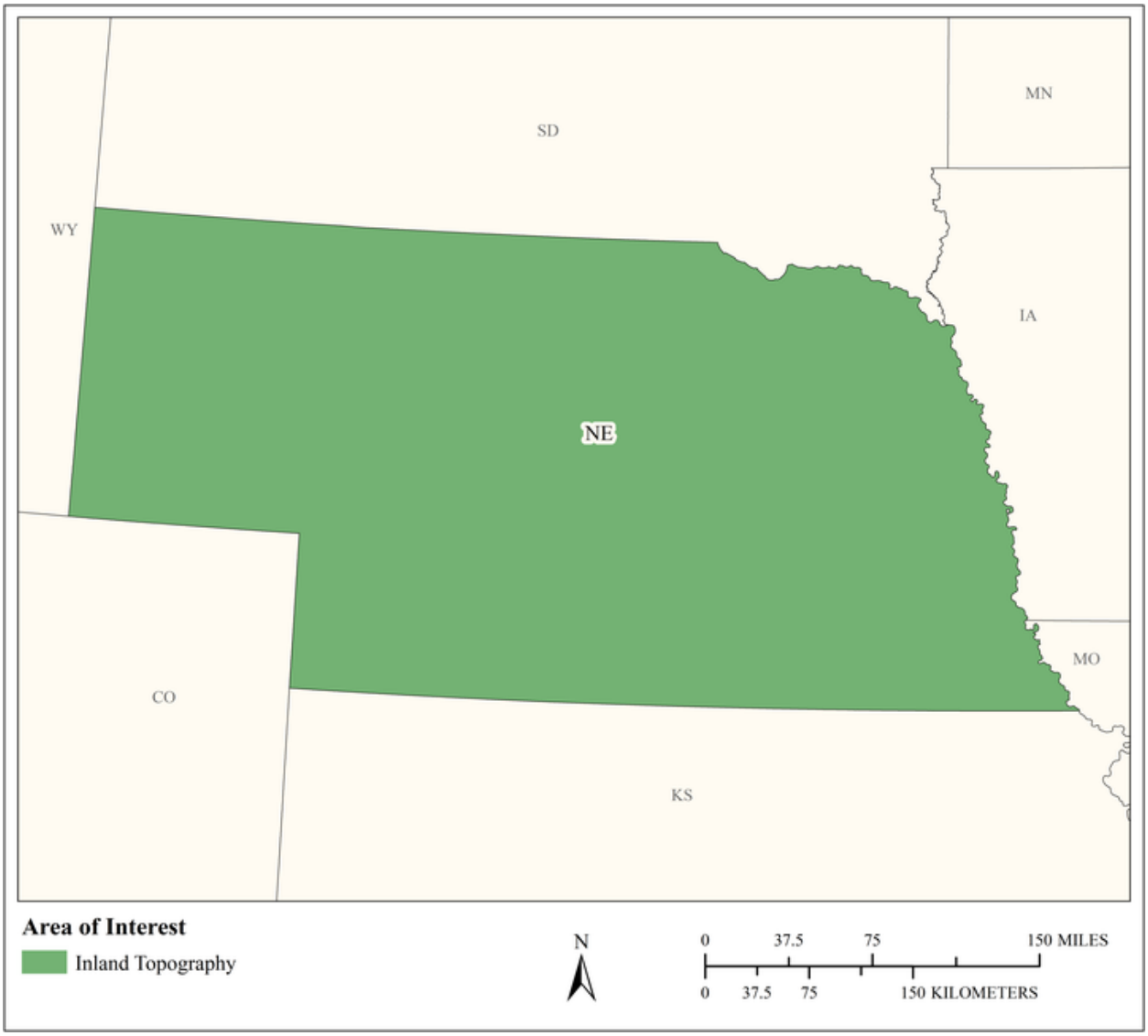
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	None											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Cultural Resources Preservation and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Discovery and analysis of underwater archaeological and historical cultural sites. Site protection and preservation planning. Discovery and analysis of Native American and other historical cultural sites and subsistence activities.
MCA Title	Cultural Resources Preservation and Management
MCA ID	60274
Organization Type	State or U.S. Territorial government
Organization Name	State of Nebraska
Sub-Agency or Division	History Nebraska
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Nice to have					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have					
DEM for entire AOI needs to be seamless	Nice to have					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	State of Nebraska OCIO			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Moderate			
Cost avoidance	Minor			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			

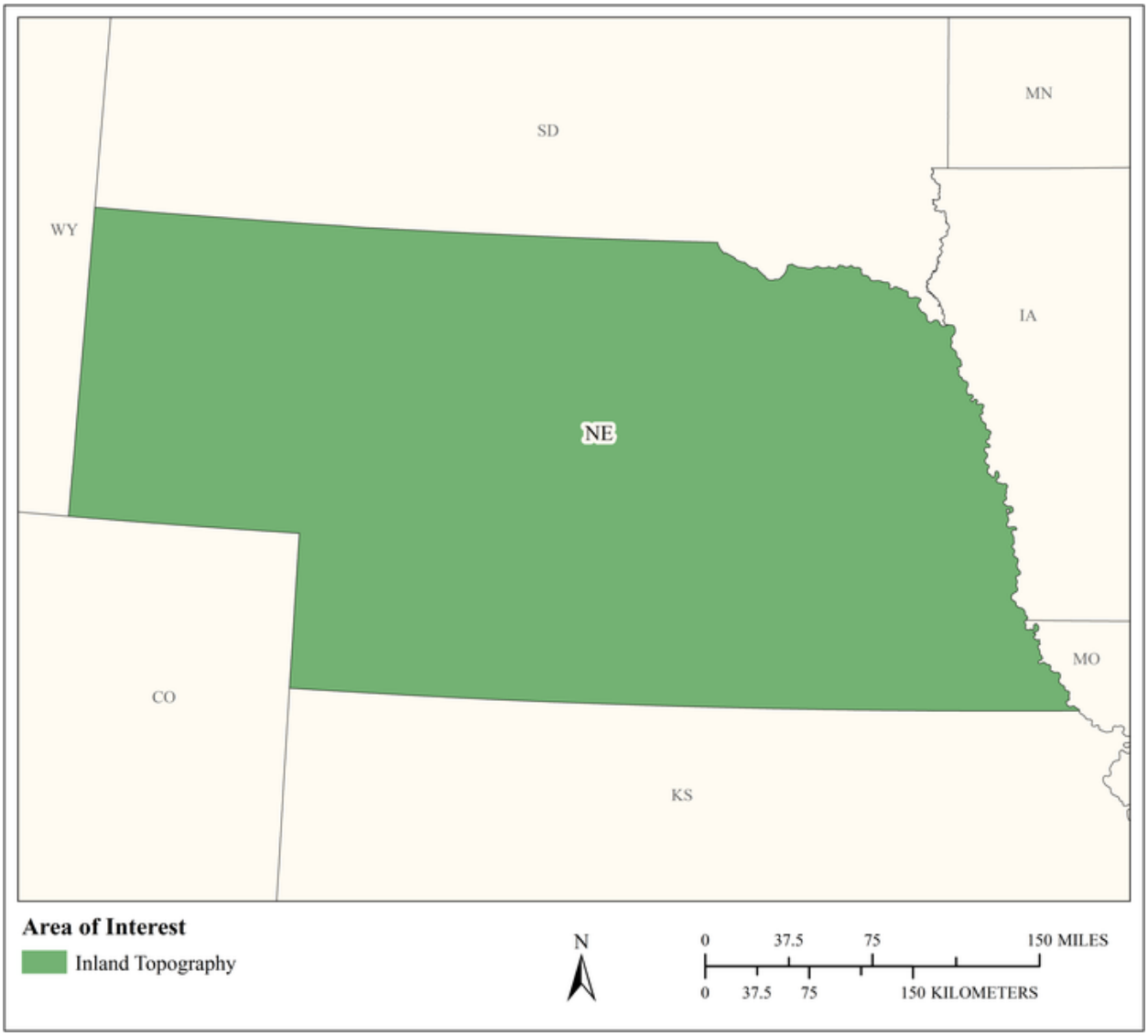
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Cost savings/cost reduction	Minor	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Moderate	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$14,178									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$12,396									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	Minor											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Flood Risk Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Dam Breach Analysis and Inundation Mapping, Floodplain Mapping, Flood Mitigation, Stream Network Digitization
MCA Title	Flood Risk Management
MCA ID	21772
Organization Type	State or U.S. Territorial government
Organization Name	Nebraska Department of Natural Resources
Sub-Agency or Division	
Organization Mission	The Nebraska Department of Natural Resources is dedicated to the sustainable use and proper management of the state's natural resources.
Program Name	NeDNR Engineering and Technical Services
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Dams, Roads, Levees, Berms, Stream Channels

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 30 cm			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Nice to have			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Required			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Nice to have			
Landmark features	Not required			
Cultural resources	Not required			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL2 LAS and Derived DEMs. Sandhills and Niobrara areas flown in 2017, South Platte flown in 2016. NIROC Eastern Nebraska Urban Areas 2016, NRCS 2013, NRCS 2012, NRCS 2011k USACE Missouri River, Elkhorn and Platte 2011, NRCS East 2010, ScottsBluff 2009, and South Central Nebraska 2009.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				

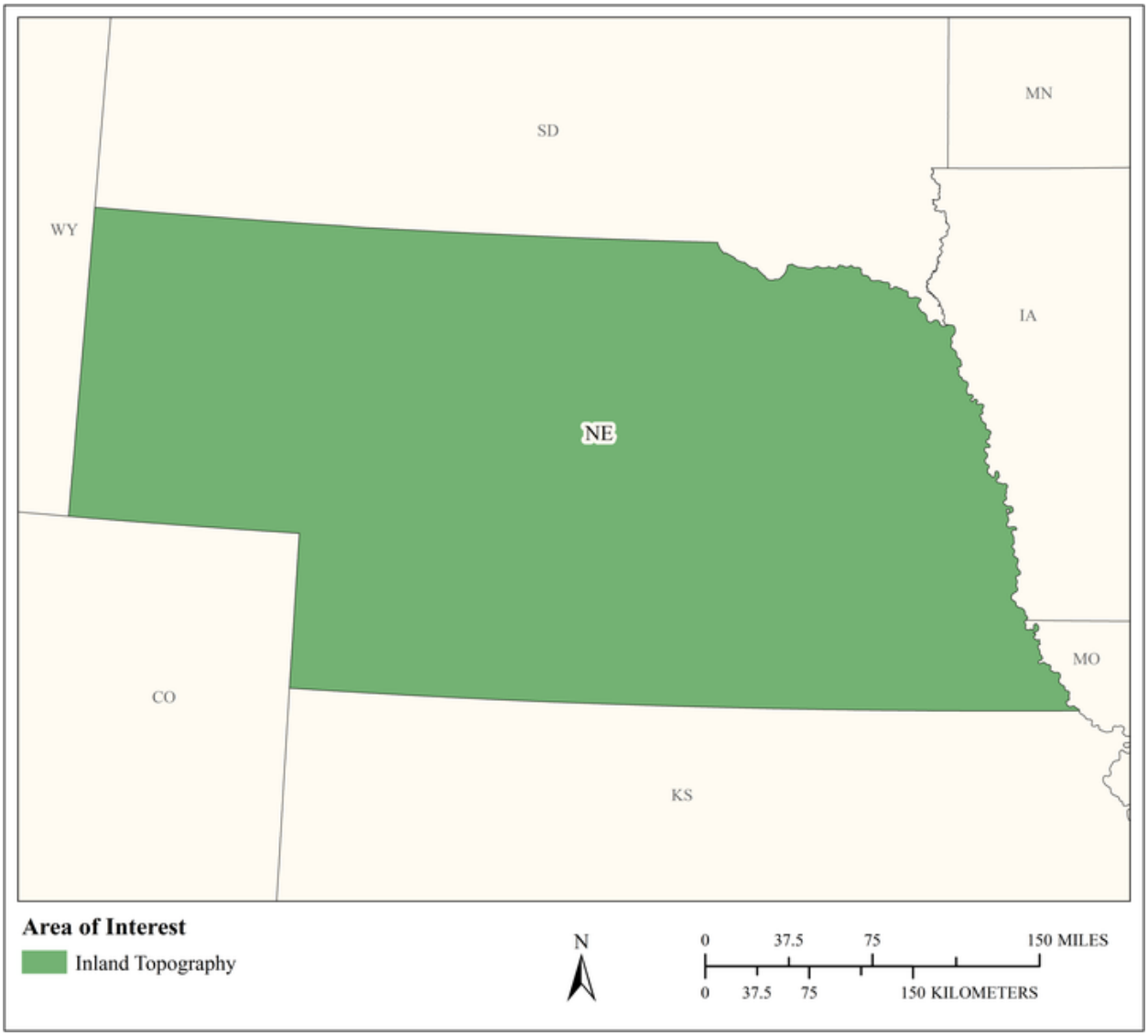
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State Repositories	Yes			
State repositories used	Nebraska Office of the Chief Information Officer (OCIO), Natural Resource Commission (NRCS), Nebraska Department of Natural Resources (NeDNR).			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	I don't know			
Cost avoidance	I don't know			
Increased revenues	I don't know			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$4,824									
Time savings description	See data in the office versus in the field. Currently mosaic different datasets of different quality level. Better end product for protecting lives and property. Less use of Survey Crew.											
Cost savings/cost reduction	Minor	Unable to provide										
Cost avoidance	Major	Unable to provide										
Cost avoidance description	Cooperating Technical Partners with FEMA, Educate the public. Included in product deliverables already.											
Increased revenues	Minor	Unable to provide										
Increased revenues description	Public Entity.											
Mission-driven performance improvements	Major	Unable to provide										
Mission-driven performance improvements description	Provide accurate data to the public. Could improve with bathymetric data.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Value added to products or services description	Improved Flood Hazard and Dam Inundation Mapping.											
Improved response or timeliness	Major	Unable to provide										
Improved response or timeliness description	Provide data to public more effectively. Currently using 10 year old DEMs in some cases. Emergency Inundation Mapping, Flood Mapping.											
Improved customer experience	Major	Unable to provide										
Improved customer experience description	New apps provide data more efficiently to public. Better accuracy provides more confidence for consumer.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	Major											
Public safety, including life and property description	One of the fundamental goals of our agency as a FEMA Technical partner.											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Wildfire Management, Planning, and Response



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of forest fuel and fire susceptibility. Fire behavior modeling to support wildfire suppression activities. Wildland/urban interface building identification. Post fire analysis to determine landslide prone areas.
MCA Title	Wildfire Management, Planning, and Response
MCA ID	60275
Organization Type	State or U.S. Territorial government
Organization Name	State of Nebraska
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 17 - Wildfire Management, Planning, and Response
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	State of Nebraska OCIO			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

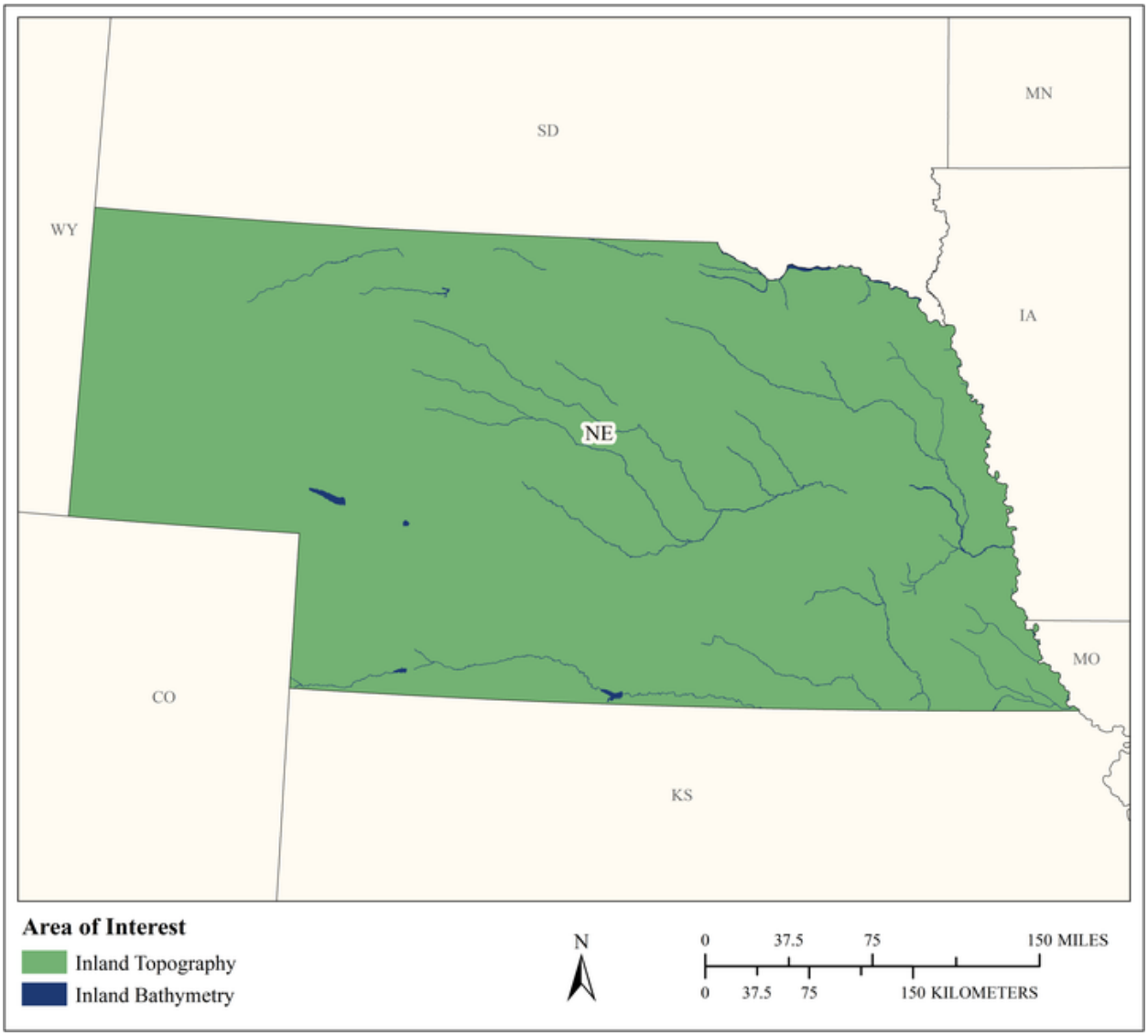
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$415,603									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Homeland Security, Law Enforcement, Disaster Response, and Emergency Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Infrastructure and border protection. Coastal search and rescue. Population dynamics. Emergency fuel supply and movement. Line of sight analysis in urban areas. Disaster response. Flood risk analysis resulting from acts of terrorism.
MCA Title	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
MCA ID	60276
Organization Type	State or U.S. Territorial government
Organization Name	State of Nebraska
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Highly desirable		
Classified point cloud	Required	Required		
Edited/cube XYZ		Highly desirable		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Required		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	State of Nebraska OCIO			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Moderate		
Increased revenues	None	None		
Mission-driven performance improvements	Major	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate		

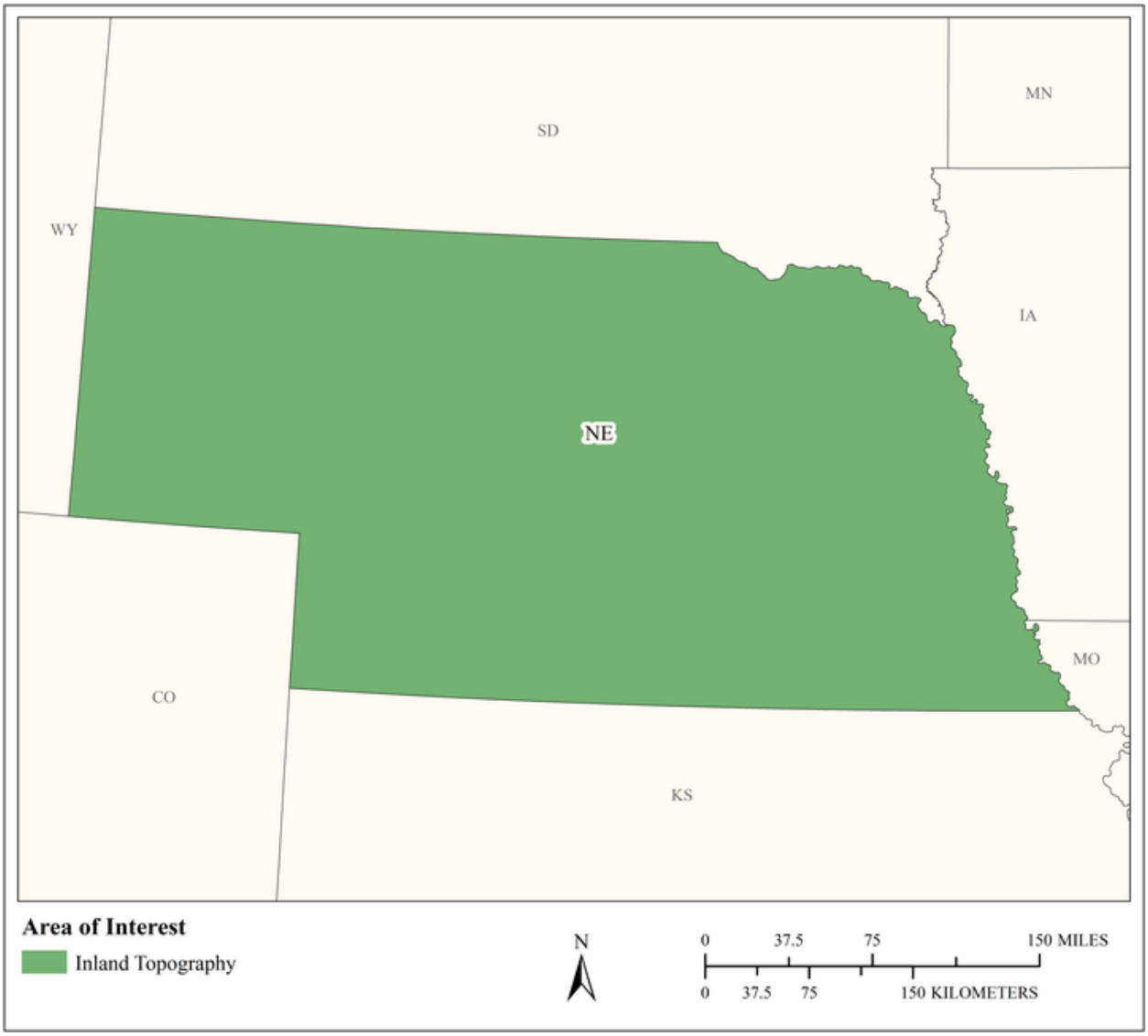
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major		
Improved customer experience	Major	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate		
Environmental	Minor	Moderate		
Public safety, including life and property	Major	Major		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,281,909		Annual dollars saved/ realized	$642,643						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$40,331		Annual dollars saved/ realized	$41,001						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Moderate			Moderate								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Land Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Road and railroad route selection and maintenance. Slope analysis for autonomous cars. GPS navigation visualization.
MCA Title	Land Navigation and Safety
MCA ID	60277
Organization Type	State or U.S. Territorial government
Organization Name	State of Nebraska
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 19 - Land Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	State of Nebraska OCIO			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

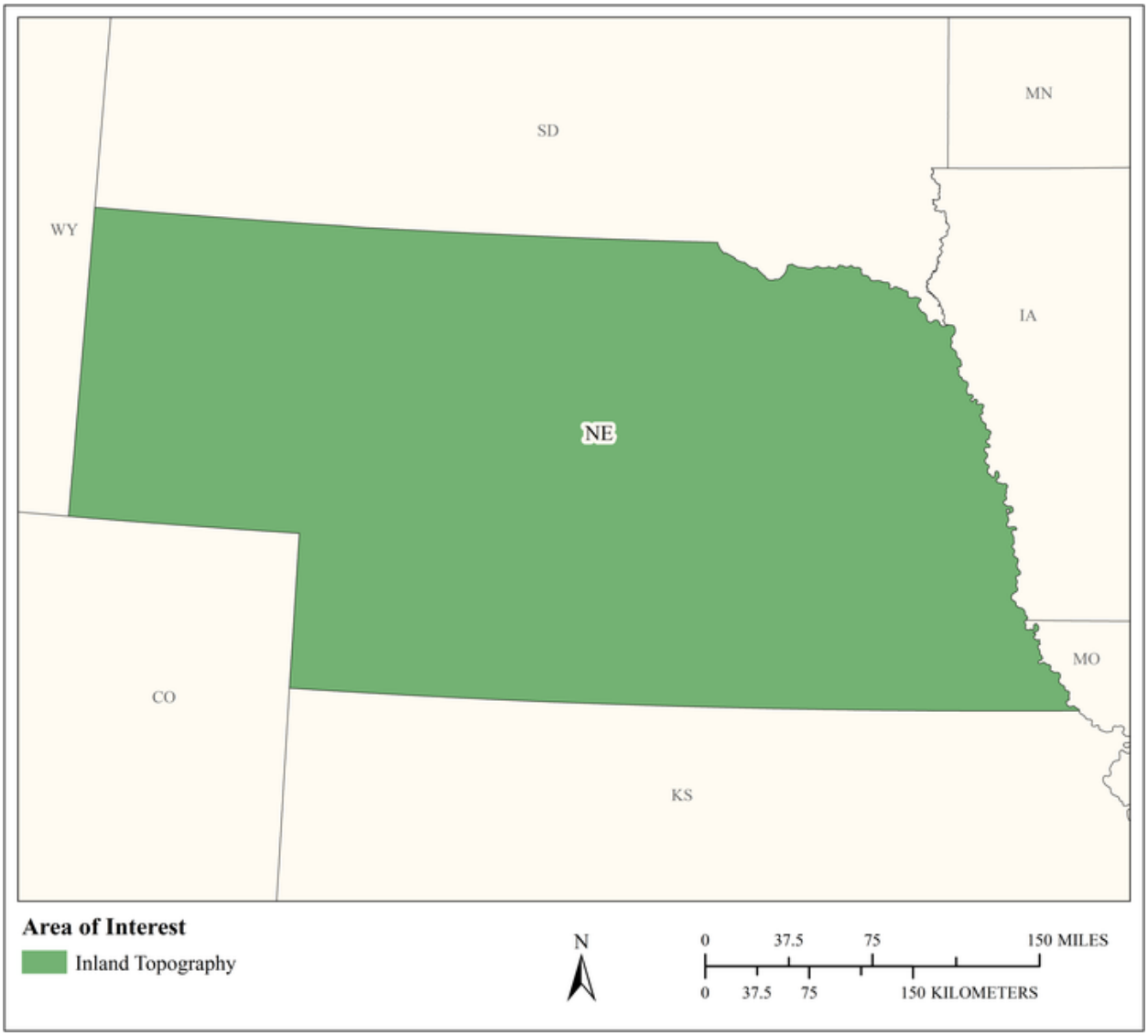
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Moderate			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Moderate	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,002,052									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$80,920									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Urban and Regional Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Land development and zoning. Municipal mapping of building footprints and elevations. Port resilience planning. Parks and transportation planning. Virtual city creation. Urban ecology planning.
MCA Title	Urban and Regional Planning
MCA ID	60278
Organization Type	State or U.S. Territorial government
Organization Name	State of Nebraska
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Required			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	State of Nebraska OCIO, Local Government Office			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			

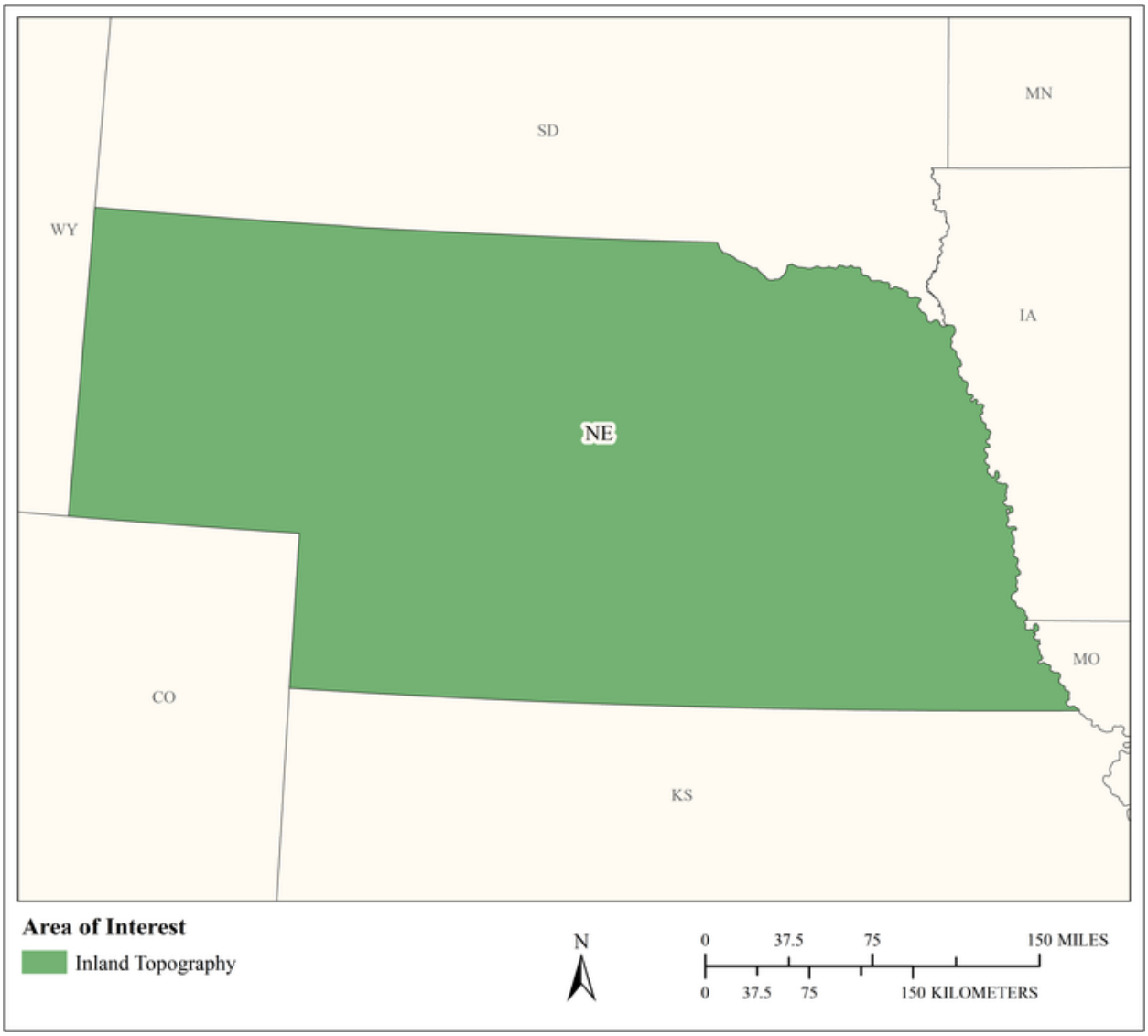
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$20,812,527									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$2,402,815									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Health and Human Services



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Health emergency response. Habitat modeling and disease prevention. Defining boundaries for health advisories for swimming and fishing. Marine-based bioproducts and pharmaceuticals. Public health and safety. Prevention of waterborne diseases.
MCA Title	Health and Human Services
MCA ID	60279
Organization Type	State or U.S. Territorial government
Organization Name	State of Nebraska
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 24 - Health and Human Services
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Not required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required			
DTM	Required			
DEM	Highly desirable			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Nice to have			
Wetlands	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Not required			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	State of Nebraska OCIO			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			

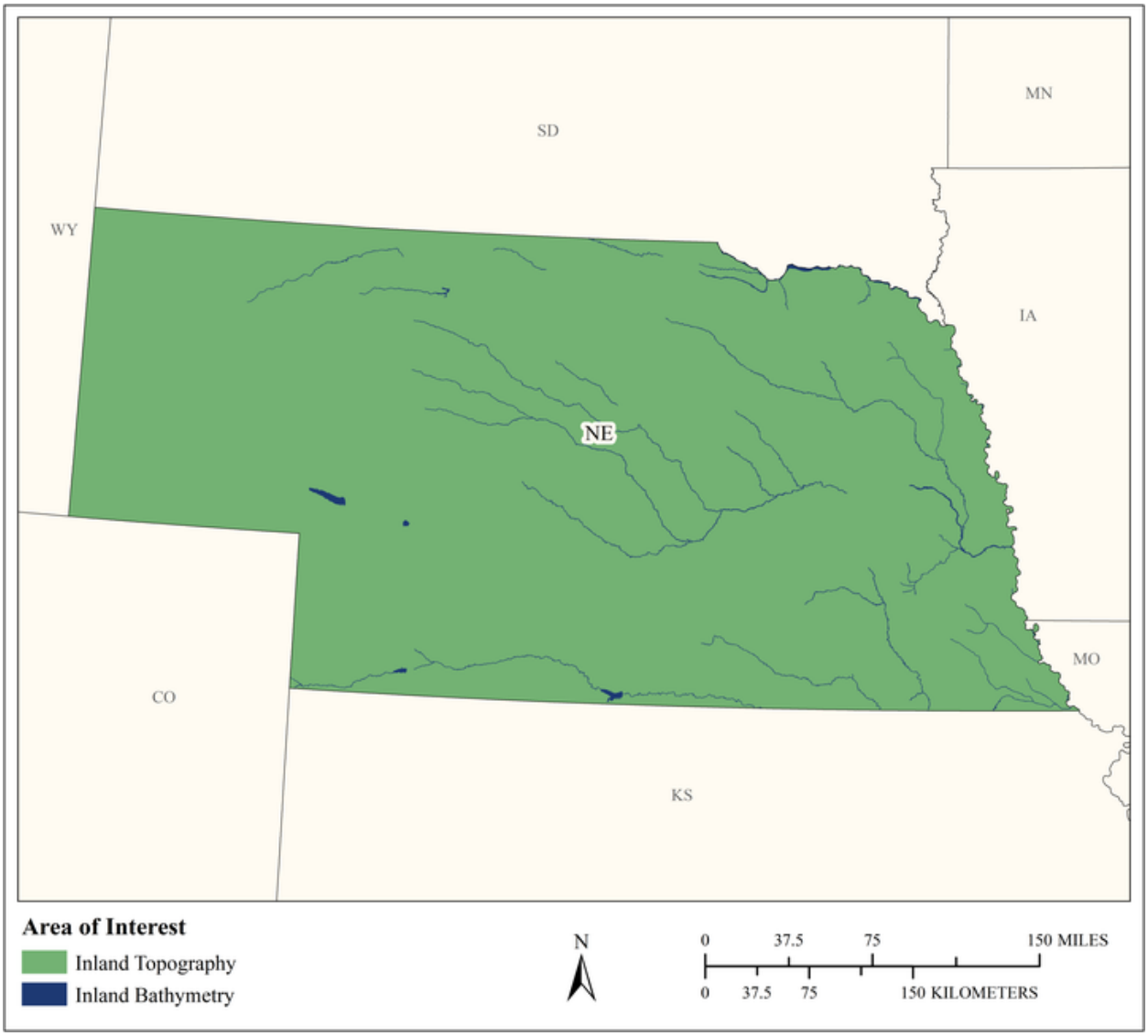
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Minor			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Moderate			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$27,600									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide										
Improved response or timeliness	Minor	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$3									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Moderate											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Recreation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Planning and development of recreational facilities such as rafting, boating, swimming, diving, and fishing areas; ski slopes; and golf courses. Location- based products and services such as maps and guides. Tourism. Trail and vista site planning. Orienteering.
MCA Title	Recreation
MCA ID	60280
Organization Type	State or U.S. Territorial government
Organization Name	State of Nebraska
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 27 - Recreation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required			Not required	
Entire AOI under same environmental conditions	Required	Not required			Not required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have			Nice to have	
DEM for entire AOI needs to be seamless	Required	Nice to have			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required		
DTM	Nice to have	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Highly desirable	Highly desirable		
Edited/cube XYZ		Highly desirable		
Full waveform	Not required	Nice to have		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Nice to have		
Ground control/ground truthing	Nice to have	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Highly desirable		
Land use/land cover	Nice to have	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Not required	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	State of Nebraska OCIO			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor		
Cost savings/cost reduction	Moderate	Minor		
Cost avoidance	Major	Minor		
Increased revenues	None	Minor		
Mission-driven performance improvements	Major	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor		

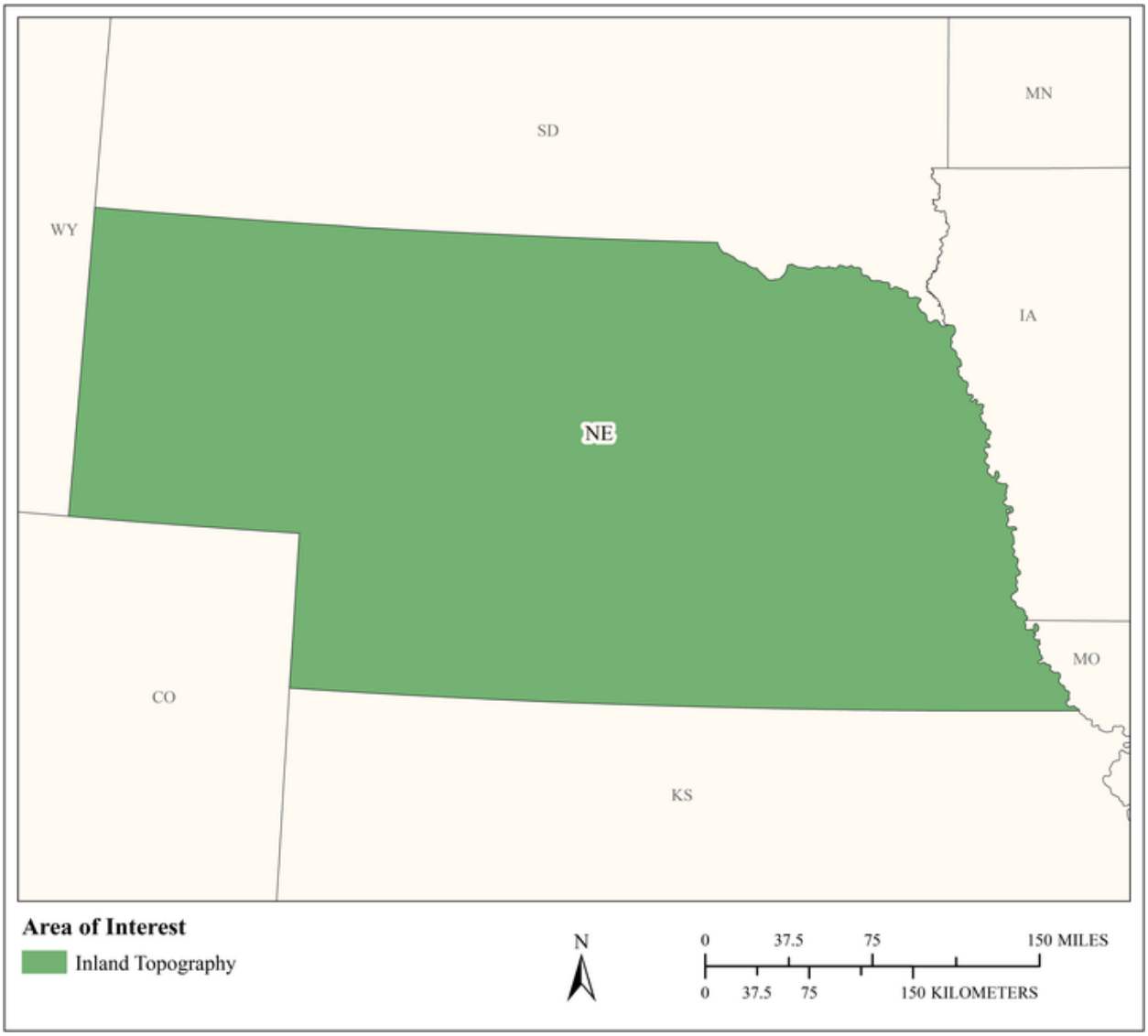
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Minor		
Improved customer experience	Moderate	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor		
Environmental	Major	Minor		
Public safety, including life and property	Major	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	None			Moderate	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$17,749		Annual dollars saved/ realized	$10,689						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Minor	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major								
Environmental	Moderate			Major								
Public safety, including life and property	Moderate			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Telecommunications



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Telecommunication tower site selection. Design of radio and radar systems. Interference analysis. Path profiles. Undersea telecommunication route selection and deployment.
MCA Title	Telecommunications
MCA ID	60281
Organization Type	State or U.S. Territorial government
Organization Name	State of Nebraska
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 28 - Telecommunications
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Highly desirable			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	State of Nebraska OCIO			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

Nevada

Current status of elevation data for Nevada

The State of Nevada is currently underserved with respect to lidar data; it is the state with the least amount of coverage at the present time although with recently initiated projects, Nevada is at about 31% coverage. Lack of coverage is due to two main factors: roughly 86% of the land is owned and managed by the federal government, and; the population is largely concentrated in two urban areas—Reno/Carson and Las Vegas. Nevada has made preliminary efforts to plan for expanded lidar, but the state lacks an agency that can provide seed funding for additional collections. The Nevada Bureau of Mines and Geology (NBMG) has taken on a leadership role in educating major stakeholders and the general public on the benefits of lidar. NBMG has also completed a collaborative project for the Reno/Carson area and leveraged one-time seed funding from the University of Nevada, Reno, for this project. However, NBMG does not have discretionary funds for collecting lidar, even for areas of high priority geologic mapping. A mechanism to tie lidar acquisition into routine federal agency actions (such as firefighting, flood mapping, mineral and energy resource assessments, and threatened and endangered species habitat protection) would provide an ideal framework for expanded lidar collection.

The Figure 1 shows current lidar availability and collections in progress for Nevada. The remainder of the state is currently served by 10- and 30-meter Digital Elevation Models (DEMs) which date back several decades.

Strategic planning for lidar in Nevada started some years ago with a grant from the Federal Geographic Data Committee's Cooperative Agreements Program and its effort to jump start strategic planning efforts for states' framework datasets. Through a series of statewide meetings and surveys, ideas for bringing together requirements and contracting opportunities were gathered. The report outlines a high-level need and strategy for building a lidar framework for Nevada. However, without continued funding or a lead Office of Geospatial Information, the effort has languished. A new effort underway at the National States Geographic Information Councils (NSGIC) may provide a new mechanism for state planning and can incorporate new 3D Nation requirements collection. Nevada has been a participant state for the NSGIC-led state planning program from 2019 through 2021.

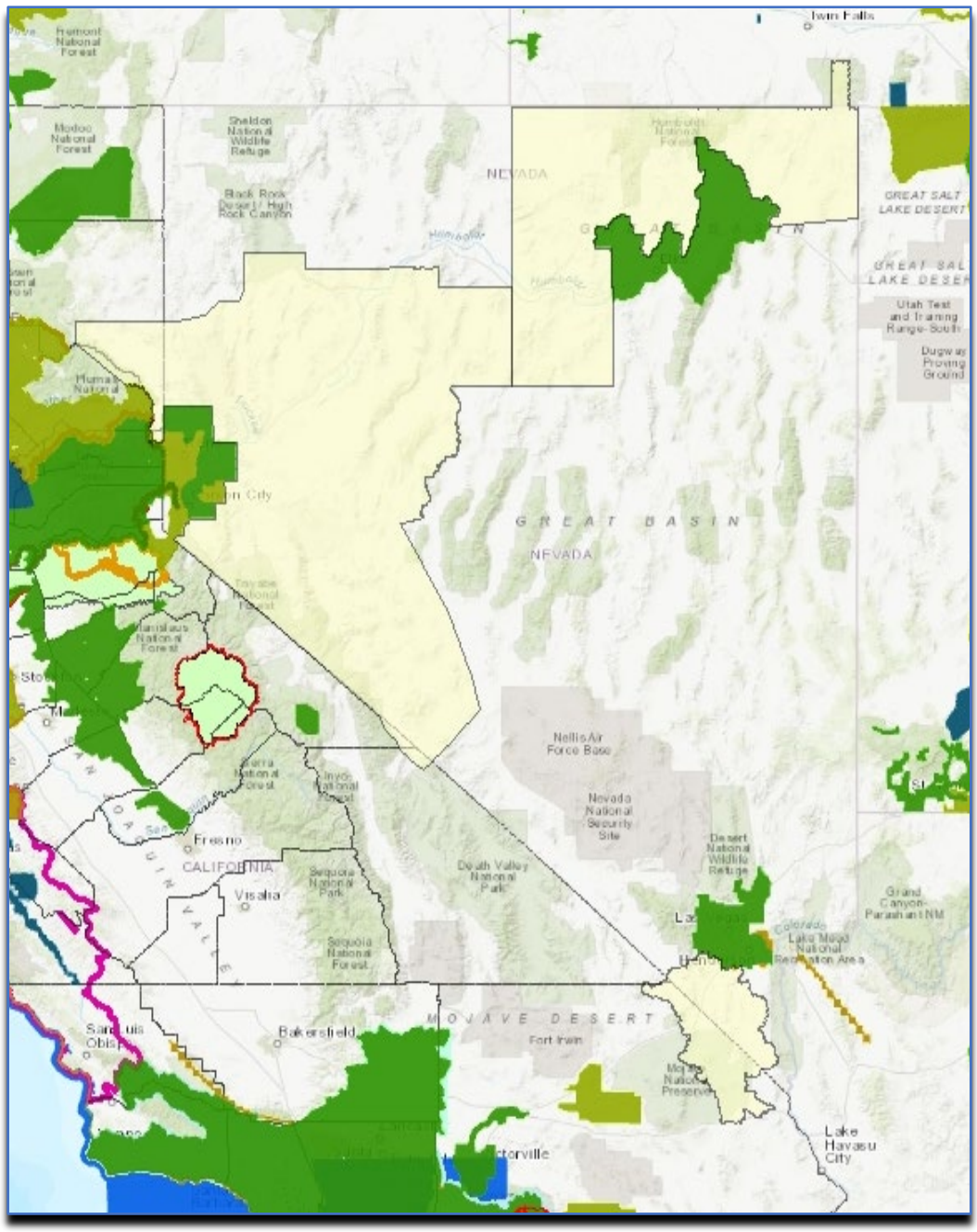


Figure 1. Status of 3DEP lidar data as of November 2020 for Nevada. Green: data available; Yellow, currently in collection

Importance of elevation data to Nevada

Elevation data are critical to the state for myriad programs that speak directly to the economic vitality and security of the state, as well as public safety concerns:

- Although Nevada is the most arid state, it is prone to both floods and landslides due to significant topographic relief. Furthermore, climate change has induced significant shifts in both rangeland and forests, leading to rapidly increasing and more intense wildland fires, as well as subsequent flooding and landslides. More precise flood plain and debris flow mapping is essential to map

potential flood extent for highly populated areas within and around the urban centers, in areas affected by recent wildfires in the rural landscapes, and for transportation and energy corridors.

- Thousands of Quaternary faults pose significant seismic hazards throughout the state. Nevada is the third most seismically active state, after Alaska and California, and many of the active faults pose significant risks to the urban areas (Las Vegas and Reno-Carson City) and critical infrastructure (e.g. transportation and energy corridors) statewide. High-resolution topographic data are needed to constrain the age, slip rates, and overall risks posed by the many Quaternary faults and identify which faults pose the greatest hazards to populated areas and infrastructure.
- Nevada is well endowed in mineral and geothermal resources. In any given year, Nevada typically leads the nation in the production of gold and more broadly non-fuel mineral production. It also has more geothermal resources than any other state and is second in the nation in geothermal energy production after California. Fault geometries and patterns of faulting are also critical for locating both geothermal and mineral resources and can be greatly elucidated with lidar data.
- Tahoe Regional Planning Agency leads the collaborative of more than 50 public and private partners working to restore and protect Lake Tahoe. The challenges that Tahoe faces today are similar to those faced by other communities across the west, and the solutions and approaches often serve as a model for others. Limited resources require a greater focus on project prioritization and identification of high return on investment projects in all areas of work. Lidar enables more robust evaluation of the effectiveness of forest health treatments, which in turn aids project design and promoting landscapes that are healthier and more resilient to fire and beetle outbreak. In populated areas, high-resolution spatial data enable design, prioritization, and implementation of Best Management Practices that promote lake health.
- Southern Nevada has seen rapid growth in recent years, creating challenges for many agencies to stay ahead in the planning and development of large-scale transportation and utility projects. Lidar data need to be available to support and implement critical studies for public, federal and local infrastructure initiatives.
- Lidar data are critical to routine federal and state actions, including firefighting, flood mapping, and sage grouse habitat improvement. This is becoming particularly important given the rapid pace of forest change due to fires, woodland thinning, and increased forest fuels reductions.

Lidar data are used across the government spectrum, across the commercial spectrum, and within academia to understand issues critical to the health and protection of the citizens of Nevada. Lidar used in conjunction with other remotely sensed data such as airborne and satellite imagery allows for enhanced and higher fidelity 3-dimensional mapping (for example, tree height and canopy type) and interpretation of the landscape and natural environment.

High-level summary of elevation data requirements

Nevada, at a minimum, requires Quality Level 2 (QL2) data throughout the rural environment, with QL1 needed for urban areas, major transportation and energy corridors, heavy tree stands, vegetation mortality, areas of significant recent faulting, subtle ground expression of active faulting, areas of subsidence or abandoned mine features, and landscapes that provide habitat for endangered species. Sparsely populated and undeveloped parts of Nevada may not need repeat collection on an eight-year cycle, but a more comprehensive effort to gather requirements could determine eventual repeat cycles to achieve.

The incomplete list below provides snapshot of state and local program work efforts that can be supported by a statewide program as well as academic research studies and commercial development. Standardized data in the public domain support the “collect once, use many times” open data requirements adopted at federal and state levels.

- Economic development specific to the strategic mineral commodities and geothermal potential present in the state.
- Enhanced public safety for recreational pursuits in areas of abandoned mine hazards. It is estimated that there are over 300,000 abandoned mine land features throughout Nevada, many of which are considered to be hazardous to the general public and animals. High-resolution elevation data help identify hazards more efficiently and in greater detail.
- Enhanced public safety with the mapping of previously unrecognized faults in urban environments and along transportation and energy corridors.
- Design, build, and maintenance of transportation networks, airports, and other infrastructure.
- Build and maintain a sustainable water infrastructure for high-quality water delivery to urban centers and throughout the state, ensuring sound water storage, management, and delivery.
- Better characterization of habitat for threatened and endangered species; identification and spread of invasive species such as cheat grass.
- Identification of tree mortality, excessive fuels, and downed timber in heavily forested areas, necessary for efficient fuel removal and mitigation of wildfire.
- More accurate flood mapping for urban areas, rural populations, and infrastructure that crosses the state; create flood resilient communities; protection of life and property.
- Cost savings for statewide programmatic work such as geologic mapping, road maintenance, and land management.
- Cost savings to consumers of flood and other types of insurance.
- Identification and protection of sensitive cultural and Native American archaeological areas.

Bathymetry data at QL2B are required for accurate stream bed modeling of rivers that flow through urban environments as well as along the shores of lakes and reservoirs.

Outreach and Education

Outreach materials and helpful guides have been published since the recent completion of the successful collaborative project over the Reno-Carson City urban area:

- Below the Neon, produced by the Nevada Bureau of Mines and Geology, is a story map that explores geologic features revealed from lidar.
- Lidar Shines in Northern Nevada, by Jay Johnson, details the generation of contours from the lidar data to meet Washoe County planning needs.
- Revealing Our Dynamic Landscape through New High-Resolution /Topographic Data by Jane Tors describes the many societal applications of the new lidar acquisition in the Reno-Carson City area – published in Nevada Today (University of Nevada, Reno, online newspaper).

See also:

- Mapping Riparian Vegetation with Lidar Data, by Thomas Dilts, Jian Yang, and Peter J. Weisberg, University of Nevada, Reno.

Early efforts for statewide strategic planning were funded by the Federal Geographic Data Committee (as described above) and can be updated to reflect current requirements and expanded to include other sectors and levels of government.

Additional Comments

State agencies in Nevada endorse the USGS 3DEP program for the continued development of lidar data across Nevada and work actively to promote the collaboration that will be required to reach statewide completion. The USGS specifications work well in most of the environments in Nevada, and deviations from the specifications, additional deliverables, and concurrent data collections can be fashioned for individual projects. The urban centers in Nevada have entered successful USGS 3DEP projects over the past five years. Abundant natural resources (e.g. minerals and geothermal) and widespread geologic hazards warrant lidar acquisition in largely unpopulated rural areas, but the large proportion of federal land (86%) will likely require significant federal input for lidar projects in these areas.

The State of Nevada has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

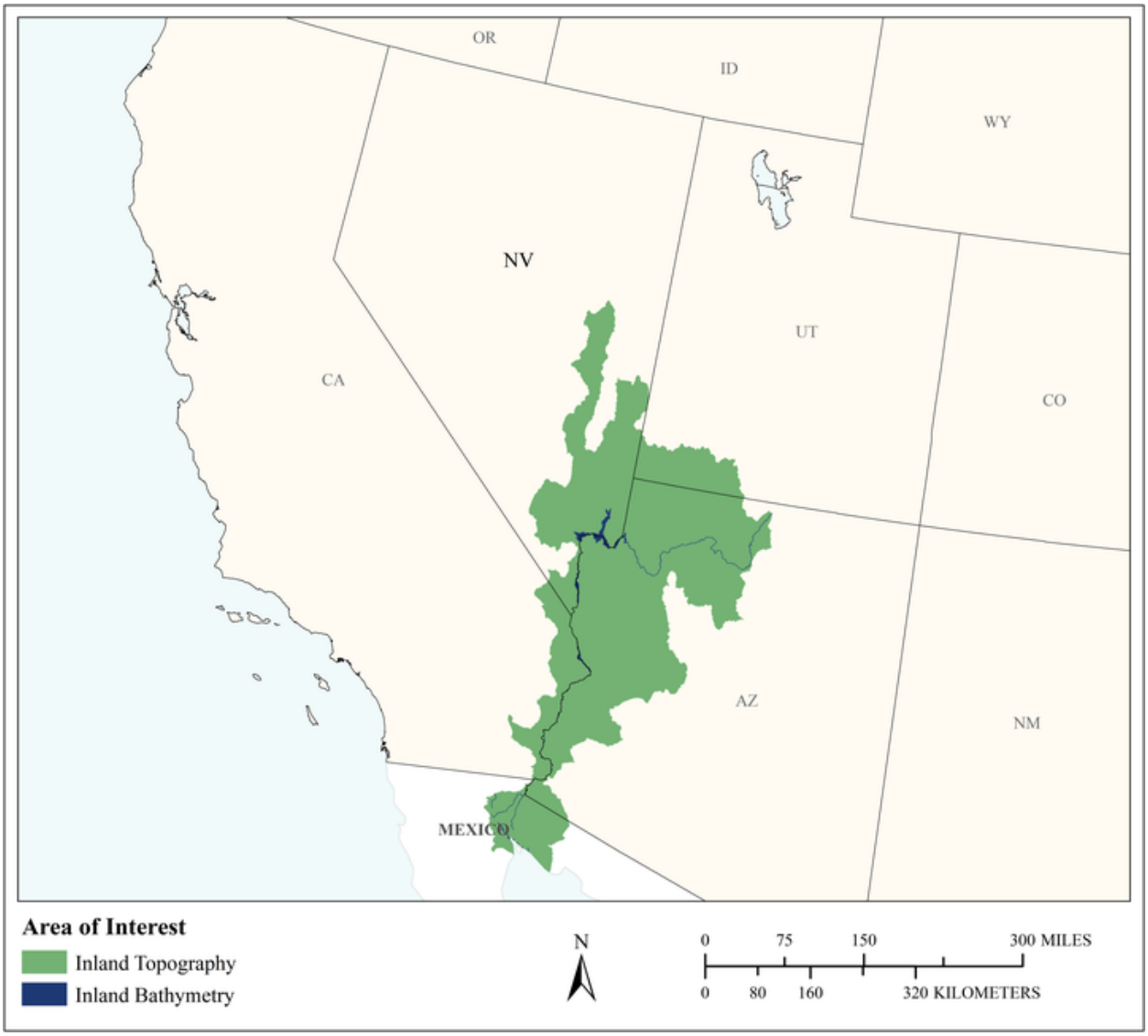
Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	Southern Nevada Water Authority	21563	Secure a Sustainable High Quality Source of Water.	Inland Topo	QL2	>10 years	$613,017	$164,199	None	Major	None
				Inland Bathy	Coarser bathymetric data satisfies my needs	>10 years	Unable to quantify	Unable to quantify	None	Minor	None
BU 02 – Riverine Ecosystem Management	State of Nevada	60282	Riverine Ecosystem Management	Inland Topo	QL1 HD	6-10 years	$169,227	$16,903	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$90,085	$6,352	Major	Major	Major
BU 04 – Forest Resource Management	University of Nevada Reno	21785	Forest Structure Mapping and Habitat Modeling	Inland Topo	QL1	>10 years	Unable to quantify	Unable to quantify	Minor	Minor	Minor
BU 04 – Forest Resource Management	State of Nevada	60283	Forest Resources Management	Inland Topo	QL1	2-3 years	$218,568	$316,840	Major	Major	Major
BU 05 – Rangeland Management	State of Nevada	60284	Rangeland Management	Inland Topo	QL2	Annually	$218,568	$316,840	Minor	Major	I don't know
BU 06 – Natural Resource Management	State of Nevada	60285	Natural Resources Conservation	Inland Topo	QL1 HD	4-5 years	$125,000	$20,000	Major	Major	Major
BU 07 – Wildlife and Habitat Management	State of Nevada	60286	Wildlife and Habitat Management	Inland Topo	QL2	4-5 years	$237,399	$203,641	Moderate	Major	Moderate
BU 10 – Geologic Assessment	Nevada Bureau of Mines and Geology	1190	Geologic Research in Nevada	Inland Topo	QL1	Event driven	$20,241,884 to $200,241,884	$4,522	Major	Major	Major
				Inland Bathy	QL2B	Event driven	$1,809	$3,618	Moderate	Moderate	Moderate
BU 11 – Geologic Resource Extraction	State of Nevada	60287	Geologic Resource Mining and Extraction	Inland Topo	QL1 HD	2-3 years	$20,000,000	$5,000,000	Minor	Major	Major
BU 12 – Renewable Energy Resources	State of Nevada	60288	Renewable Energy Resources	Inland Topo	QL2	6-10 years	$5,000,000	$1,000,000	Minor	Minor	None

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 13 – Oil and Gas Resources	Nevada Division of Minerals/Nevada Bureau of Mines and Geology	1442	Monitoring Basin Elevation Changes Associated With Oil, Gas, Geothermal, and Dissolved Mineral Resource Exploration	Inland Topo	QL2	2-3 years	$500,148	$100,000	Minor	Major	Major
BU 14 – Cultural Resource Management	Gnomon Inc., Carson City NV	22232	Client Service and Support	Inland Topo	QL1	2-3 years	$20,575	$18,090	None	Moderate	Moderate
				Inland Bathy	QL3B	4-5 years	Unable to quantify	Unable to quantify	None	None	None
BU 15 – Flood Risk Management	Nevada Division of Water Resources	32800	Flood Risk Modeling and Mapping of Rivers, Drainages, and Alluvial Fans	Inland Topo	QL2	4-5 years	$15,523,402	$2,716,109	Moderate	Minor	Major
				Inland Bathy	QL1B	4-5 years	$1,078,363	$1,210,725	Moderate	Minor	Major
BU 17 – Wildfire Management	State of Nevada	60289	Wildfire Management, Planning, and Response	Inland Topo	QL1	4-5 years	$300,000	Unable to quantify	Major	Major	Major
BU 18 – Homeland Security	State of Nevada	60290	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management	Inland Topo	QL2	4-5 years	$3,261,565	Unable to quantify	Major	Moderate	Major
BU 19 – Land Navigation	State of Nevada	60291	Land Navigation and Safety	Inland Topo	QL0	2-3 years	$690,000	$115,661	Minor	Major	Major
BU 21 – Aviation Navigation	Nevada Airport Authorities	32891	Airport Security and Public Safety, Planning and Infrastructure Management	Inland Topo	QL1 HD	2-3 years	$379,882	$470,895	Moderate	Major	Major
				Inland Bathy	QL0B	2-3 years	$102,510	Unable to quantify	Moderate	Major	Major
BU 22 – Infrastructure Management	Southern Nevada Water Authority	21653	Provide and Maintain an Updated, Reliable Water Delivery System to a Large Urban Area	Inland Topo	QL1	4-5 years	$658,004	Unable to quantify	None	None	None

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 22 – Infrastructure Management	Nevada DOT	22019	Engineering for Transportation and Other Infrastructure	Inland Topo	QL0 HD	Event driven	Unable to quantify	Unable to quantify	None	None	None
BU 23 – Urban and Regional Planning	Tahoe Regional Planning Agency	1354	Ecosystem Approach for Lake Tahoe and Las Vegas Environmental Restoration Goals	Inland Topo	QL0 HD	4-8 years	$4,403,162	$518,319	Major	Major	Major
				Inland Bathy	QL0B	4-8 years	$149,495	$33,165	Major	Major	Major
BU 24 – Health and Human Services	Nevada Division of Minerals	1221	Abandoned Mine Lands Inventory	Inland Topo	QL1	6-10 years	$100,199	$20,000	Moderate	Moderate	Major
BU 27 – Recreation	State of Nevada	60292	Recreation	Inland Topo	QL1	4-5 years	$25,369	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	4-5 years	$15,277	Unable to quantify	Major	Major	Moderate

MCA Title: Secure a Sustainable High Quality Source of Water.



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Highly desirable		
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)	One or more Hydrologic Units (HUC4s)		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Secure a sustainable high quality source of water.
MCA Title	Secure a Sustainable High Quality Source of Water.
MCA ID	21563
Organization Type	Regional, County, City, or other local government
Organization Name	Southern Nevada Water Authority
Sub-Agency or Division	
Organization Mission	Provide world class water service in a sustainable, adaptive and responsible manner to our customers through reliable, cost effective systems.
Program Name	Wholesale distribution of water to Southern Nevada. Includes securing water supply from the Colorado River and insuring the quality of water that flows from the Valley back into the reservoir of Lake Mead.
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 02 - Riverine Ecosystem Management
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	All forms of vegetation for resource/habitat characterization.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required

Inland Bathy Feature Size Requirements	Response
2.1 – 5 acres	Not required
5.1 – 10 acres	Not required
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	Coarser bathymetric data satisfies my needs		
Update Frequency	>10 years	>10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI	In areas of the Las Vegas Wash that drains into Lake Mead updates would be more frequent and would rather have QL1			
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 1 meter		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Not required			Not required	
Entire AOI under same environmental conditions	Required	Not required			Not required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Not required			Not required	
DEM for entire AOI needs to be seamless	Highly desirable	Not required			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer				Up to double the required TVU at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have		
DTM	Required	Nice to have		
DEM	Required	Nice to have		
Raw point cloud data	Nice to have	Not required		
Classified point cloud	Highly desirable	Nice to have		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Nice to have		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Nice to have		
Ground control/ground truthing	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Nice to have		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required	Not required		
Land use/land cover	Not required	Not required		
Wetlands	Not required	Not required		
Estuaries				
Inland surface water features	Not required	Nice to have		
Bridges/culverts	Highly desirable	Nice to have		
Landmark features	Nice to have	Not required		
Cultural resources	Not required	Not required		
Coastal and riverine structures	Highly desirable	Not required		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL1 from 2016 is available for a good part of my area. QL2 from 2016 is also available for some. But in a more remote area there is only old data (2007?) of marginal quality.	There is very little Bathymetric data available. Incomplete data coverage of Lake Mead shoreline area from BOR and USGS.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories				
State repositories used				

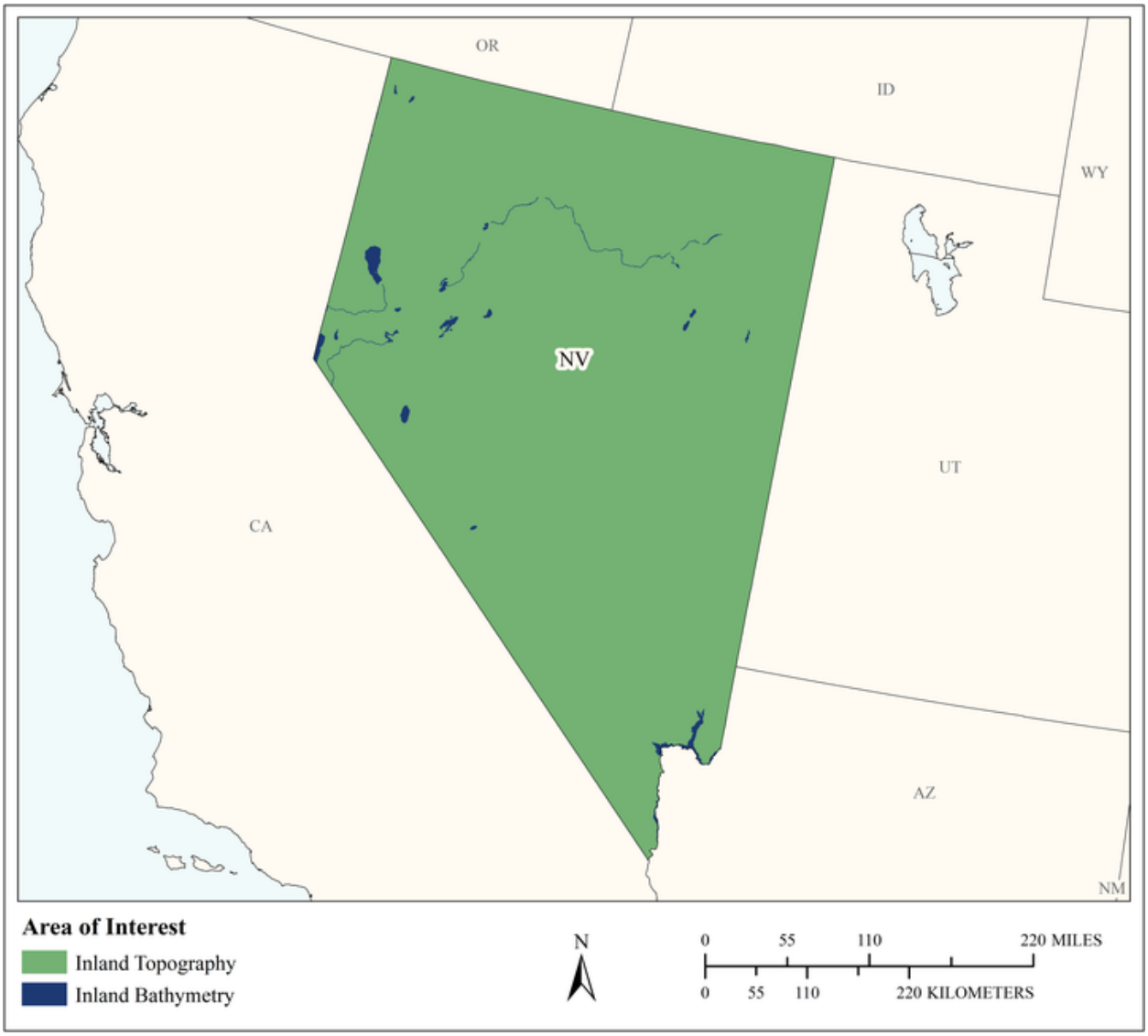
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other	Yes	Yes		
Other description	We have contracted for our own digital data and used a 3DEP grant to obtain some of the funding for it.	Studies done by USGS and BOR		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None	I don't know		
Cost savings/cost reduction	None	I don't know		
Cost avoidance	None	I don't know		
Increased revenues	None	I don't know		
Mission-driven performance improvements	Moderate	I don't know		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	None		
Improved response or timeliness	None	None		
Improved customer experience	None	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	None		
Environmental	I don't know	None		
Public safety, including life and property	None	None		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide							
Increased revenues	None			None								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements description				Better ability to manage the resource.								
Other operational benefits	Major	Unable to provide										
Other operational benefits description	Better ability to manage the resource.											
Future annual operational benefits added during validation		Annual dollars saved/ realized	$613,017									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Minor	Unable to provide							
Improved response or timeliness	None			None								
Improved customer experience	Major	Unable to provide		None								
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$164,199									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			None								
Environmental	Major			Minor								
Environmental description	Can improve resource management, including environmental resources			Better ability to manage the resource								
Public safety, including life and property	None			None								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Riverine Ecosystem Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Stream channel analysis and mapping. Stream bank erosion analysis. Aquatic and terrestrial species habitat management. Environmental management.
MCA Title	Riverine Ecosystem Management
MCA ID	60282
Organization Type	State or U.S. Territorial government
Organization Name	State of Nevada
Sub-Agency or Division	Nevada Department of Environmental Protection
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B		
Update Frequency	6-10 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Required			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Required	Highly desirable		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Highly desirable	Nice to have		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Moderate	Minor		
Cost avoidance	Moderate	None		
Increased revenues	None	None		
Mission-driven performance improvements	Major	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		

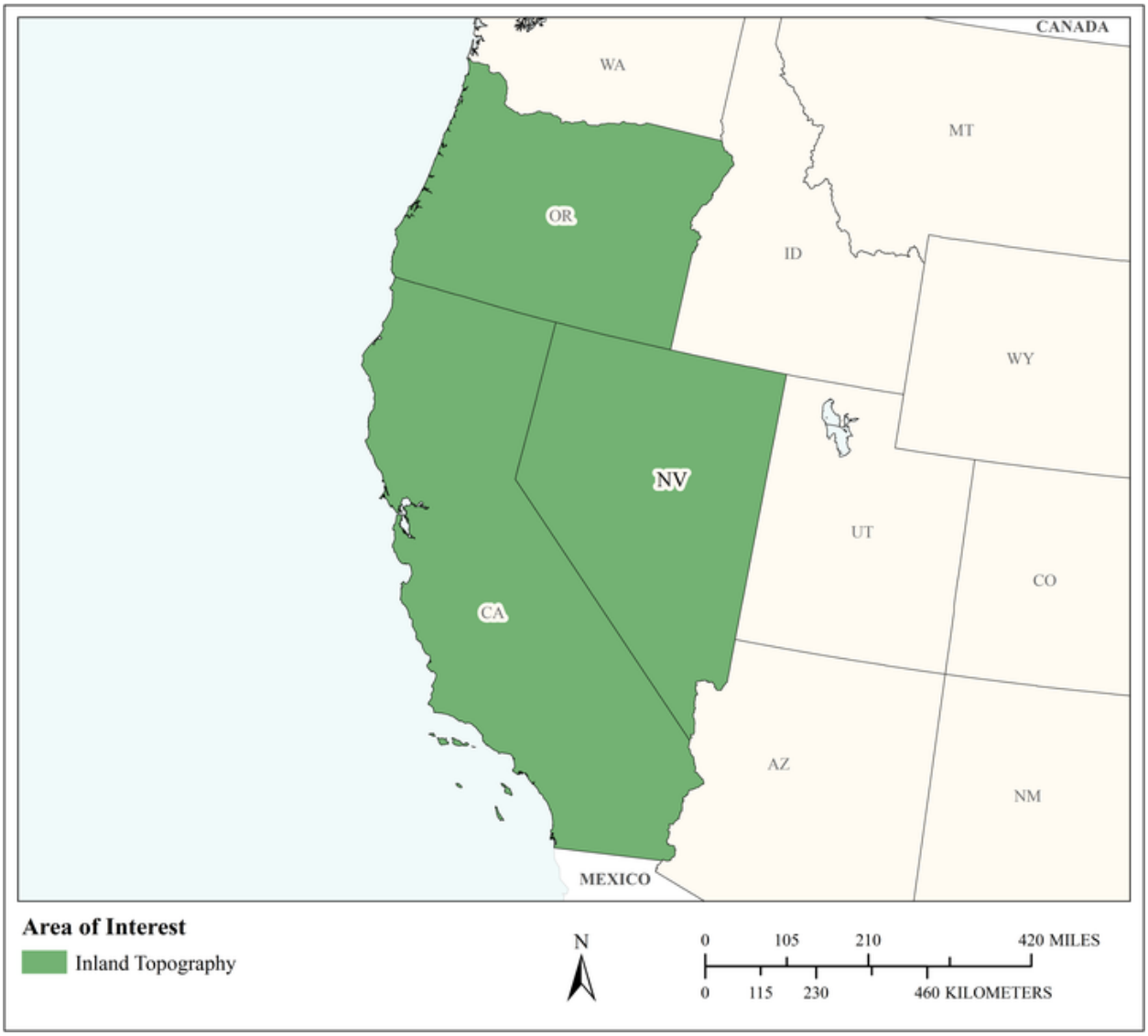
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Moderate		
Improved customer experience	Major	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate		
Environmental	Major	Major		
Public safety, including life and property	Major	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$169,227		Annual dollars saved/ realized	$90,085						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$16,903		Annual dollars saved/ realized	$6,352						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Major			Major								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Forest Structure Mapping and Habitat Modeling



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Monitoring forest-grasslands and habitat health. An additional Business Use for this activity is BU 07 - Wildlife and Habitat Management.
MCA Title	Forest Structure Mapping and Habitat Modeling
MCA ID	21785
Organization Type	Academic or Not-for-Profit
Organization Name	University of Nevada Reno
Sub-Agency or Division	
Organization Mission	Conduct academic research that enhances the use of our natural resources while minimizing resource damage.
Program Name	Department of Natural Resources and Environmental Science
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	BU 05 - Rangeland Management
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Tall bunchgrasses ~1 meter tall

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	>10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI	QL1 meets my needs (general vegetation mapping) but other PIs in the department prefer QL0 for smaller more intense study areas (snow hydrology, forest growth)			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Horizontal Error	Up to 40 cm			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Not required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	I use ~Q2 level LiDAR for canopy cover mapping and 10 meter NED data for most topographic applications (because LiDAR-derived DEMs are so rare in Nevada). Drs. Harpold and Greenberg use Q0 level LiDAR to measure snowpack levels and measure forest growth. Dr. Greenberg collects field data with a portable terrestrial scanning LiDAR.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				

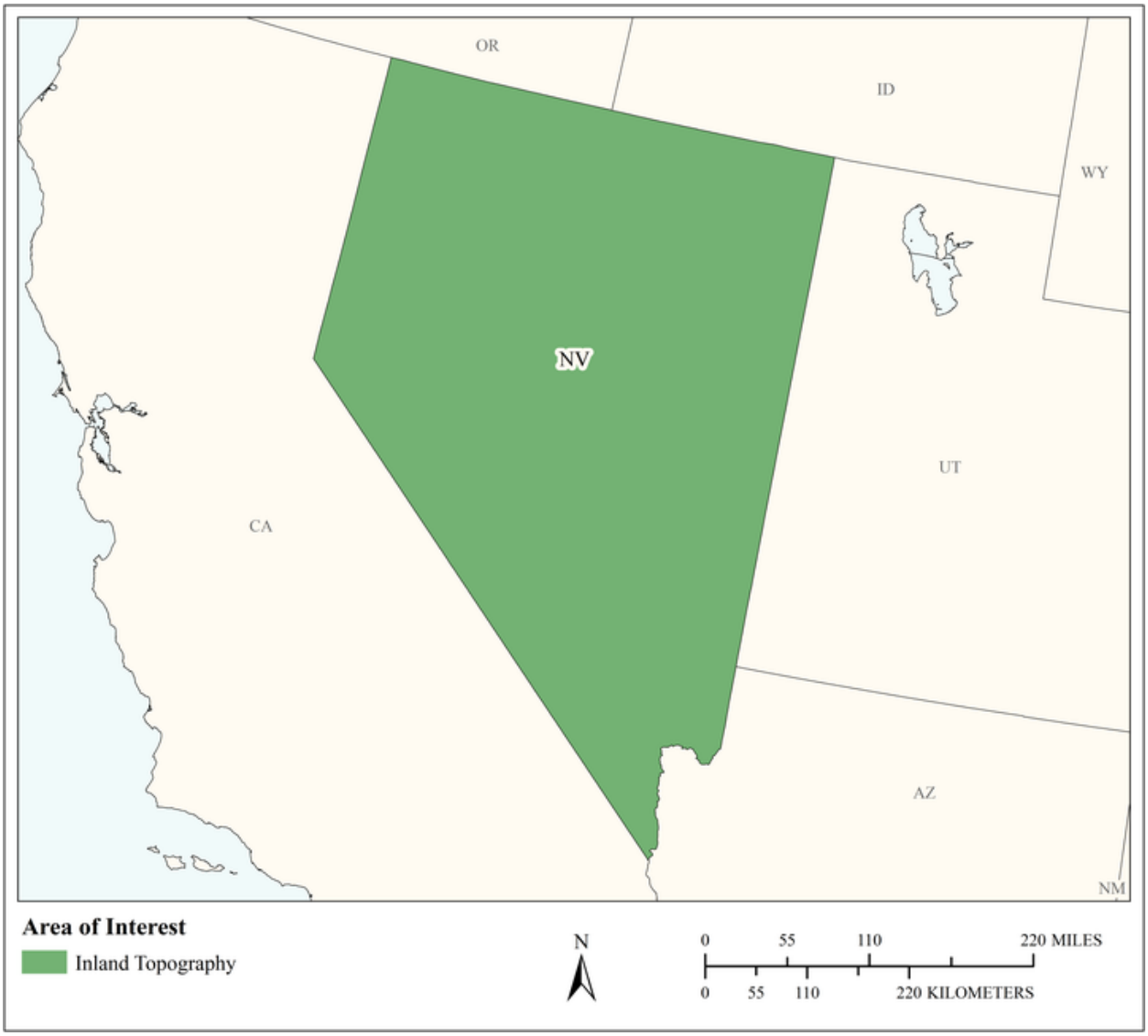
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Moderate			
Cost avoidance	Minor			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Other operational benefits	Major	Unable to provide										
Other operational benefits description	Major benefits come in the form of improved accuracy and ability to generate predictive models. We frequently scale up using Landsat, but this statistical modeling step would be unnecessary if wall-to-wall LiDAR were available in Nevada and eastern Calif. Improved accuracy and ability to generate predictive models.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Value added to products or services description	Improved vegetation maps.											
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	Minor											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Forest Resources Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Forest health assessment. Determination of standing inventory of forest resources. Prescribed burn planning. Analysis of carbon stocks for trade. Harvest systems planning.
MCA Title	Forest Resources Management
MCA ID	60283
Organization Type	State or U.S. Territorial government
Organization Name	State of Nevada
Sub-Agency or Division	Nevada Division of Forestry
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Highly desirable			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

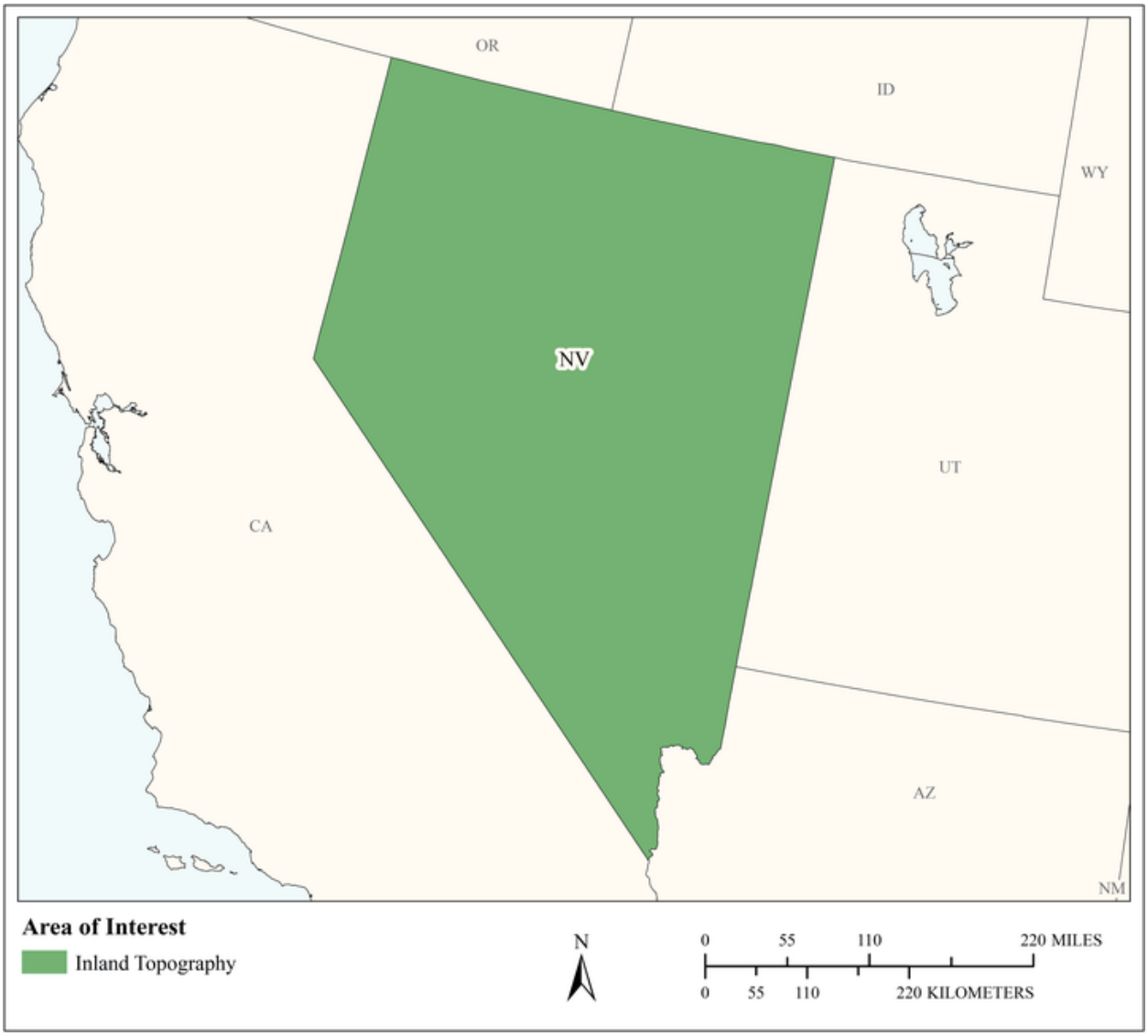
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$218,568									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$316,840									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Rangeland Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Assessment of rangeland health. Mapping for soil erosion potential due to grazing.
MCA Title	Rangeland Management
MCA ID	60284
Organization Type	State or U.S. Territorial government
Organization Name	State of Nevada
Sub-Agency or Division	Nevada Division of Forestry
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 05 - Rangeland Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Highly desirable			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Not required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None			
Cost savings/cost reduction	None			
Cost avoidance	None			
Increased revenues	None			
Mission-driven performance improvements	None			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None			

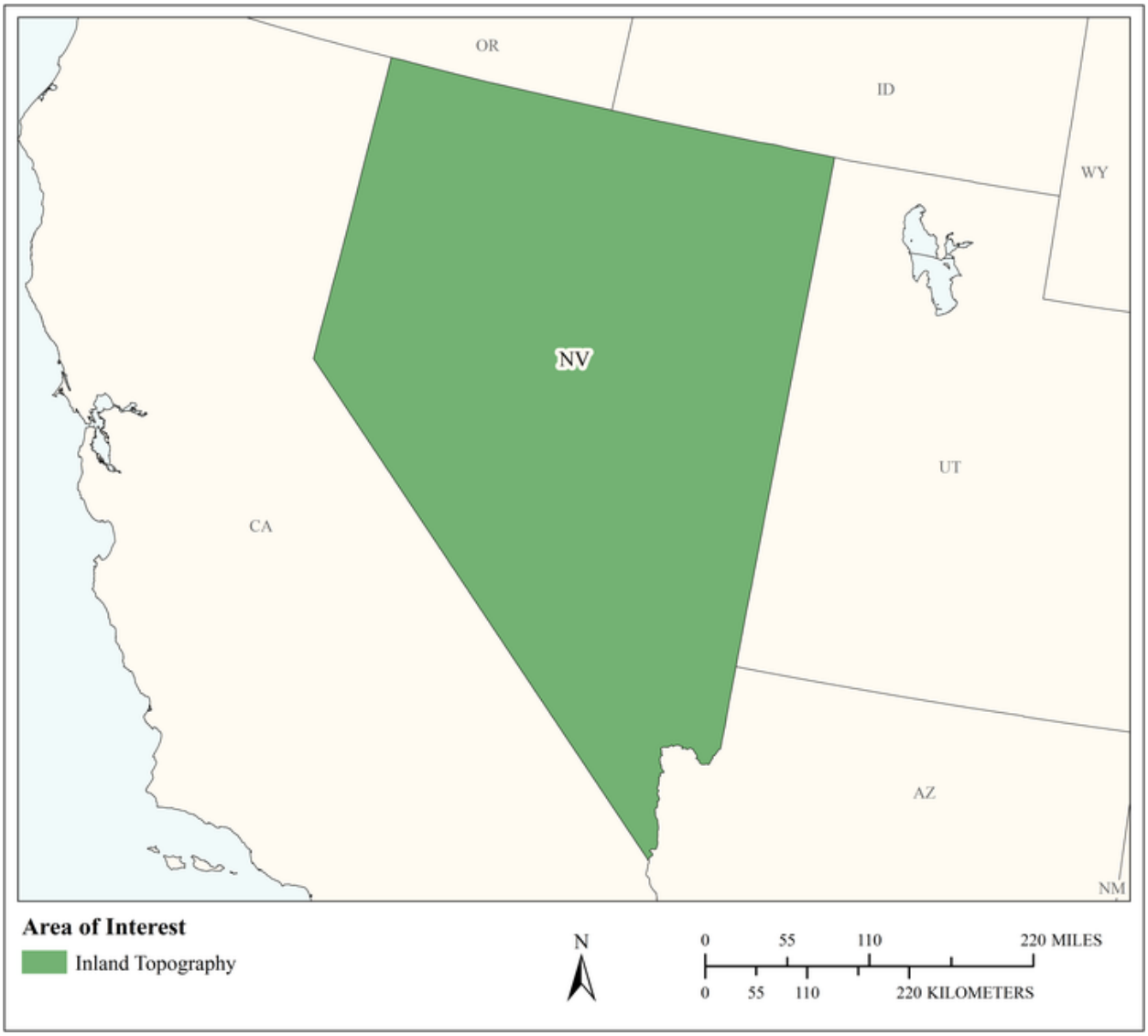
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	None			
Improved customer experience	None			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	None			
Public safety, including life and property	None			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	None											
Cost avoidance	Minor	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$218,568									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$316,840									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Natural Resources Conservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation engineering. Soils and wetlands mapping and characterization. Modeling of biological and ecological systems. Erosion control. Rainfall penetration studies, impervious surfaces. Assessment of blue carbon stocks.
MCA Title	Natural Resources Conservation
MCA ID	60285
Organization Type	State or U.S. Territorial government
Organization Name	State of Nevada
Sub-Agency or Division	Nevada Department of Conservation and Natural Resources
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

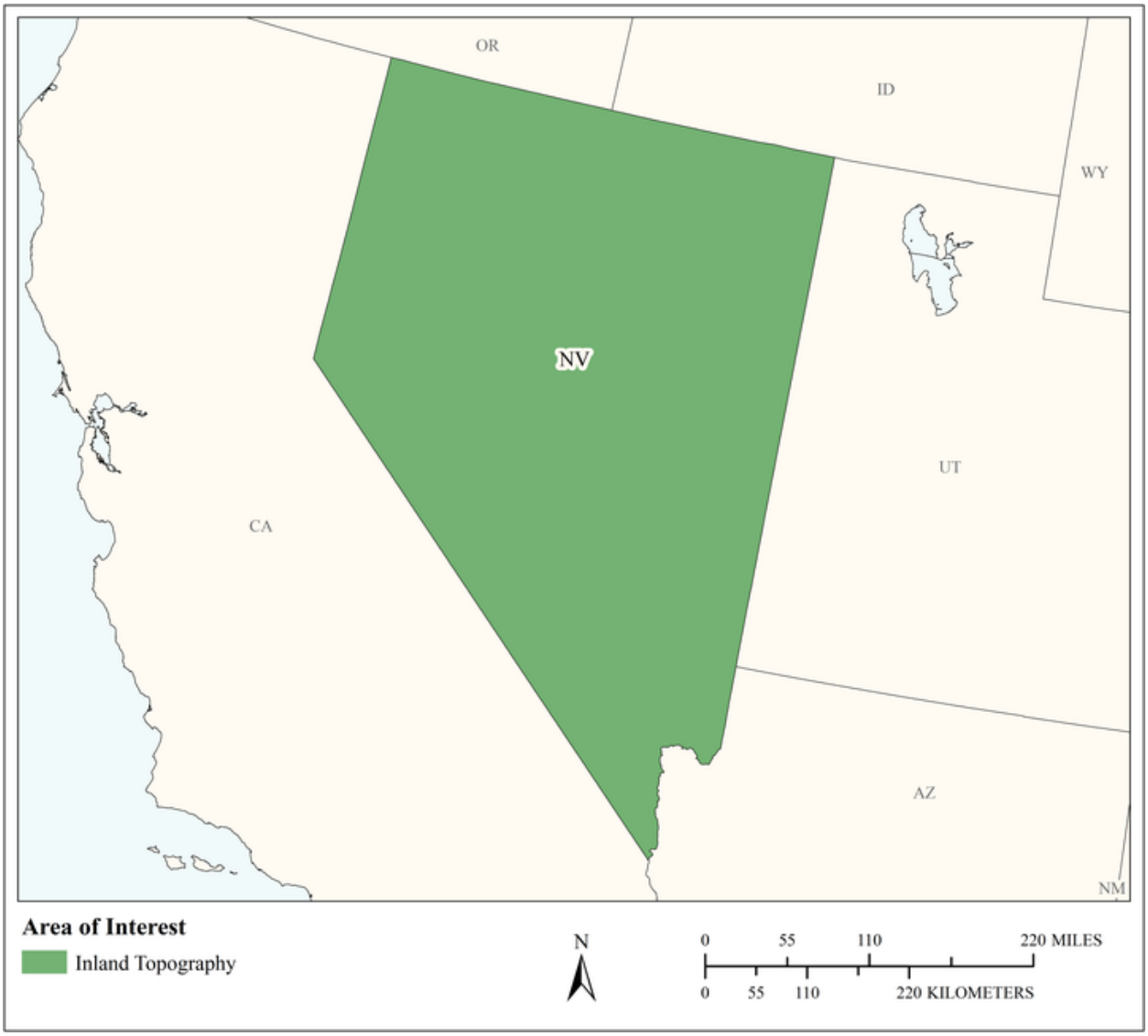
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$125,000									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$20,000									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Wildlife and Habitat Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation planning for wildlife refuges and marine sanctuaries. Conservation of critical habitats. Management of diverse migratory bird habitats, coral reef and coral communities, marine mammals, protected fish species, and trust resources.
MCA Title	Wildlife and Habitat Management
MCA ID	60286
Organization Type	State or U.S. Territorial government
Organization Name	State of Nevada
Sub-Agency or Division	Nevada Department of Wildlife
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			

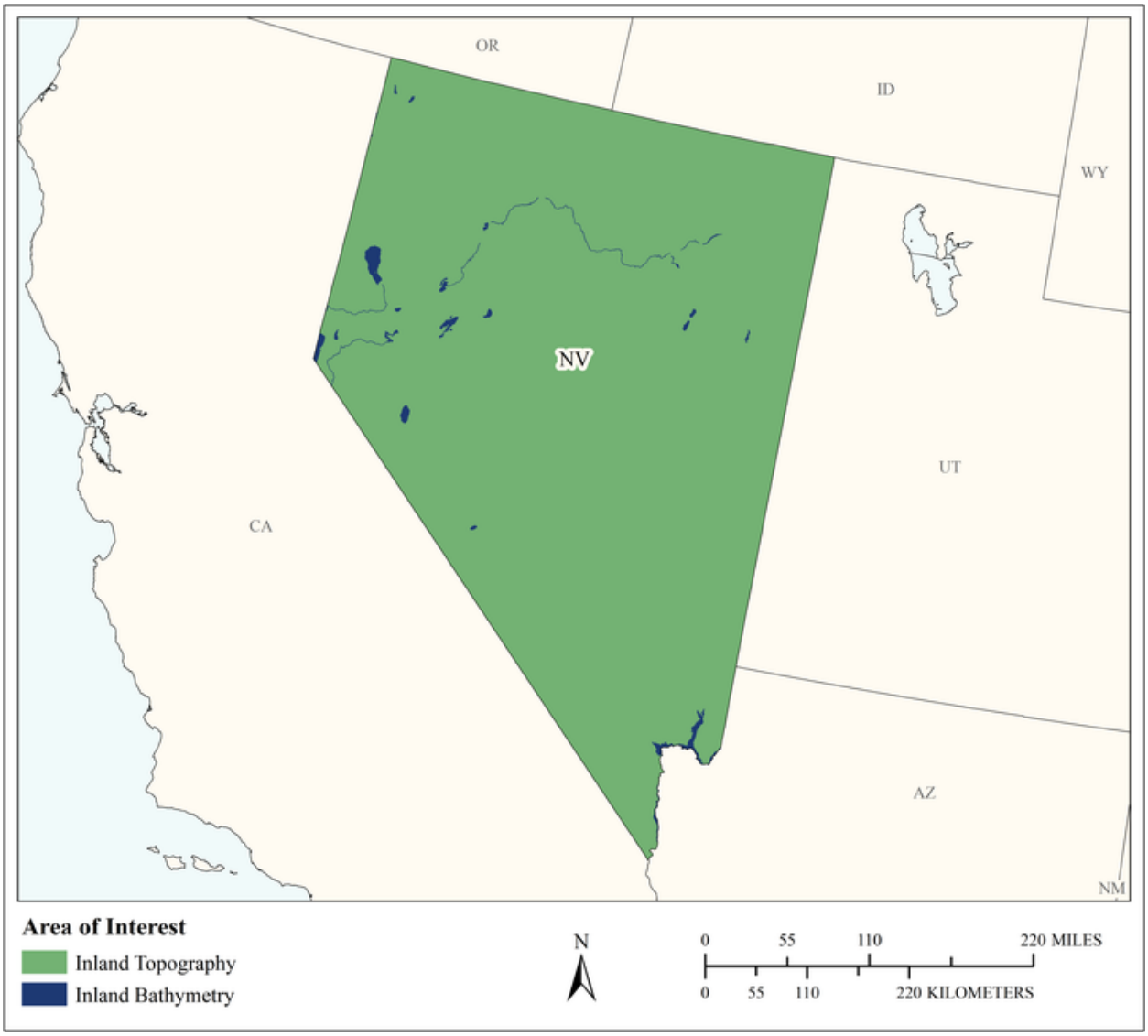
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Moderate			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Minor	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$237,399									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$203,641									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Major											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic Research in Nevada



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conduct research and publish reports on mineral and energy resources, engineering geology, environmental geology, hydrogeology, and geologic mapping.
MCA Title	Geologic Research in Nevada
MCA ID	1190
Organization Type	State or U.S. Territorial government
Organization Name	Nevada Bureau of Mines and Geology
Sub-Agency or Division	
Organization Mission	The Nevada Bureau of Mines and Geology (NBMG) is a research and public service unit of the University of Nevada and is the state geological survey. NBMG is part of the Mackay School of Earth Sciences and Engineering within the College of Science at the University of Nevada, Reno. NBMG scientists conduct research and publish reports on mineral resources, engineering geology, environmental geology, hydrogeology, and geologic mapping. Current activities in geologic mapping and mineral resources include detailed geologic mapping and stratigraphic studies in Nevada, comparative studies of bulk-mineable precious-metal deposits, geochemical investigations of mining districts, metallic and industrial mineral resource assessments, igneous petrologic studies, hydrothermal experiments, and research on the origin of mineral deposits. Engineering geology, and hydrogeology projects include investigations of earthquake hazards and related aspects of neotectonics, examination of geological issues involved in disposing nuclear and hazardous wastes, mapping of geomorphic features, radon hazard studies, studies of landslide hazards, geochemical characterization of natural environmental hazards, investigations of the fate of mercury from processing Comstock ores by amalgamation in late 1800s, and investigation of land subsidence, primarily in Las Vegas Valley. Earth science education projects include writing guidebooks for laymen, teachers, and students; presenting lectures, short courses, and workshops; and assisting with science fairs, curriculum development, and conferences. Geologic and geographic information activities include creating and updating databases on mining districts, active mines and prospects, and geothermal and petroleum exploration and production; implementation and development of statewide geographic information systems and the digital maps needed for these systems; and maintenance of core and cuttings facilities, rock and mineral collections for research, aerial photographic imagery and maps, and extensive files on Nevada geology and resources. NBMG cooperates with numerous state and federal agencies in conducting research and in providing geologic and resource information. Research results are published as NBMG bulletins, reports, maps, and special publications as well as in federal publications and scientific journals. In addition to addressing the needs for geologic information by conducting research, publishing reports and maps, and creating computer databases, staff members assist the public, industry, and government agencies by answering specific questions regarding Nevada geology and resources and by providing some chemical and mineralogical analyses.
Program Name	Conduct geologic research and publish reports to benefit Nevada.
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 11 - Geologic Resource Mining and Extraction
Tertiary Business Use	BU 12 - Renewable Energy Resources

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Our work can benefit from identification of sub-meter surficial geologic features such as boulders, gullies, faults scarps, soil texture, and variations in bedrock roughness.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Not required
5.1 – 10 acres	Nice to have
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B		
Update Frequency	Event driven only – Data need to coincide with a specific event.	Event driven only – Data need to coincide with a specific event.		
Event type(s)	Flood or earthquake.	Event driven only		

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI	QL1 data is desirable for the more densely populated portions of Nevada, and areas with high flood and earthquake hazard. Other portions of the state would be acceptable at QL2. In some instances we prefer more QL2 data coverage over smaller QL1 acquisitions.			
Acceptable Horizontal Error	Up to 80 cm	Up to 1 meter		
Acceptable Vertical Error	Up to 10 cm	Up to 40 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required			Not required	
Entire AOI under same environmental conditions	Not required	Nice to have			Not required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Not required			Not required	
DEM for entire AOI needs to be seamless	Nice to have	Highly desirable			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Highly desirable		
DTM	Nice to have	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Highly desirable	Nice to have		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Nice to have		
Ground control/ground truthing	Required	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Nice to have		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Highly desirable		
Land use/land cover	Nice to have	Not required		
Wetlands	Not required	Not required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Not required		
Bridges/culverts	Not required	Not required		
Landmark features	Not required	Not required		
Cultural resources	Not required	Not required		
Coastal and riverine structures	Not required	Not required		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We always use the best available data. For the areas of NV with lidar that is what we use. The higher the quality the better but Q2 is the minimum for accurate interpretations. If no lidar we use the statewide 10 m DEM data.	Pyramid Lake and Tahoe bathymetry are commonly used for geologic mapping and fault hazard studies. Higher resolution data than the existing data sets would be utilized for these areas and new data for other lakes would be great.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes		

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State repositories used	We have collected most available datasets in house at NBMG. These usually arrive on hard drives and we load them on our local server. Or we download them from OpenTopo which is excellent and the standard all lidar download sites should strive for. We do not have the capability currently to serve up the lidar data we have. The national map appears to have some of NV data available for download. I find the lidar download functionality on the national map to be somewhat confusing and challenging.	Anything we have acquired and is available on our local servers.		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Major	Moderate		
Cost avoidance	Major	Moderate		
Increased revenues	None	None		
Mission-driven performance improvements	Major	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate		
Improved response or timeliness	Moderate	Minor		
Improved customer experience	Moderate	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate		
Environmental	Minor	None		

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Public safety, including life and property	Major	Moderate		

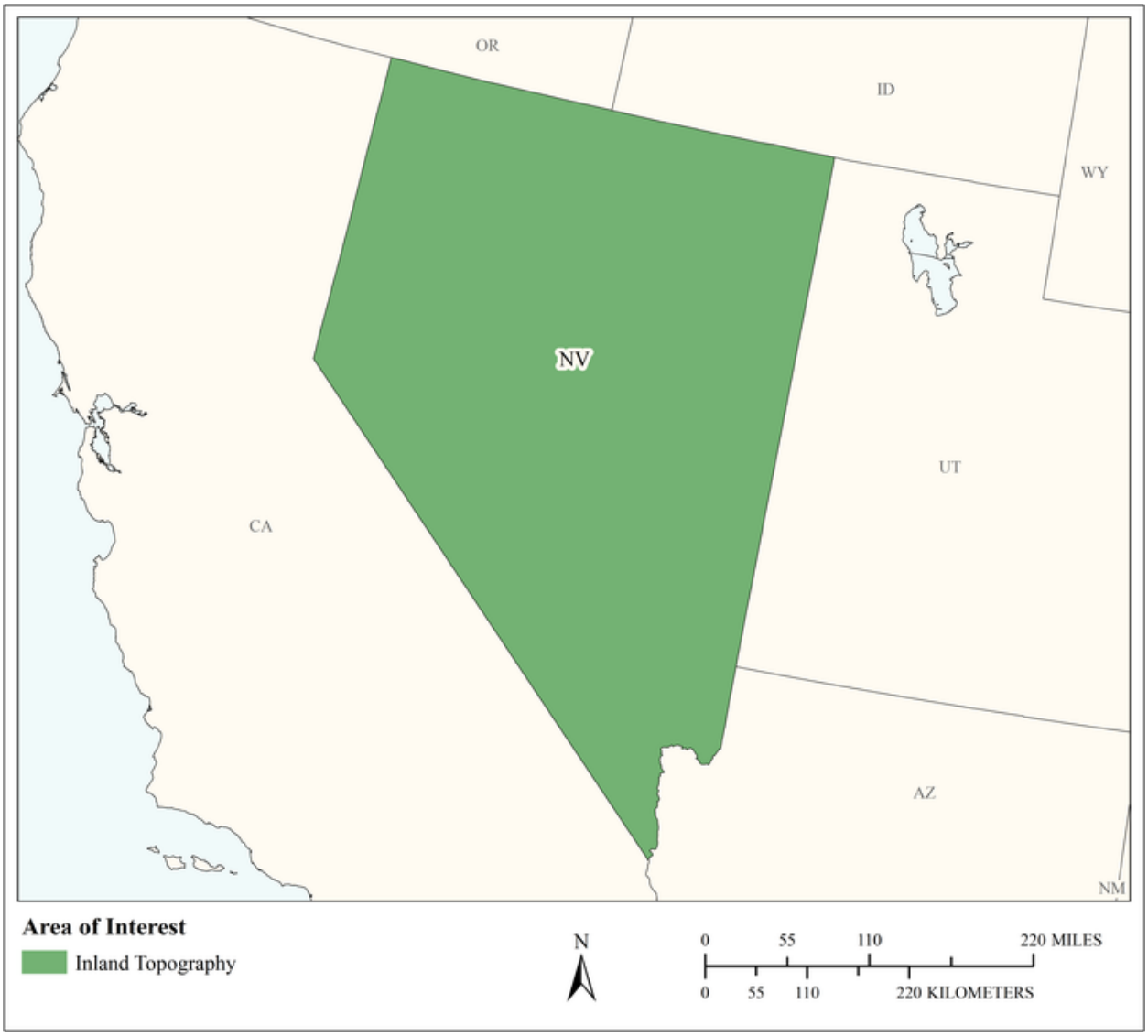
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$16,884	Moderate	Annual dollars saved/realized	$1,809						
Time savings description	75% of the time saved for field visits. Particularly if the data distribution system was improved. Having lidar in areas that experience flooding or an earthquake will be hugely beneficial and save time collecting data via other means (SFM etc). Could also allow for differencing. Not annual occurrences so time estimate is very approximate. 50% of field time saving outlined above. Only pursue a a couple permits a year so time savings is limited. Given that there's no comparable data set for most of the state there is only minimal error reduction. 3 quadrangle maps / year, 30 hours per map = 90 hours, 2 fault studies expedited, 20 hours / study = 40 hours, 1 geothermal mapping project expedited = 30 hours.			No underwater field work for us.								
Cost savings/cost reduction	Major	Annual dollars saved/realized	$225,000	None								
Cost savings/cost reduction description	UNR and NBMG recently contributed to two lidar acquisitions for approximately $150,000 and $75,000. If these were annual expenditures (which they currently are not), we would save 225K / per year. No connection that I can think of.			We don't currently collect bathymetry.								
Cost avoidance	Major	Annual dollars saved/realized	$20,000,000 to $200,000,000	None								
Cost avoidance description	We don't do much data processing in-house. No comparable data set, no way to calculate. Improved fault and flood plain mapping could lead to a massive amount of loss avoidance, potentially in the 10s to 100s of millions of dollars.											
Increased revenues	Moderate	Unable to provide		None								
Increased revenues description	Theoretical so can not estimate cost revenue. But could see NBMG providing better products using lidar.											
Mission-driven performance improvements	Major	Annual percent improvement	80%	Moderate	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness	Major	Annual dollars saved/realized	$4,522	Moderate	Annual dollars saved/realized	$3,618						
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide							
Improved customer experience description	Good data distribution through the USGS could same 100s of hours from user groups.											
Other customer service benefits				Moderate	Unable to provide							
Other customer service benefits description												

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Societal Benefits	**Benefits**	**Benefits**	**Benefits**	**Benefits**
Education or outreach	Major	Moderate		
Environmental	Major	Moderate		
Public safety, including life and property	Major	Moderate		
Other				
Other benefits		Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps	Yes			
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic Resource Mining and Extraction



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Onshore or offshore mineral extraction. Monitoring sand as a local resource. Seabed resources. Open mine volume computations. Stockpile analysis. Environmental impact assessment and site restoration. Nevada mines $5 billion in gold annually.
MCA Title	Geologic Resource Mining and Extraction
MCA ID	60287
Organization Type	State or U.S. Territorial government
Organization Name	State of Nevada
Sub-Agency or Division	Nevada Bureau of Mines and Geology
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 11 - Geologic Resource Mining and Extraction
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			

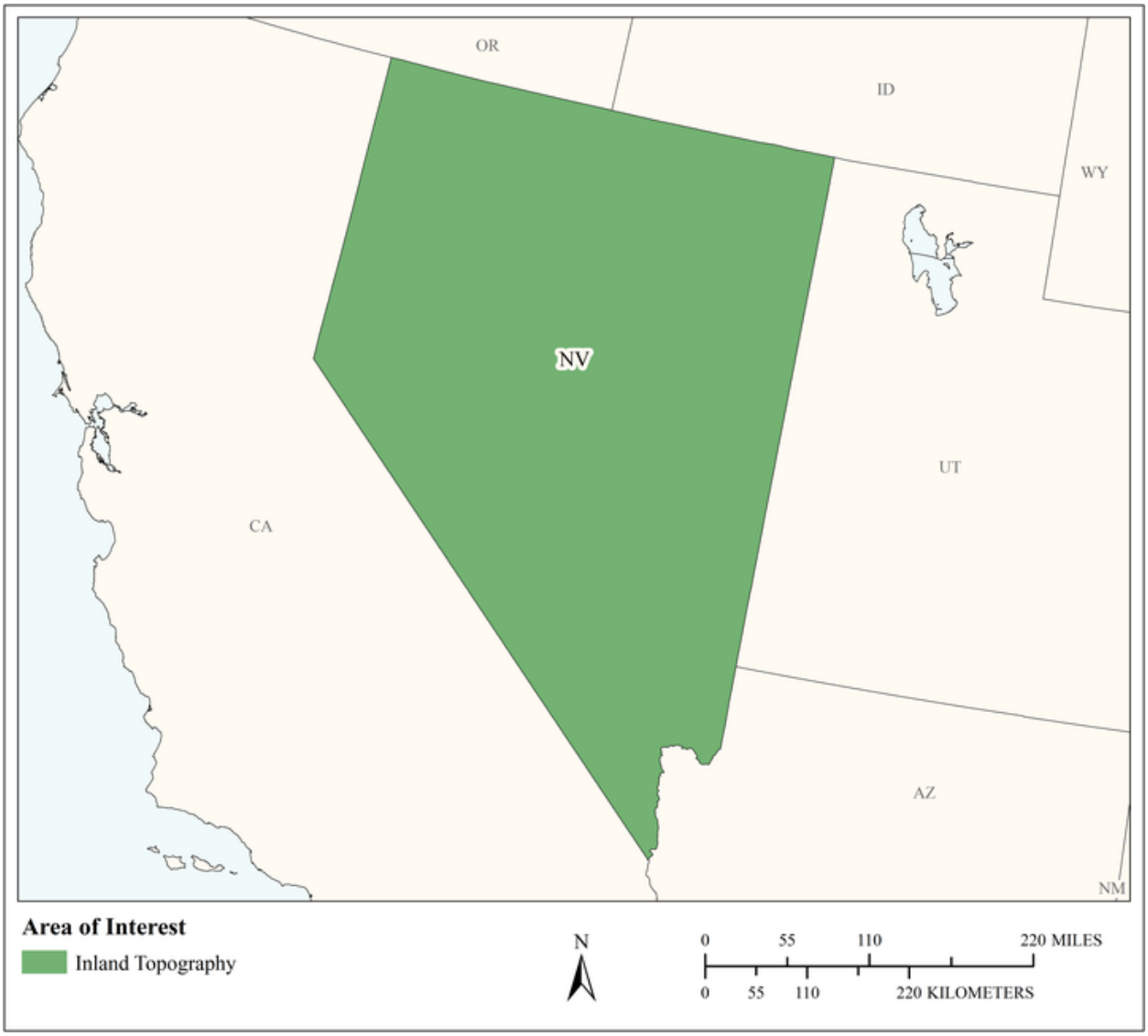
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Minor	Unable to provide										
Cost avoidance	Minor	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$20,000,000									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$5,000,000									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Renewable Energy Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Nevada is experiencing significant geothermal developments annually. Alternate energy development – solar, tidal, wind, wave, and ocean current. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Low head power potential for hydropower.
MCA Title	Renewable Energy Resources
MCA ID	60288
Organization Type	State or U.S. Territorial government
Organization Name	State of Nevada
Sub-Agency or Division	Nevada Division of Minerals
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Not required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Minor			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor			

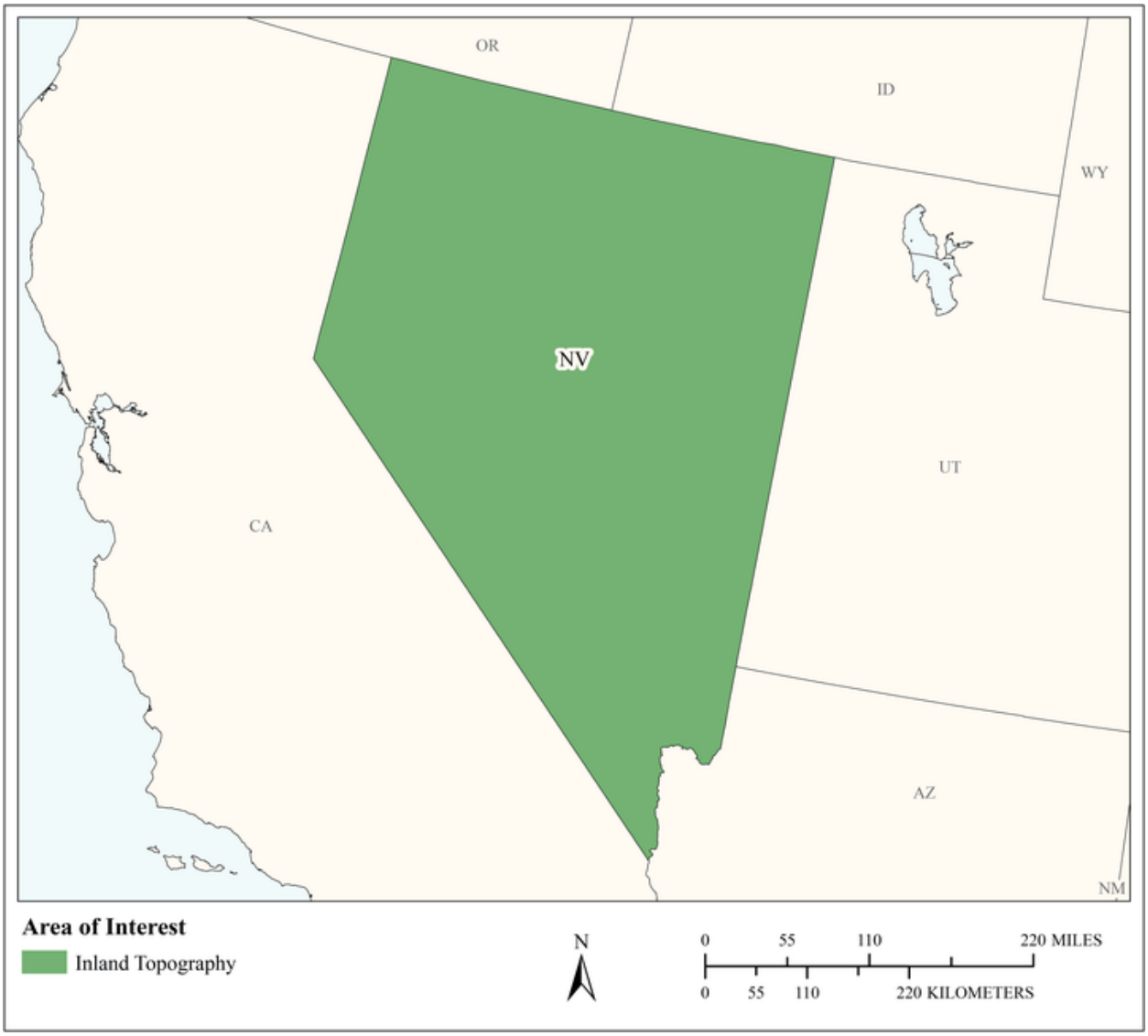
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$5,000,000									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,000,000									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	None											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Monitoring Basin Elevation Changes Associated with Oil, Gas, Geothermal, and Dissolved Mineral Resource Exploration



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Oil, Gas and Geothermal exploration and production monitoring and Dissolved Mineral Resource exploration. The Division of Minerals is responsible for overseeing the drilling of wells for Oil, Gas and Geothermal production or exploration. As the nation's 2nd largest, but most widespread, geothermal producer in a time when alternatives energy sources are increasingly in demand, the Division seeks to encourage and assist in safe well construction practices that do not harm state, federal or private lands, environments or property. In a few basins that have both domestic geothermal wells and industrial, we have seen concern that the larger wells are affecting the smaller producers or neighboring lands via subsidence of basins where production wells are located, or bulging where injection wells are present. In the case of Dissolved Mineral Resources, such as lithium brines, exploration for new resources has been increasing in recent years, and basin could also potentially be affected by over-pumping. Nevada is a mining rich state, and contributes greatly to national resource commodities needs. We wish to monitor land changes and address concerns while allowing for responsible exploration and production practices to continue where safe and beneficial to the state and nation.
MCA Title	Monitoring Basin Elevation Changes Associated With Oil, Gas, Geothermal, and Dissolved Mineral Resource Exploration
MCA ID	1442
Organization Type	State or U.S. Territorial government
Organization Name	Nevada Division of Minerals/Nevada Bureau of Mines and Geology
Sub-Agency or Division	
Organization Mission	To encourage and assist in the responsible exploration for and the production of minerals, oil, gas, and geothermal energy which are economically beneficial to the State.
Program Name	Fluid Minerals - Oil, Gas, Geothermal and Dissolved Mineral Resources
Total Annual Program Budget	
Primary Business Use	BU 13 - Oil and Gas Resources
Secondary Business Use	BU 12 - Renewable Energy Resources
Tertiary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)

General Geographic Area and Size	
Description of smallest 3D features	Looking at basin changes both around a particular well and basin-wide.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI	Interested mostly in basins, however other changes in ranges would be interesting to see. Baseline is 2-3 years with site-specific updates as needed.			
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Less than 5 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial			
Cross section/transect requirement	Cross sections would have to be oriented along and very near wells of interest, with same vertical/horizontal accuracy as listed above.			

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have					
DEM for entire AOI needs to be seamless	Nice to have					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required			
DTM	Required			
DEM	Highly desirable			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Not required			
Landmark features	Not required			
Cultural resources	Not required			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We have used InSAR and physical inspection/field work within basins. We currently don't conduct continuous monitoring of basin, but would like to be able to check should a problem arise.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	SSARA/UNAVCO, ArcGIS			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	I don't know			
Cost avoidance	I don't know			
Increased revenues	I don't know			
Mission-driven performance improvements	I don't know			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

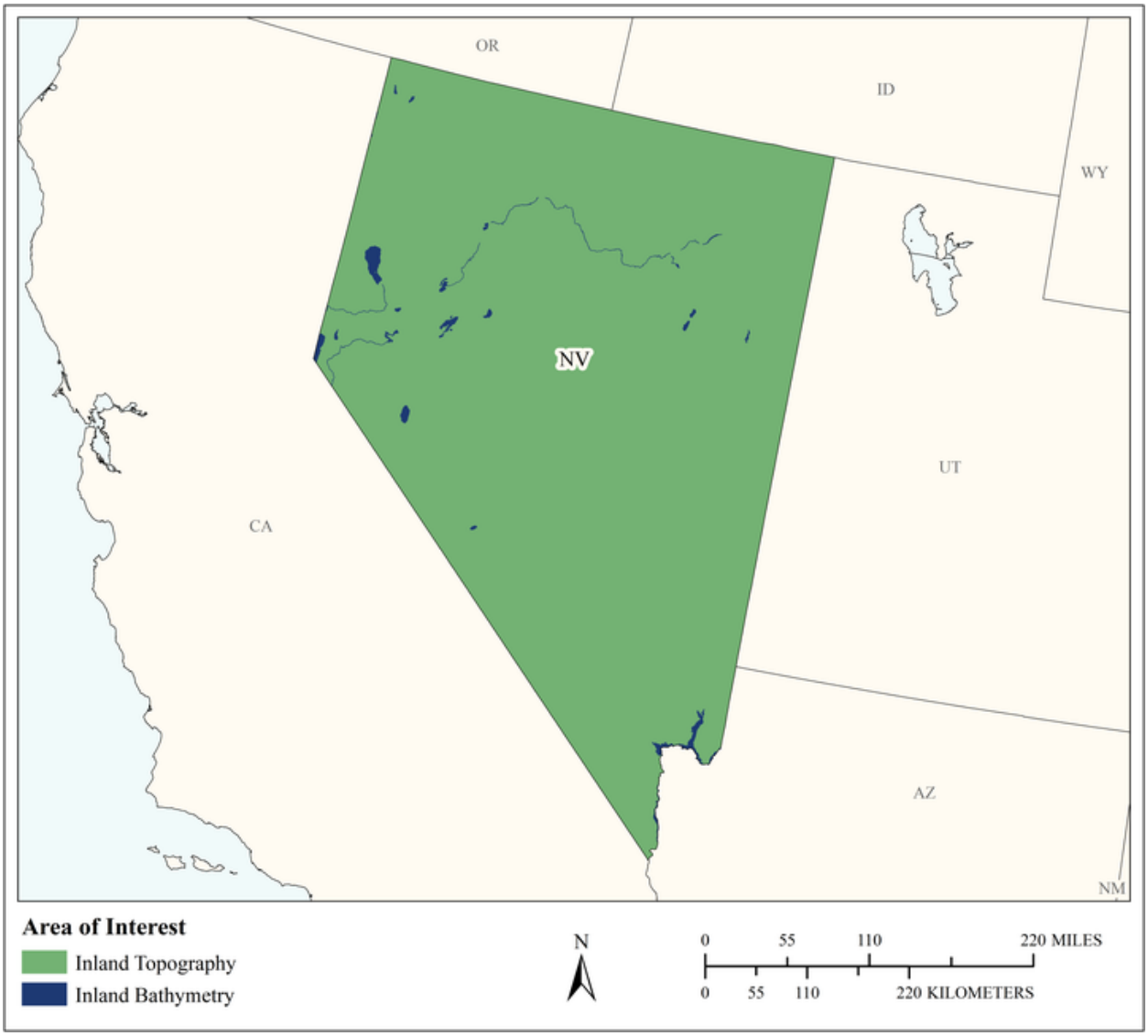
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$7,236									
Time savings description	Repeat acquisitions for topographic change detection using lidar could replace time spent on INSAR analysis. Benefits potentially much broader due to better resolution. 3 weeks. Would be able to weigh in on issues, but wouldn't change regular required field time.											
Cost savings/cost reduction	Moderate	Unable to provide										
Cost savings/cost reduction description	We wouldn't be able to spend state moneys on a project like this.											
Cost avoidance	Moderate	Unable to provide										
Cost avoidance description	Insar has its limitations and takes a big of processing know-how to use. Could induce errors - for instance we see subsidence but there may be a difference of opinion why (pumping? farming? climate?).											
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Mission-driven performance improvements description	Would be able to more knowledgeably weigh in, before we physically inspected areas and findings were largely inconclusive.											
Future annual operational benefits added during validation		Annual dollars saved/ realized	$492,912									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Value added to products or services description	Would be able to support future production if effects on basin prove to be minimal.											
Improved response or timeliness	Moderate	Unable to provide										
Improved response or timeliness description	As mentioned above, current analysis were largely inconclusive would have some sense of how the basin are changing through time. As mentioned above, current analysis were largely inconclusive, would have better ability to weigh in on disputes.											
Improved customer experience	Minor	Unable to provide										
Improved customer experience description	It helps the Division to with public appearance to be more up to date in its methods. It helps the Division be more successful by being more up to date in its methods.											
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$100,000									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Education or outreach description	We do a lot of education outreach, this would be a great topic for Nevada schools, we could show them how we are using available data			
Environmental	Major			
Environmental description	As mentioned above, current analysis were largely inconclusive would have some sense of how the basin are changing through time and if they are affecting residents/farms/environment			
Public safety, including life and property	Major			
Public safety, including life and property description	As mentioned above, current analysis were largely inconclusive would have some sense of how the basin are changing through time and if they are affecting residents/farms			

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours				
Hillshades				
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	1
Update frequency	3

MCA Title: Client Service and Support



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Client service and support in using geospatial data. Elevation data are needed for bare earth modeling; contours are used to derive hydrology networks. Bare earth data are needed to detect historic features.
MCA Title	Client Service and Support
MCA ID	22232
Organization Type	Private or Commercial
Organization Name	Gnomon Inc., Carson City NV
Sub-Agency or Division	
Organization Mission	Geospatial information system design, population, and consulting.
Program Name	Business activity; this does not really apply well to private sector consultants!
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	BU 01 - Water Supply and Quality
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	This varies by client need, but in general a single car-size landscape feature (2 to 3 m in maximum extent) is a typical small feature in which our clients have an interest.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Highly desirable
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required

Inland Bathy Feature Size Requirements	Response
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL3B		
Update Frequency	2-3 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI	Varies by client project / need.			
Acceptable Horizontal Error	Up to 50 cm	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm		
How far onshore needed				
How far down the beach profile needed	To MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Not required			Nice to have	
Entire AOI under same environmental conditions	Nice to have	Nice to have			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Not required			Nice to have	
DEM for entire AOI needs to be seamless	Required	Nice to have			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level			Up to triple the required TVU at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable		
DTM	Highly desirable	Nice to have		
DEM	Required	Highly desirable		
Raw point cloud data	Nice to have	Not required		
Classified point cloud	Nice to have	Nice to have		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Highly desirable	Not required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Not required		
Ground control/ground truthing	Nice to have	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Nice to have	Nice to have		
Wetlands	Nice to have	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have	Required		
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Nice to have		
Cultural resources	Highly desirable	Nice to have		
Coastal and riverine structures	Nice to have	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Typically QL 1 (not HD) is great; QL2 is often sufficient.	Currently using limited available bathymetry data for fluvial geometry analysis for selected clients. Bathymetry QL 3 has been very useful.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast		Yes		
NCEI		Yes		
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	None	Minor		

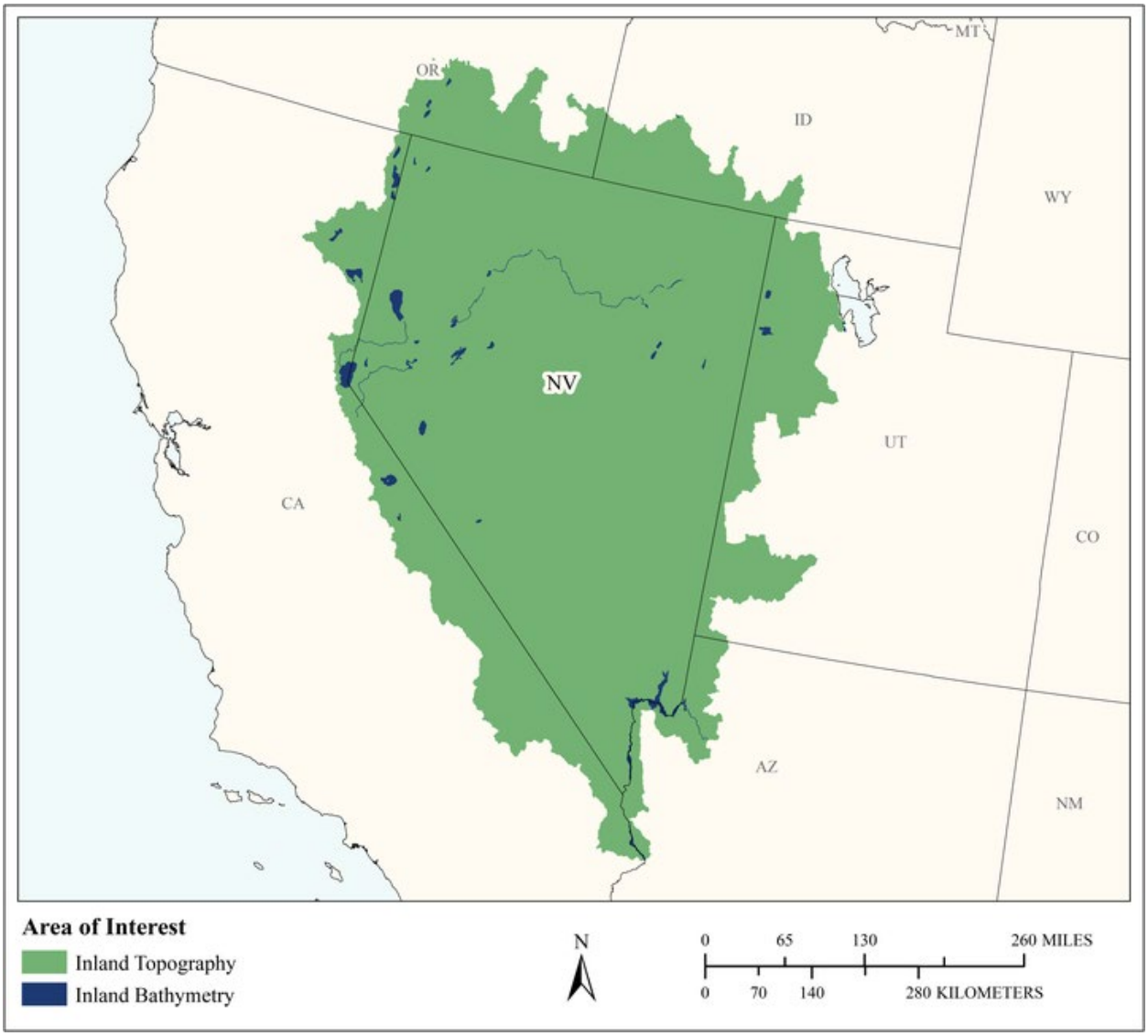
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	Minor	Moderate		
Mission-driven performance improvements	Minor	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor		
Improved response or timeliness	Moderate	Major		
Improved customer experience	Major	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	Minor		
Environmental	Moderate	None		
Public safety, including life and property	None	I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$15,075	Minor	Unable to provide							
Cost savings/cost reduction	Moderate	Annual dollars saved/realized	$3,000	Minor	Unable to provide							
Cost avoidance	Major	Annual dollars saved/realized	$2,500	Minor	Unable to provide							
Increased revenues	None			None								
Mission-driven performance improvements	Moderate	Unable to provide		Minor	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	Moderate	Annual dollars saved/realized	$15,075	None								
Improved customer experience	Moderate	Annual dollars saved/realized	$3,015	Minor	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			None								
Environmental	Moderate			None								
Public safety, including life and property	Moderate			None								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes	Yes		
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Flood Risk Modeling and Mapping of Rivers, Drainages, and Alluvial Fans



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more Hydrologic Units (HUC8s)	One or more Hydrologic Units (HUC8s)		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Flood risk modeling and mapping of rivers, drainages, and alluvial fans.
MCA Title	Flood Risk Modeling and Mapping of Rivers, Drainages, and Alluvial Fans
MCA ID	32800
Organization Type	State or U.S. Territorial government
Organization Name	Nevada Division of Water Resources
Sub-Agency or Division	
Organization Mission	The mission of the Nevada Division of Water Resources (NDWR) is to conserve, protect, manage and enhance the State's water resources for Nevada's citizens through the appropriation and reallocation of the public waters. In addition, the Division is responsible for quantifying existing water rights; monitoring water use; distributing water in accordance with court decrees; reviewing water availability for new subdivisions and condominiums; reviewing the construction and operation of dams; appropriating geothermal water; licensing and regulating well drillers and water rights surveyors; reviewing flood control projects; monitoring water resource data and records; and providing technical assistance to the public and governmental agencies. The goal of the NDWR's Floodplain Management Program is to create flood resilient communities in Nevada that encourage protection of life, property, water quality, environmental values and the preservation of natural floodplain functions.
Program Name	Nevada Floodplain Management Program
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 25 - Real Estate, Banking, Mortgage, and Insurance
Tertiary Business Use	BU 23 - Urban and Regional Planning

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Channels (including ephemeral)

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required

Inland Bathy Feature Size Requirements	Response
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI	Drainages with minimal development in/around them do not require frequent updates.			
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs		Partial		
Cross section/transect requirement		Transects are not required in sub-watersheds with minimal development		

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Nice to have	Nice to have			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have		
DTM	Highly desirable	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Highly desirable	Highly desirable		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Nice to have	Nice to have		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Nice to have	Nice to have		
Wetlands	Nice to have	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Required		
Bridges/culverts	Highly desirable	Required		
Landmark features	Nice to have	Nice to have		
Cultural resources	Not required	Not required		
Coastal and riverine structures	Required	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Floodplain mapping efforts require QL2 level or better data. Typically data is new or only a few years old. Lidar acquisition has been funded by FEMA, Bureau of Reclamation, the Navy, USGS, and others. In some communities lidar data exists, access is restricted. It is currently unclear whether this data would be available for floodplain mapping purposes, and at what cost.	QL2—US Army Corps of Engineers and the University of Nevada Reno Desert Research Institute		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				

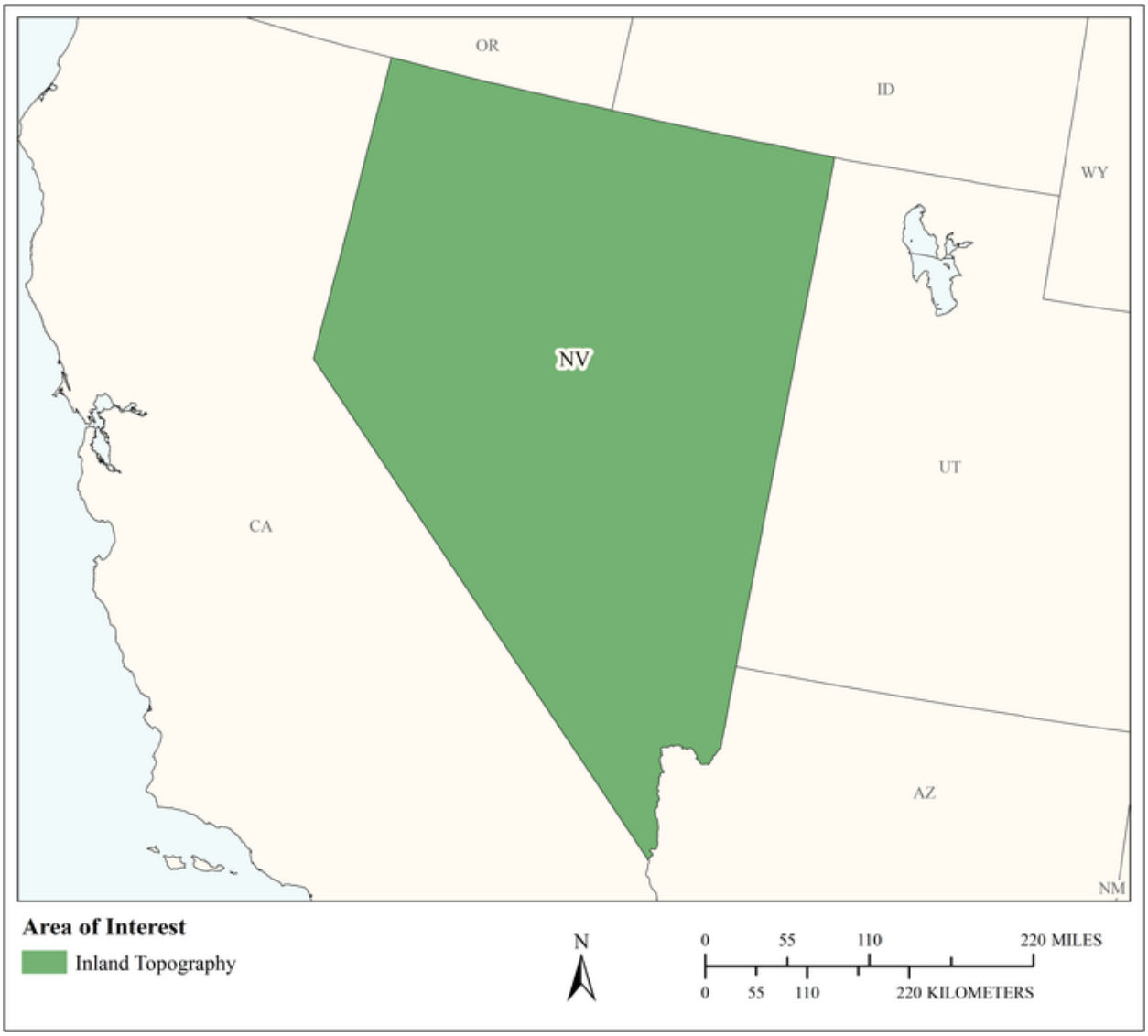
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes	Yes		
Other description	Depends on the contractor	Depends on contractor		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor	Minor		
Cost savings/cost reduction	Major	Moderate		
Cost avoidance	Moderate	Moderate		
Increased revenues	None	I don't know		
Mission-driven performance improvements	Moderate	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		
Improved response or timeliness	Moderate	None		
Improved customer experience	Moderate	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor		
Environmental	Minor	Minor		
Public safety, including life and property	Moderate	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Moderate	Unable to provide							
Time savings description	Could perform more accurate modeling for flood maps. Wouldn't have to spend time finding available and missing data.			Could perform more accurate modeling for flood maps. Wouldn't have to spend time finding available and missing data.								
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction description	Wouldn't have to budget for data acquisition in flood mapping update projects.			Wouldn't have to budget for data acquisition in flood mapping update projects.								
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide							
Cost avoidance description	Data would enhance understanding of changes in flood risk due to development. Would potentially have more accurate flood forecasts.			Data would enhance understanding of changes in flood risk due to development. Would potentially have more accurate flood forecasts.								
Increased revenues	None			None								
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide							
Mission-driven performance improvements description	Data would improve modeling accuracy for FEMA flood maps. Development decisions would be better informed with better data. Data would improve modeling accuracy for FEMA flood maps.			Data would improve modeling accuracy for FEMA flood maps. Development decisions would be better informed with better data. Data would improve modeling accuracy for FEMA flood maps.								
Future annual operational benefits added during validation		Annual dollars saved/ realized	$15,523,402		Annual dollars saved/ realized	$1,078,363						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Moderate	Unable to provide							
Value added to products or services description	Flood maps, and potentially flood warnings, would have improved accuracy across the state.			Flood maps, and potentially flood warnings, would have improved accuracy across the state.								
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness description	Potential improvements to flooding forecasts. Data could expedite the update of flood maps in need of revision across the state.			Potential improvements to flooding forecasts. Data could expedite the update of flood maps in need of revision across the state.								
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Improved customer experience description	Better input data for flood map modeling should bolster the public's trust in flood map products.			Better input data for flood map modeling should bolster the public's trust in flood map products.								
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$2,716,109		Annual dollars saved/ realized	$1,210,725						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate								
Environmental	Minor			Minor								
Public safety, including life and property	Major			Major								
Public safety, including life and property description	Accurate flood risk data is critical for community decision making, especially in regards to development and storm-related responses			Accurate flood risk data is critical for community decision making, especially in regards to development and storm-related responses								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades				
Slope maps	Yes	Yes		
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Wildfire Management, Planning, and Response



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of forest fuel and fire susceptibility. Fire behavior modeling to support wildfire suppression activities. Wildland/urban interface building identification. Post fire analysis to determine landslide prone areas.
MCA Title	Wildfire Management, Planning, and Response
MCA ID	60289
Organization Type	State or U.S. Territorial government
Organization Name	State of Nevada
Sub-Agency or Division	Nevada Division of Forestry
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 17 - Wildfire Management, Planning, and Response
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

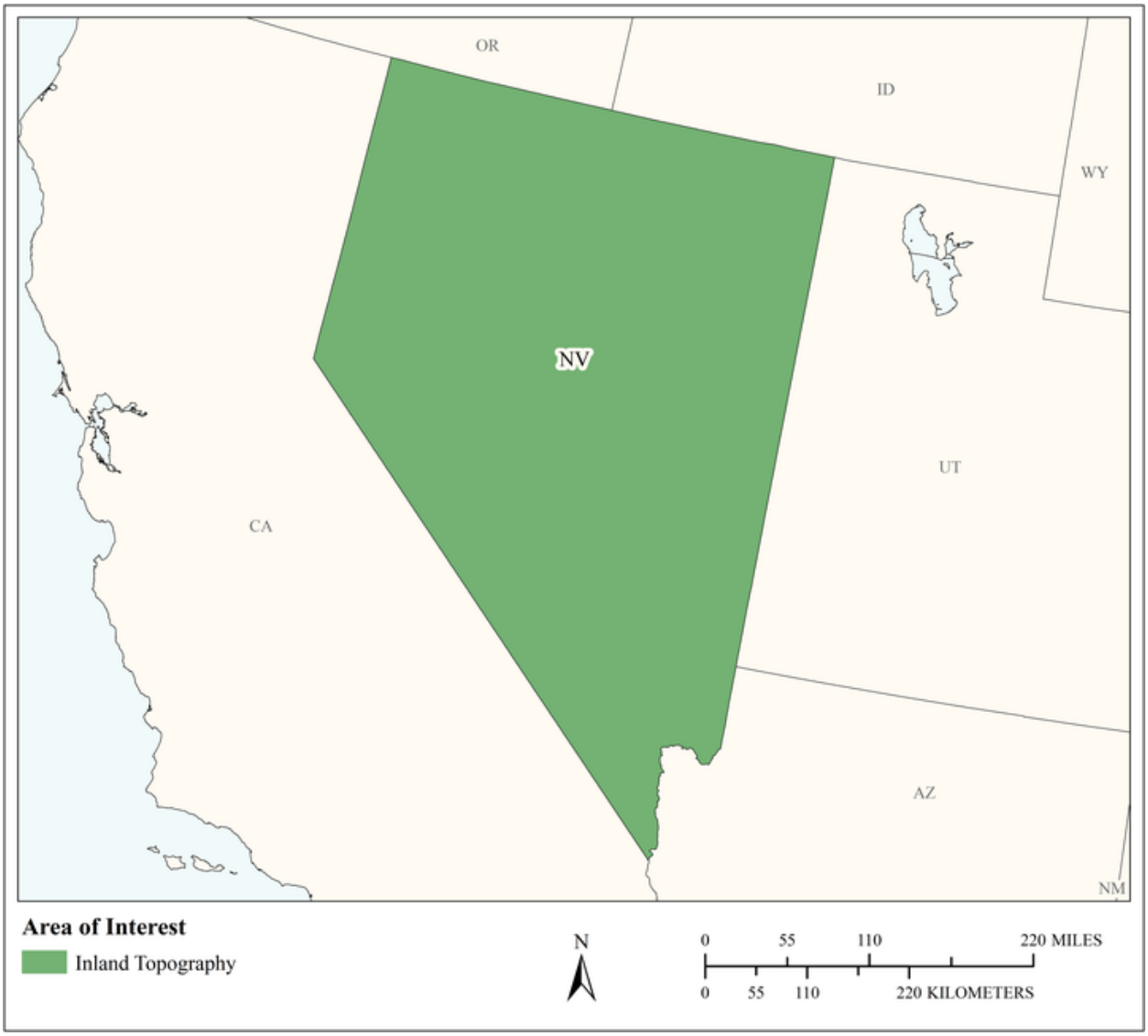
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$300,000									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Homeland Security, Law Enforcement, Disaster Response, and Emergency Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Infrastructure and border protection. Coastal search and rescue. Population dynamics. Emergency fuel supply and movement. Line of sight analysis in urban areas. Disaster response. Flood risk analysis resulting from acts of terrorism.
MCA Title	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
MCA ID	60290
Organization Type	State or U.S. Territorial government
Organization Name	State of Nevada
Sub-Agency or Division	Nevada Division of Emergency Management
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

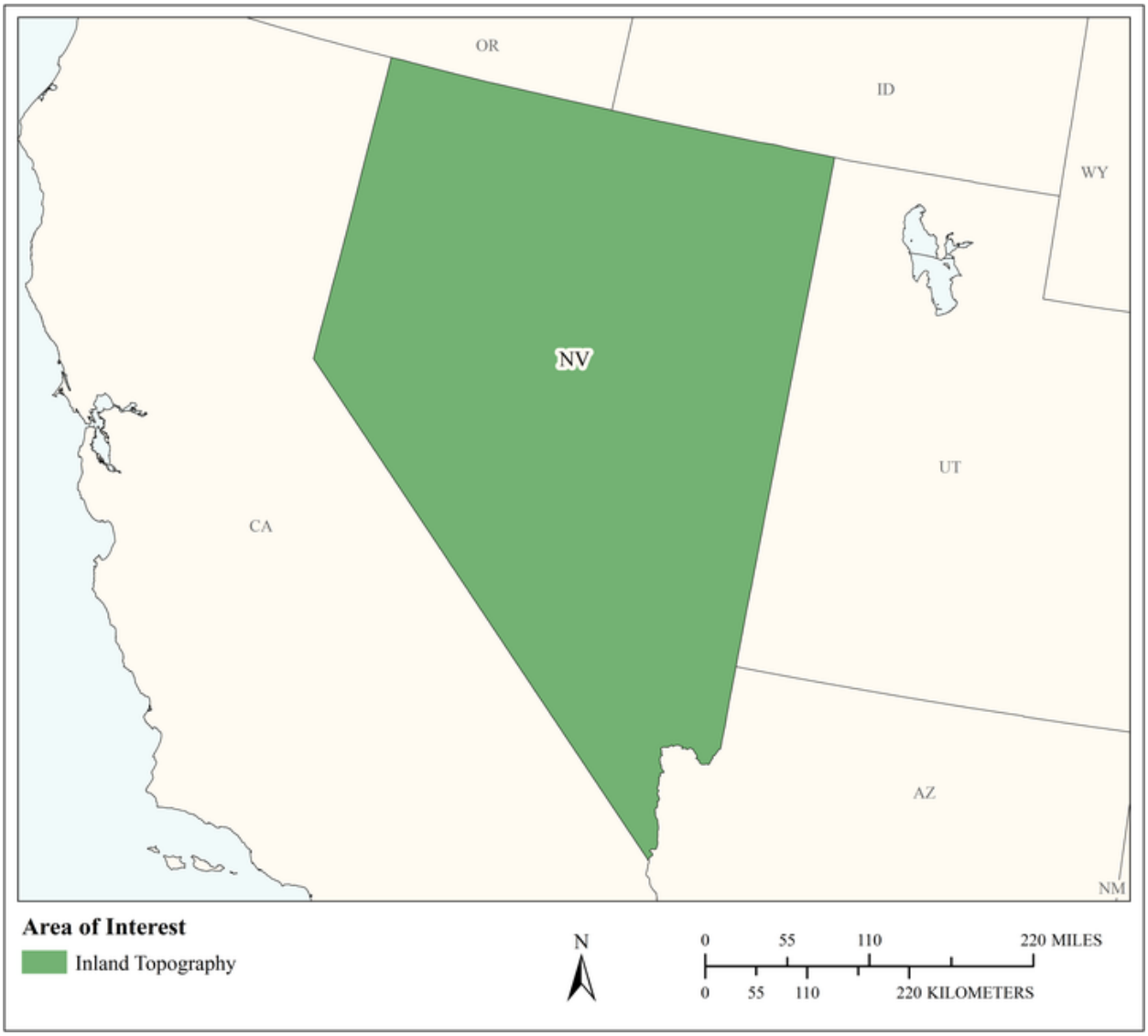
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Minor			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$3,261,565									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Moderate											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Land Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Road and railroad route selection and maintenance. Slope analysis for autonomous cars. GPS navigation visualization.
MCA Title	Land Navigation and Safety
MCA ID	60291
Organization Type	State or U.S. Territorial government
Organization Name	State of Nevada
Sub-Agency or Division	Nevada Department of Transportation
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 19 - Land Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

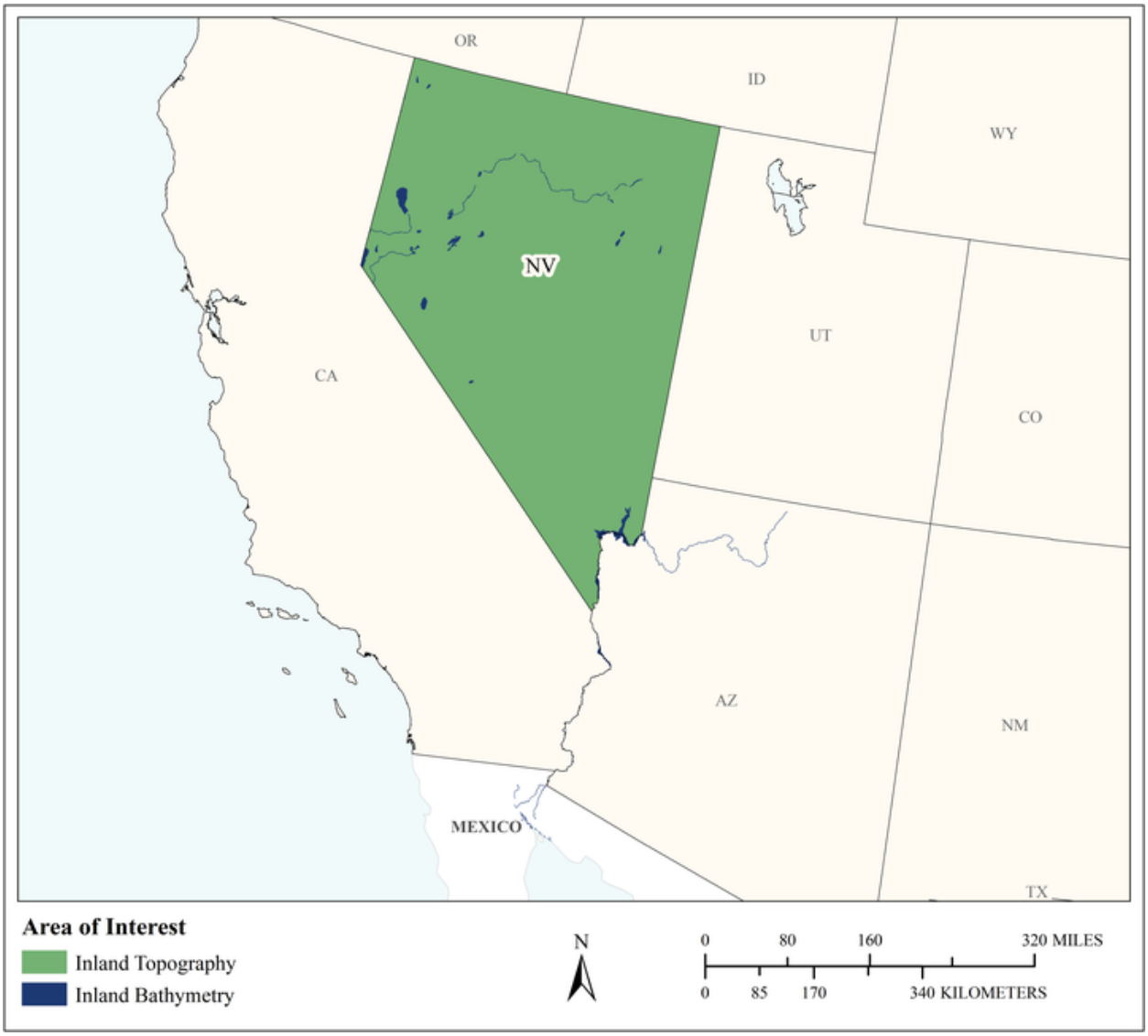
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Moderate			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Moderate	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$690,000									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$115,661									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Airport Security and Public Safety, Planning and Infrastructure Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	Custom description		
Sub Area Requirements		Nevada and HUCs 1606, 1501, & 1503		

MCA Description	Response
Mission Critical Activity	Airport Security and Public Safety, Planning and Infrastructure Management. Comply with Federal Aviation Administration (FAA) requirements to develop and maintain the Airport Layout Plan (ALP) data in a specific GIS format. This action is also in support of Strategic Initiatives: Expand Cargo Development and Service, Increase Air Service, Optimize General Aviation Operations and Services, and Facilitate Economic Development. The enterprise GIS, related datasets and applications are expected to provide timely, accurate data for airport users, leading to better data analysis, enhanced information sharing, improved decision making, and potential operational cost reductions. Airport GIS data is critical in many aspects of our community. From flooding to transportation modeling to passenger ease of use and most everything in between, all available data is used at a critical level for passenger and public safety. Having the highest resolution, latest data available will make our airport as viable and safe as possible. And will enhance passenger experience and future business.
MCA Title	Airport Security and Public Safety, Planning and Infrastructure Management
MCA ID	32891
Organization Type	Regional, County, City, or other local government
Organization Name	Nevada Airport Authorities
Sub-Agency or Division	
Organization Mission	Vision Statement: To be a global leader. Mission Statement: To provide excellence in customer service, airport facilities, and airport security. To maintain and grow aviation services and facilities, as part of the global air transportation system, to transport people and goods to benefit the region while being financially self-sustaining. Our vision is to develop and operate a system of airports that support our region's economic growth and provide safe, convenient and customer-focused facilities. This will create a positive experience for those who work at and travel through our airports.
Program Name	FAA Exhibit A property management; The Airport GIS leverages datasets into an enterprise GIS with information available to enhance and improve the efficiencies of various airport business and operational functions.
Total Annual Program Budget	
Primary Business Use	BU 21 - Aviation Navigation and Safety
Secondary Business Use	BU 22 - Infrastructure and Construction Management
Tertiary Business Use	BU 25 - Real Estate, Banking, Mortgage, and Insurance

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Assets such as airfield signage, paint, structures, taxiways, runways, aprons, perimeter roads, etc...

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Nice to have
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Other	Highly desirable
Other description	Flood Control Planning
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable
Other	Highly desirable
Other description	Flood Control Planning (reservoirs, dry lakes)

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B		
Update Frequency	2-3 years	2-3 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	Less than 50 cm		
Acceptable Vertical Error	Up to 20 cm	Up to 20 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial	Partial		

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross section/transect requirement	Cross Sections or transects in south Clark County, NV for SNSA site and Las Vegas valley urban area.	QL1		

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Highly desirable		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Highly desirable	Highly desirable		
Edited/cube XYZ		Highly desirable		
Full waveform	Highly desirable	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required	Highly desirable		
Land use/land cover	Required	Required		
Wetlands	Highly desirable	Highly desirable		
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Required	Required		
Cultural resources	Required	Highly desirable		
Coastal and riverine structures	Nice to have	Not required		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			
Other		Highly desirable		
Other description		Roadways		

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	3" imagery from 2018 flights and 2016 QL1 Lidar data for urban areas. No current continuous coverage for south Clark County, NV available. 3" aerials for Reno-Tahoe Airport. Purchased 6" from Washoe County in 2016 for Reno-Stead Airport. Lidar flown in 2015 to capture all obstacle data.	6" imagery collected as needed for areas/facilities and land owned outside the urban environment		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes	Yes		
Other description	GISMO-County site. Airport-flown Lidar from 2015	Local government - GISMO		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Moderate	Major		
Increased revenues	Minor	Minor		
Mission-driven performance improvements	Major	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		
Improved response or timeliness	Major	Major		
Improved customer experience	Major	Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Moderate		
Environmental	Major	Major		
Public safety, including life and property	Major	Major		

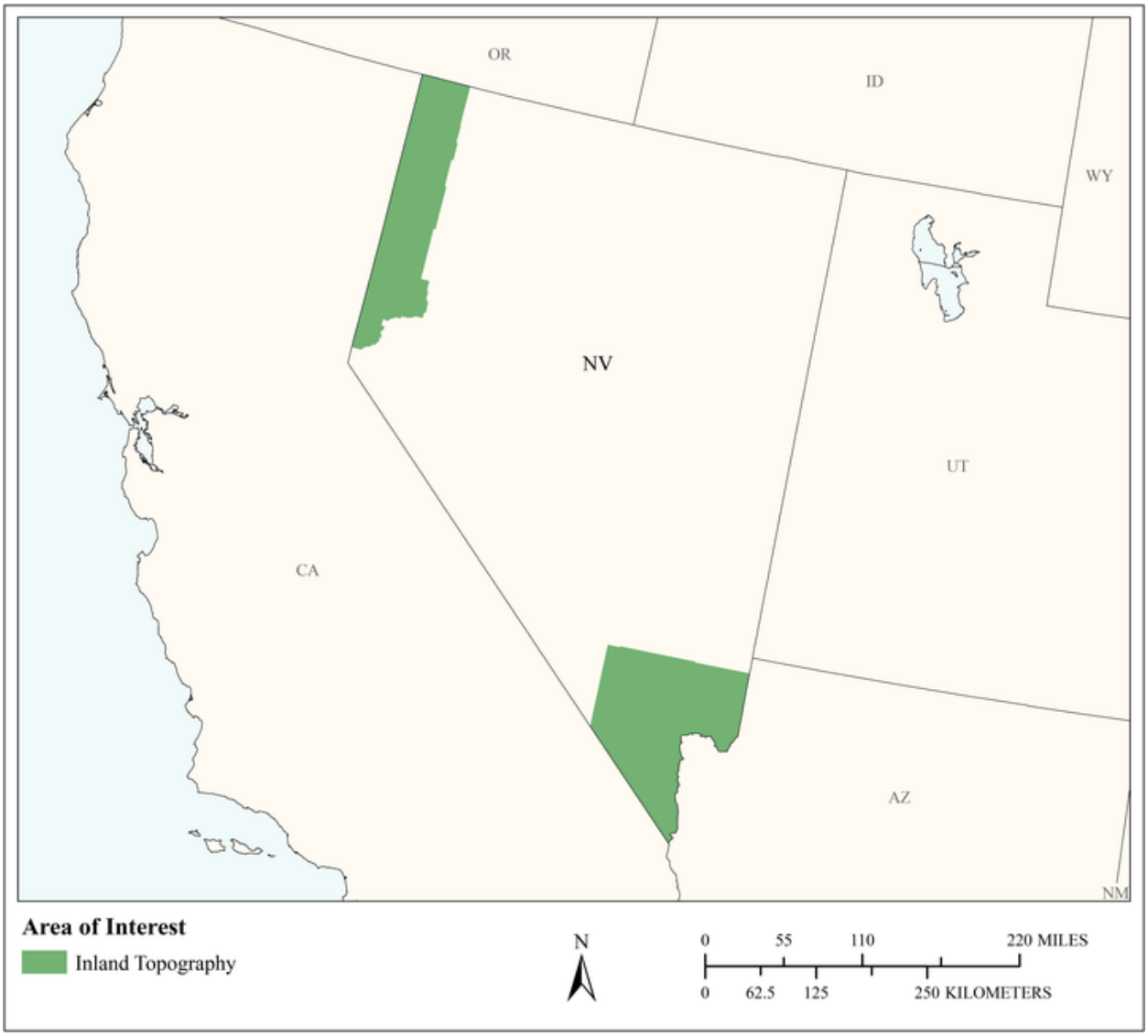
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$267,732	Major	Annual dollars saved/realized	$102,510						
Time savings description	Asset Management & verification, Operations, FAA inspections, wildlife mitigation, obstacle identification. C/E Projects and planning studies; Verification of field conditions, operations use, maintenance, facilities. C/E Projects and planning studies; FAR139 certification/inspection & AGIS data updates; FAA inspections, wildlife mitigation, obstacle identification. C/E Projects and planning studies, master plan implementation on projects. Seamless data and coverage, not having to rely on external data sources. FAA & TSA Compliance, life safety.											
Cost savings/cost reduction	Major	Annual dollars saved/realized	$36,000	Major	Unable to provide							
Cost savings/cost reduction description	Better estimates for contracts and operational items, millings/fill/paint, gasoline for inspections, etc... Cost savings.											
Cost avoidance	Major	Annual dollars saved/realized	$34,000	Major	Unable to provide							
Cost avoidance description	Contractor errors in planning & construction; Avoid contract fees; legal fees, confusion avoided, better wayfinding. Ability to quantify losses with better data. Flood mitigation. Software for processing/storage & survey verification; Staff time savings. Contractor errors in planning & construction; Avoid contract fees; Obstacle evaluations & mitigation.											
Increased revenues	Major	Annual dollars saved/realized	$12,000	Major	Unable to provide							
Increased revenues description	Improved applications for use by internal stakeholders for increased efficiencies. Planning & development efficiencies and estimates; Avoid contract fees.											
Mission-driven performance improvements	Major	Annual percent improvement	100%	Major	Unable to provide							
Mission-driven performance improvements description	Overall more consistent data products for all facilities for planning & construction. Timeliness and regular frequency of quality data; more organization buy-in. Current data for areas not currently available; better accuracy.											
Other operational benefits	Major	Annual dollars saved/realized	$30,150									
Other operational benefits description	Coverage for undeveloped areas to be developed in future under Federal Law. Federal Legislative & legal compliance.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$89,244	Major	Unable to provide							

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Value added to products or services description	Wayfinding, passenger satisfaction. Navigation aid identification, flood warnings, airspace obstacle identification.											
Improved response or timeliness	Major	Annual dollars saved/realized	$342,456	Major	Unable to provide							
Improved response or timeliness description	Avoid contract fees; Time savings & operational data capture for internal stakeholders; Airspace obstacle identification, airfield signage and marking identification. Avoid contract fees; Time savings & operational data capture for internal stakeholders; faster identification of damaged structures. $40,000 + 1,000 annual hours saved. Avoid contract fees; Time savings & operational data capture for internal stakeholders; passenger travel warnings. Avoid contract fees; Time savings & operational data capture for internal stakeholders; mobile device use by passengers. Avoid contract fees; Operational improvement; Aircraft rescue and firefighting response times, Triennial preparation. $40,000 + 1,000 annual hours saved. Avoid contract fees; Mitigate height related legal issues; permitting approval, EIS reviews. $40,000 + 1,000 annual hours saved.											
Improved customer experience	Major	Annual dollars saved/realized	$9,045	Major	Unable to provide							
Improved customer experience description	Avoid contract fees; Time savings & operational data capture for facility stakeholders; clearinghouse and silo elimination. Avoid contract fees; Time savings & operational data capture for facility stakeholders; in-house application development. Avoid contract fees; Time savings & operational data capture for facility stakeholders; more customer buy-in.											
Other customer service benefits	Major	Annual dollars saved/realized	$30,150									
Other customer service benefits description	Airport planning.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate								
Education or outreach description	Sharing with stakeholders & contractors; data sharing											
Environmental	Major			Major								
Environmental description	Better decision-making and coordination for planning & construction; environmental review of proposed projects											
Public safety, including life and property	Major			Major								
Public safety, including life and property description	Improved safety monitoring and operational data; Mitigation of any issues for public safety. Obstacle identification, wildlife mitigation, FAA inspections											
Other	Transportation planning											
Other benefits	Major			Major								
Other description	Regional level dataset for all facilities; ease of use in passenger modeling											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Provide and Maintain an Updated, Reliable Water Delivery System to a Large Urban Area



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements	Clark & Washoe Counties, NV			

MCA Description	Response
Mission Critical Activity	Provide and maintain an updated, reliable water delivery system to a large urban area.
MCA Title	Provide and Maintain an Updated, Reliable Water Delivery System to a Large Urban Area
MCA ID	21653
Organization Type	Regional, County, City, or other local government
Organization Name	Southern Nevada Water Authority
Sub-Agency or Division	
Organization Mission	Provide world class water service in a sustainable, adaptive and responsible manner to our customers through reliable, cost effective systems.
Program Name	Operations and Maintenance.
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Objects approximately 1 foot in height

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Nice to have
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required			
DTM	Not required			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Not required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Not required			
Wetlands	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Not required			
Bridges/culverts	Nice to have			
Landmark features	Not required			
Cultural resources	Not required			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Currently using QL1 level DEM derived from LiDAR at 1 foot resolution. Data from 2016.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	We contracted for our own data and store it locally.			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Moderate			

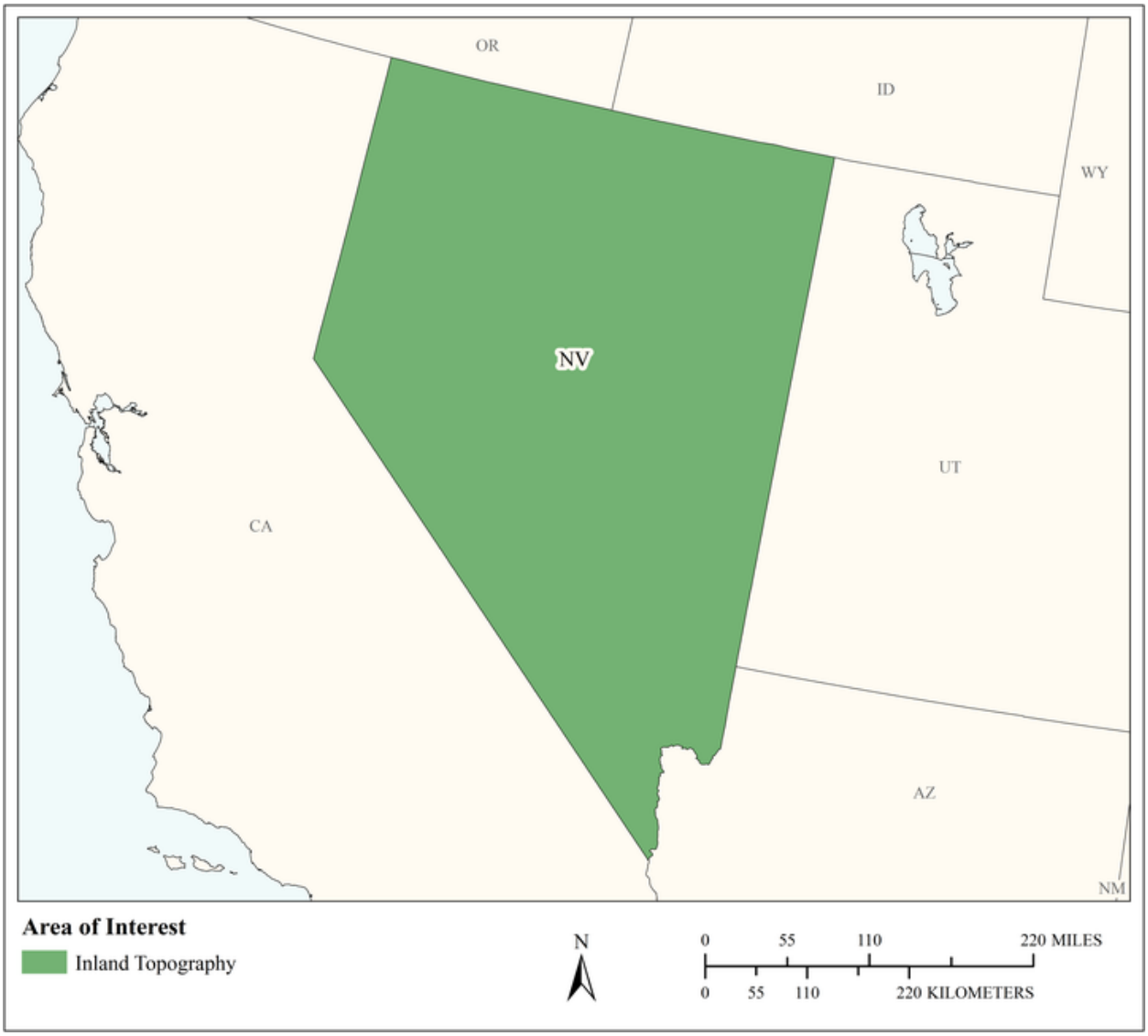
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None			
Improved response or timeliness	None			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	None			
Public safety, including life and property	None			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Annual dollars saved/realized	$40,000									
Cost savings/cost reduction description	Based on USGS cost share, 4-year cycle.											
Cost avoidance	Major	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Other operational benefits	Moderate	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$618,004									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None											
Environmental	None											
Public safety, including life and property	None											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades				
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Engineering for Transportation and Other Infrastructure



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Provide engineering services for designing and supporting transportation network and infrastructure for the State of Nevada.
MCA Title	Engineering for Transportation and Other Infrastructure
MCA ID	22019
Organization Type	State or U.S. Territorial government
Organization Name	Nevada DOT
Sub-Agency or Division	
Organization Mission	Provide transportation network and infrastructure for the State of Nevada
Program Name	The Federal Highway's current bill, FAST or Fixing America's Surface Transportation Act.
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 19 - Land Navigation and Safety
Tertiary Business Use	BU 01 - Water Supply and Quality

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Most of our Mission Critical data needs to represent "As-Built" infrastructure to make a more informed engineering decision. This data needs to be "Survey Grade".

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD			
Update Frequency	Event driven only – Data need to coincide with a specific event.			
Event type(s)	Highway construction project or reconstruction due to natural disaster or other cause.			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm			
Acceptable Vertical Error	Less than 5 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial			
Cross section/transect requirement	We would require a vertical accuracy of less than .1 of a foot. The cross sections would typically range from 50' to 100' depending upon the project demands.			

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Nice to have					
Other	Highly desirable					
Other description	Entire roadway needs to be collected at the same time					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Nice to have			
Wetlands	Nice to have			
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Each project currently requires a new survey. This information must meet our state standards for design quality work. We would require the highest level of precision available. Drainage studies would be the most appropriate use enhanced 3D data. Positional requirements of .5 foot would be acceptable and data would not need to be reacquired every year.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	In house collection			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Minor			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Moderate			
Public safety, including life and property	Moderate			

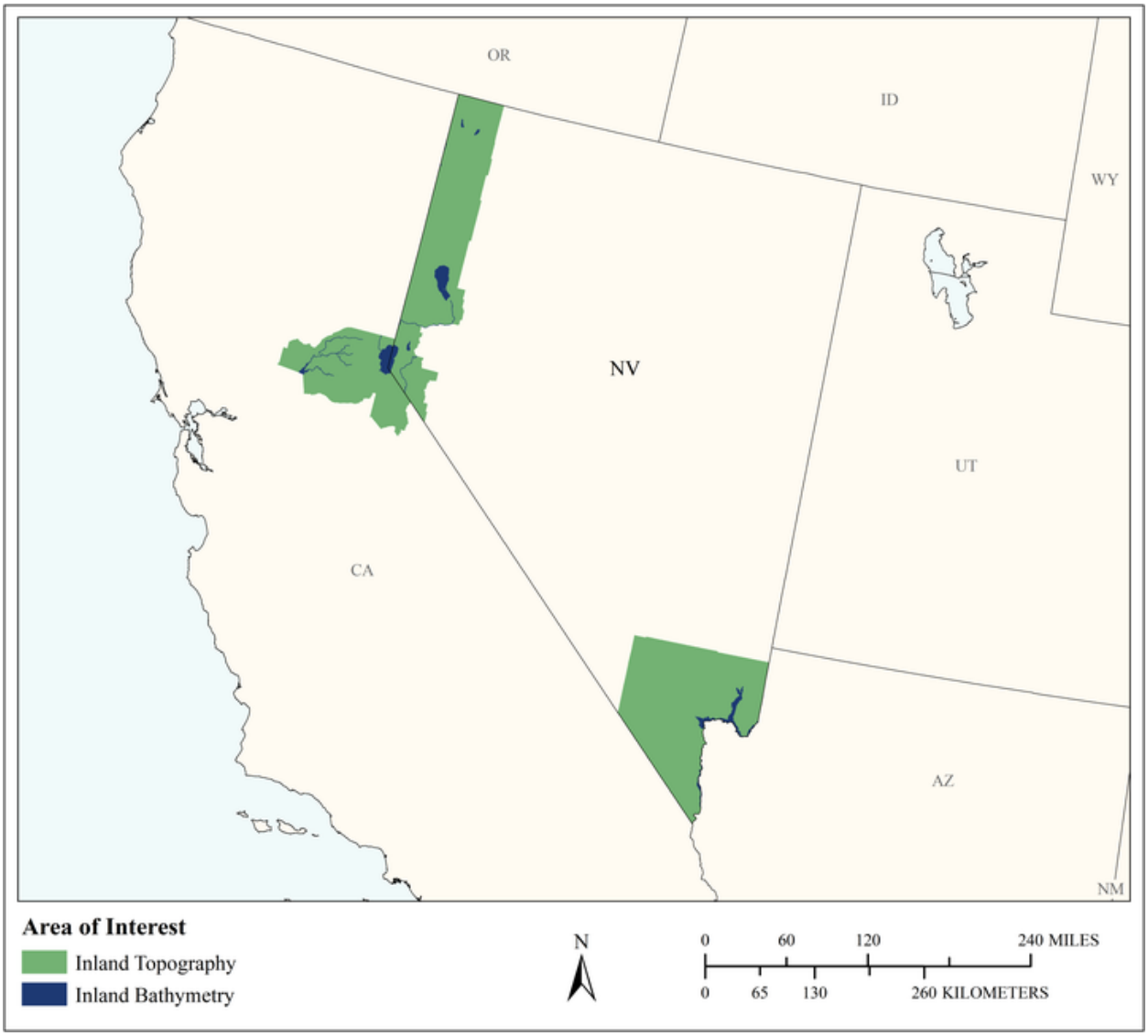
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Time savings description	Avoid going into field to collect data. Would not have to pre-plan data collection missions. Save time from processing and evaluating data. Would not need to correct apparent discrepancies. Be able to create reports and models more efficiently.											
Cost savings/cost reduction	Moderate	Unable to provide										
Cost savings/cost reduction description	Would not need to collect all data in house.											
Cost avoidance	Moderate	Unable to provide										
Cost avoidance description	Hopefully data would meet our requirements for error analysis. Would not need to process our own data. Help build a better transportation network.											
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Moderate	Unable to provide										
Mission-driven performance improvements description	Gain access to information more readily. Would not need to collect all data in house. More accurate information faster for modelling.											
Other operational benefits	Major	Unable to provide										
Other operational benefits description	Would be able to access excellent data when we need it for Hydraulic studies, but not essential to hydraulic studies. Hydraulic Studies.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	None											
Improved response or timeliness	Major	Unable to provide										
Improved response or timeliness description	Better information quicker leads to faster reviews.											
Improved customer experience	Major	Unable to provide										
Improved customer experience description	Serve internal customers faster.											
Other customer service benefits	Moderate	Unable to provide										
Other customer service benefits description	Access to accurate 3D Data. Hydraulics Modelling will be much improved.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None											
Environmental	None											
Public safety, including life and property	None											

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other	Access to accurate 3D Data			
Other benefits	Moderate			
Other description	Access to 3D data for modelling processes much faster for storm water mitigation			

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Ecosystem Approach for Lake Tahoe and Las Vegas Environmental Restoration Goals



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements	Clark, Washoe, Carson City, & Douglas Counties, NV and Alpine, El Dorado, & Placer Counties, CA	Clarck, Washoe, Carson City, & Douglas Counties, NV and El Dorado & Placer Counties, CA		

MCA Description	Response
Mission Critical Activity	Stormwater best management practice (BMP) prioritization and design. Impervious surface classification used to quantify and regulate development and parking. Vegetation classification used to plan and assess forest health treatments and model fuel loads and wildfire risk. Benthic habitat mapping used to assess and quantify native and aquatic invasive species distribution. Nearshore nautical navigation.
MCA Title	Ecosystem Approach for Lake Tahoe and Las Vegas Environmental Restoration Goals
MCA ID	1354
Organization Type	Regional, County, City, or other local government
Organization Name	Tahoe Regional Planning Agency
Sub-Agency or Division	
Organization Mission	The Tahoe Regional Planning Agency leads the cooperative effort to preserve, restore, and enhance the unique natural and human environment of the Lake Tahoe Region, while improving local communities, and people's interactions with our irreplaceable environment.
Program Name	Environmental Improvement Program, Long Range Planning Division, and the Research and Analysis Division.
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 01 - Water Supply and Quality
Tertiary Business Use	BU 04 - Forest Resources Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required
Other	Required
Other description	Would eventually require inland bathymetry to 20 m depth

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	We are interested in identifying individual trees, buoy blocks, parking lots, piers, roadways, houses, and decks.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Other	Required
Other description	Buoy block (less than 1 sqm)
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B		
Update Frequency	4-8 years	4-8 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Less than 50 cm		
Acceptable Vertical Error	Up to 10 cm	Less than 10 cm		
How far onshore needed				
How far down the beach profile needed	Below MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement	Need seamless topobathy	Need seamless topobathy		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Required			Required	
Entire AOI under same environmental conditions	Required	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Required	Required		
Classified point cloud	Required	Required		
Edited/cube XYZ		Highly desirable		
Full waveform	Required	Required		
Bathymetric Attributed Grid (BAG)		Required		
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required	Required		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Nice to have	Highly desirable		
Coastal and riverine structures	Required	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We are currently using a 2010 LiDAR acquisition collected at QL1.	SHOALS USGS 2000. https://walrus.wr.usgs.gov/pacmaps/lt-shoal.html		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts		Yes		
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Major		
Increased revenues	Major	Major		
Mission-driven performance improvements	Major	Major		

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		
Improved response or timeliness	Major	Major		
Improved customer experience	Major	Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major		
Environmental	Major	Major		
Public safety, including life and property	Major	Major		

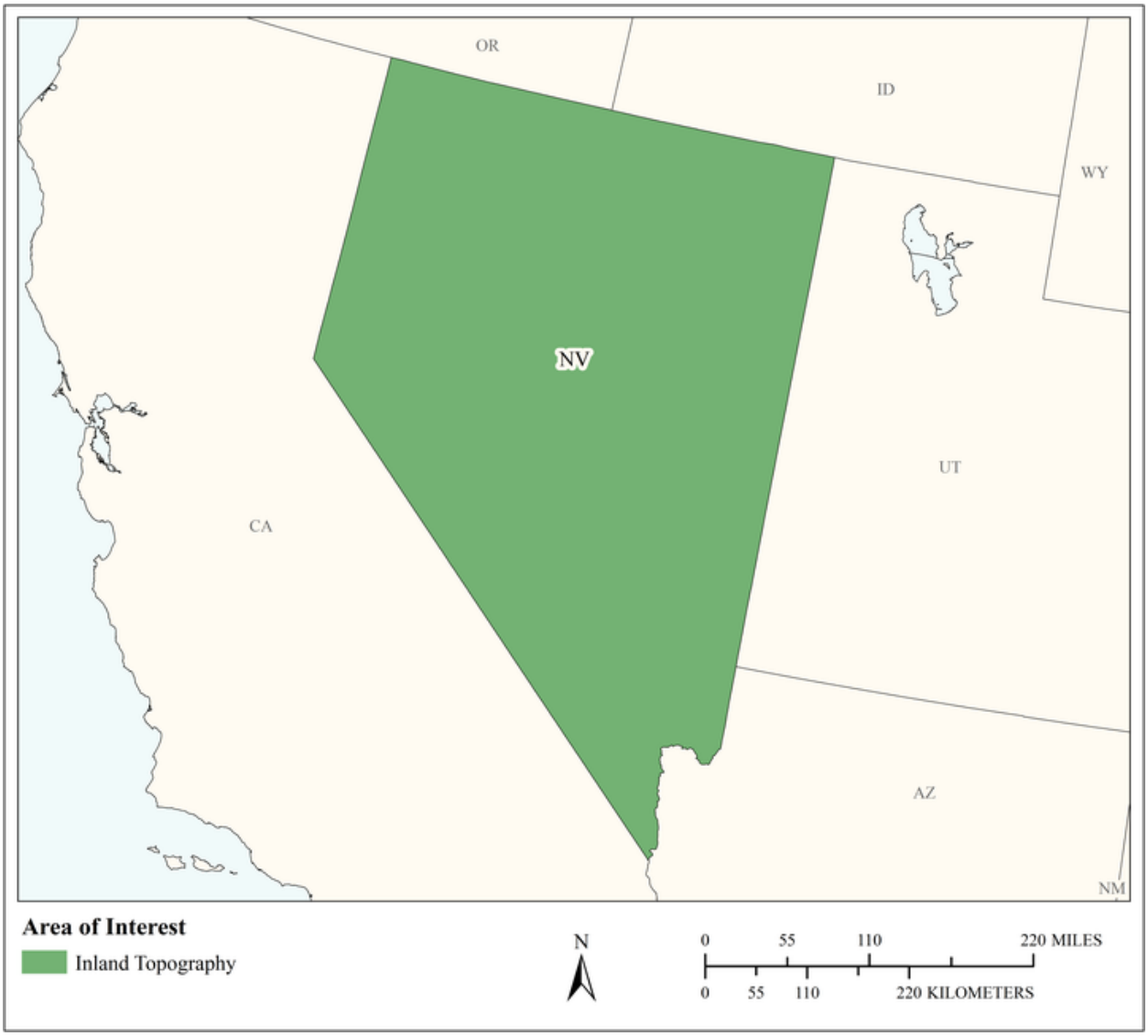
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$153,765	Major	Annual dollars saved/realized	$99,495						
Time savings description	Identifying features from LiDAR has reduced field survey requirements. Fewer site visits required to assess parcel characteristics. Seamless elevation data allows for more efficient modeling. Increased accuracy has allowed for more precise planning. Better modeling will allow for better project design. Modeling in the office has reduced field data collection time.			Hydroenforment savings for stormwater runoff modeling. We will save hours permitting the acceptable depth and location for piers and buoys on Lake Tahoe. We will also save time identifying areas where aquatic invasive species may exist.								
Cost savings/cost reduction	Major	Annual dollars saved/realized	$50,000	Major	Annual dollars saved/realized	$50,000						
Cost savings/cost reduction description	By replacing field surveys with LiDAR modeling.											
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide							
Increased revenues	I don't know	Unable to provide		Major	Unable to provide							
Increased revenues description	Products are distributed free of charge to stakeholders.			New nautical navigation tools will save our boat crew time and resources.								
Mission-driven performance improvements	Major	Annual percent improvement	100%	Major	Unable to provide							
Mission-driven performance improvements description	Our ability to accurately depict impervious surface, hydrology connectivity, and forest stand and structure informs design and implementin of projects. Better understanding of the change in forest structure and effectiveness of forest health treatments. Impervious surface directly informs permitting, implementation of the regional plan and regulatory reporting. Stormwater BMP modeling, Forest stand and structure modeling, and impervious surface modeling has made all of our divisions more effective.			Our ability to update thresholds for the nearshore environment of Lake Tahoe is contingent upon collection topobathy data. Our ability to accurately depict the nearshore environment will greatly inform our planning efforts. The ability to map benthic habitat, bouy blocks, and piers will help us prioritize enforcement efforts and permitting.								
Future annual operational benefits added during validation		Annual dollars saved/ realized	$4,199,397									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Annual dollars saved/realized	$6,030						
Value added to products or services description	Inland bathymetry will improve monitoring and response to Aquatic Invasive Species, implementation of the shoreline program. Identificati“ on of "ghost" roads on the landscape will help our environmental improvement program direct the construction of new roads and rehabilitation of the "ghost" (old) roads needed for forest health treatments. Change in impervious cover aids tracking and enforcement of the regional plan.			Inland bathymetry will improve monitoring and response to Aquatic Invasive Species, implementation of the shoreline program, and improve boater safety.								
Improved response or timeliness	Major	Annual dollars saved/realized	$93,465	Major	Annual dollars saved/realized	$18,090						

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Improved response or timeliness description	Improved ability to map sensitive habitats in the nearshore environment will help steer new development away from that. In the event of a Wildfire, slope modeling would be crucial to understanding landslide potential. Improved parcel slope delineation will help planners permit projects at the parcel level. In the event of a wildfire, LiDAR would be used in the rapid response to map hazards and conditions for fire crews. In the event of a wildfire, values at risk would be identified by combining soil burn severity models with elevation slope models. Our ability to model forest stand and structure, impervious surface, and catchment size has allowed us to review projects quickly and accurately. Basin wide impervious cover allows for faster calculation of site based impervious cover allowances.			Improved ability to map sensitive habitats in the nearshore environment will help steer new development away from that. Response to aquatic invasive species outbreaks will be much improved. Improved ability to map sensitive habitats in the nearshore environment will help steer new development away from that. improved nautical navigation. Improved ability to map sensitive habitats in the nearshore environment will help steer new development away from that. Improved nautical navigation, improved mapping of AIS risk.								
Improved customer experience	Major	Annual dollars saved/realized	$60,300	Major	Annual dollars saved/realized	$9,045						
Improved customer experience description	Terrestrial LiDAR is enabling more robust evaluation of forest and watershed health treatments and refinemetns in project prioritization. Our ability to estimate floor area and trees using LiDAR has increased confidence in our map products ten fold. Better delineation of inland water regulatory boundaries. By having the data up on Open Topography we are able to easily access the data and point our partners to it. Greater availability of data to the scientific community that supports our mission.			Our ability accurately to map bathymetric contours that will be used to limit the extent of piers will greatly reduce conflict with pier applicants by improving confidence in the contour accuracy. Data on Open Topography will reduce requests from us to curate data and allow greater access to the data. We will have the ability to increase the accuracy of the nearshore mapping which will help us create a useful mobile navigation application with boater safety and information.								
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$364,554									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Education or outreach description	Confidence in data products derived from LiDAR is really high. Potential to refine the education app produced by partners in the basin.											
Environmental	Major			Major								
Environmental description	Models using LiDAR improve assessment of the natural environment and lead to more informed decisions.											
Public safety, including life and property	Major			Major								
Public safety, including life and property description	3D Models during a flood or wildfire allow us to quickly assess values at risk.											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Abandoned Mine Lands Inventory



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	The Abandoned Mine Lands program inventories, monitors and secures abandoned mine hazard sites that pose a physical safety risk. These hazards are the result of historic mining practices that predate the reclamation laws established in the 1970s. The features include shafts, adits (tunnels) and open pits, often with interconnected features. Hundreds of thousands of these features exist in Nevada, with 10's of thousands believed to be hazardous. Fatalities due to bad air, falls and other accidents have occurred in past at these sites. Many features remained un-inventoried in our database as they are very numerous and span the entirety of the state. They are located throughout Nevada: near towns, near occupied structures and in close proximity to roads to rural and hard-to-access federally owned or private lands. The Nevada Division of Minerals works to inventory these hazards and determine the proper method of securing them, with thoughtful respect to wildlife and cultural features, throughout the state. Often these features are hard to access and we have recently began to use remote sensing, such as unmanned aerial systems (UAS) to identify hazards that are hard to reach or many in numbers. We have seen in existing LiDAR scans that it may be possible to remotely identify abandoned mine features of interest using this method.
MCA Title	Abandoned Mine Lands Inventory
MCA ID	1221
Organization Type	State or U.S. Territorial government
Organization Name	Nevada Division of Minerals
Sub-Agency or Division	
Organization Mission	To encourage and assist in the responsible exploration for and the production of minerals, oil, gas, and geothermal energy which are economically beneficial to the State.
Program Name	Abandoned Mine Lands (AML) Program
Total Annual Program Budget	
Primary Business Use	BU 24 - Health and Human Services
Secondary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Tertiary Business Use	BU 07 - Wildlife and Habitat Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required
Other	Highly desirable
Other description	Unfiltered Data with outliers - sub-bare earth, needed to see shafts where points below smoothed raster that could indicate a deep hole.

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)

General Geographic Area and Size	
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Small holes or subsidence in the ground, vertical or inclined, that could be very deep or obscured by vegetation might constitute a hazard. Anything small enough that a small person or pet could fit through. ~1 x 1'.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 40 cm			
Acceptable Vertical Error	Up to 30 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Highly desirable

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Not required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required			
DTM	Required			
DEM	Highly desirable			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Nice to have			
Wetlands	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Not required			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	USGS topo maps, air photos			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	NV Points Layer from Nevada Bureau of Mines and Geology			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			
Improved response or timeliness	Minor			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Moderate			
Public safety, including life and property	Major			

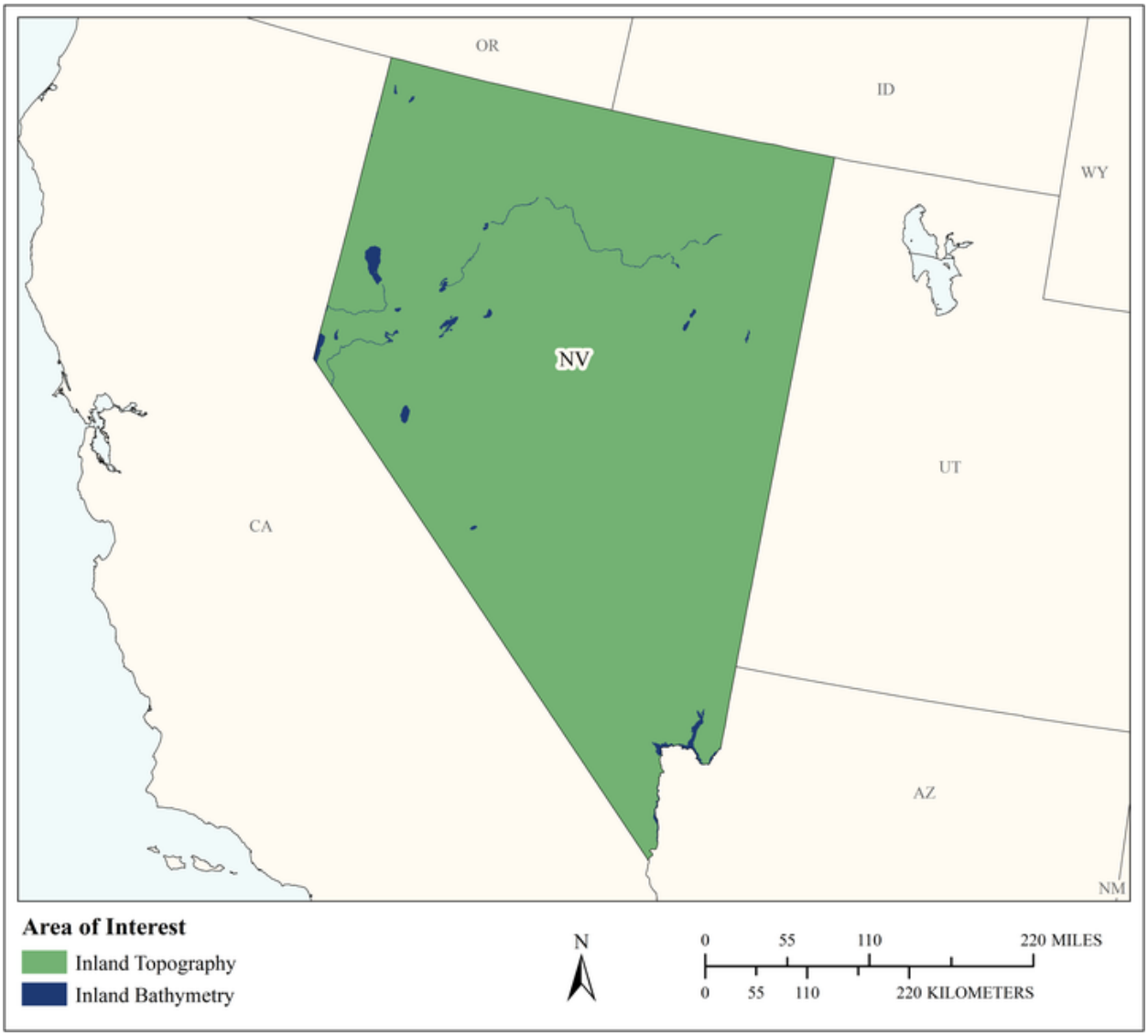
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$9,648									
Time savings description	New datasets would be used to increase productivity. We do not currently use spatial analysis for our workflows. Being able to prioritize an area is key to success on such a large scale as we are working on, this would help us ID potential hazardous sites to visit that we did not know existed before. 2 weeks. We would still have to visit many of these sites, but we could prioritize which one we do visit. 2 weeks. Would contribute to more efficient field mapping in initial site visits eliminating the need to revisit a site. Would contribute to more accurate reports. Better QC checks. No repeat field visits. 2 weeks. The work we do is ongoing, as we have hundreds of thousands of hazardous features from legacy mining yet to inventory. This data could save us weeks of work per field season by better prioritization of target areas and minimizing revisits. 2 weeks.											
Cost savings/cost reduction	Moderate	Annual dollars saved/realized	$30,000									
Cost savings/cost reduction description	This would save us on gas and personnel for initial field visits for known hazardous areas. The scope of the project remains the same, but the public safety aspect is better prioritized. Avoided loss of life/public safety is immeasurable.											
Cost avoidance	Major	Unable to provide										
Cost avoidance description	We hope to isolate and secure physical safety hazards, could save a life if a previously undiscovered hazard was found. Avoided loss of life/public safety is immeasurable. These data will help locate hazardous sites that otherwise would have been missed. Avoided loss of life/public safety is immeasurable. We do not use other 3D data that requires this.											
Increased revenues	None											
Mission-driven performance improvements	Major	Annual percent improvement	30%									
Mission-driven performance improvements description	By covering large amount of Nevada, we can remotely view and identify potential hazards, saving tremendous time in the field. We can expedite hazard inventory and closure projects over the estimated 40 year inventory period. We have a responsibility to keep physical safety hazards to a minimum while promoting safe mining practices in Nevada. The ability to prioritize areas of high right over minimal risk.											
Future annual operational benefits added during validation		Annual dollars saved/ realized	$60,551									

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Annual percent improvement	5%									
Value added to products or services description	By clearing areas of hazards, recreation is safer and can be more easily promoted in historic mining districts (for example a new state park developed in 2018 needed clearing of AML features, we spend many weeks inventorying and securing near the new park, and its likely we may have missed some without this data). Minimal customer Service in AML program.											
Improved response or timeliness	Minor	Unable to provide										
Improved response or timeliness description	Quality and trust of customers would increase – builds trust in program. If there is an safety incident reported we would physically go to the location regardless of data available. We do not usually warn the public of specific hazards, only in the general sense that they exist.											
Improved customer experience	Minor	Unable to provide										
Improved customer experience description	Quality and trust of customers would increase – builds trust in program.											
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$19,995									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Education or outreach description	We attend schools and share our message of stay out/stay alive concerning abandoned mines, in this we also educate about geology and physical sciences, we could include these data to inspire kids to get a career in digital sciences or mapping along with our AML message											
Environmental	Moderate											
Environmental description	Less holes in the ground helps wildlife too, we do not deal with environmental issues, like acid mine drainage, in our department but another department in Nevada does (NDEP) and may have their own uses.											
Public safety, including life and property	Major											
Public safety, including life and property description	Public safety is the purpose of our program, it is why we do the inventory of hazardous features and securing that we do											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Recreation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Planning and development of recreational facilities such as rafting, boating, swimming, diving, and fishing areas; ski slopes; and golf courses. Location- based products and services such as maps and guides. Tourism. Trail and vista site planning. Orienteering.
MCA Title	Recreation
MCA ID	60292
Organization Type	State or U.S. Territorial government
Organization Name	State of Nevada
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 27 - Recreation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required			Not required	
Entire AOI under same environmental conditions	Required	Not required			Not required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have			Nice to have	
DEM for entire AOI needs to be seamless	Required	Nice to have			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required		
DTM	Nice to have	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Highly desirable	Highly desirable		
Edited/cube XYZ		Highly desirable		
Full waveform	Not required	Nice to have		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Nice to have		
Ground control/ground truthing	Nice to have	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Highly desirable		
Land use/land cover	Nice to have	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Not required	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor		
Cost savings/cost reduction	Moderate	Minor		
Cost avoidance	Major	Minor		
Increased revenues	None	Minor		
Mission-driven performance improvements	Major	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor		

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Minor		
Improved customer experience	Moderate	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor		
Environmental	Major	Minor		
Public safety, including life and property	Major	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	None			Moderate	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$25,369		Annual dollars saved/ realized	$15,277						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Minor	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major								
Environmental	Moderate			Major								
Public safety, including life and property	Moderate			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

New Hampshire

New Hampshire covers 9,349 square miles of which 382 consists of inland water bodies. The topography ranges from the Coastal Lowlands to the Eastern New England upland to the White Mountain Region. The Coastal Lowlands extend 15 to 20 miles into New Hampshire. Sandy beaches line the coast and rivers and tidal wetlands extend inland. The Great Bay tidal estuary, occupying over nine square miles, is part of the Coastal Lowlands. Further inland, glacially scoured uplands of moderate relief are traversed by two major north-south river valleys, the Merrimack and Connecticut. The White Mountains cover about 25% of the state and Mount Washington, part of the Presidential Range, is the tallest mountain in New England at 6,288 feet. Accurate statewide elevation data are required to manage such a diverse landscape and New Hampshire has a history of successfully partnering with 3DEP federal agencies to use lidar technology to upgrade available elevation products and services.

Current status of elevation data for New Hampshire

Lidar and lidar-derived elevation products are available for all of New Hampshire. Quality Level 2 (QL2) lidar data, as defined by USGS, are available for approximately 75% of the state, with QL3 covering the remainder. A project funded by the State of New Hampshire and 3DEP was initiated in the fall of 2019 to upgrade the QL3 area. The New Hampshire portion of the Nashua River Watershed and the coastal areas is being upgraded to QL1. The remaining QL3 area, the Merrimack River Watershed in New Hampshire, is being upgraded to QL2. Delivery of final products is scheduled for March 2021. One meter and 2-meter DEMs are available for the QL2 and QL3 areas, respectively, as are intensity images and breaklines to support hydro flattening of the DEMs. All of the topographic data are relatively easy to access and download through federal and state services, although difficulties are encountered when geographic areas for requested downloads become too large. NH GRANIT at the University of New Hampshire (UNH) is the public clearinghouse for geospatial data and maintains a site dedicated to distributing lidar data and derivatives.

Available inland bathymetric data are limited and derive mainly from flood studies or scientific research. While bathymetry data for lakes and ponds are discoverable and distributed through the standard NH GRANIT mechanisms, other collections have not been submitted for distribution and continue to reside in private archives. Offshore bathymetric data are acquired by NOAA in support of ocean navigation and organizations like USGS Woods Hole and the UNH Center for Coastal and Ocean Mapping (CCOM). Nearshore bathymetric data are also limited but continues to be the focus of New Hampshire coastal programs and the UNH CCOM. The most recent 3DEP project to upgrade QL3 lidar data is tidally coordinated which will facilitate the development of a topobathy model for the coast.

The New Hampshire GIS Advisory Committee, which operates under the auspices of the New Hampshire GIS Steering Committee, monitors state geospatial needs and makes data acquisition recommendations including topographic and bathymetric data. The work of both committees is guided by the state's GIS Strategic Plan which was developed in 2007. To date, state funding for lidar acquisitions has come primarily from state capital appropriations.

The Strategic Plan and subsequent planning documents adopted by the NH GIS Advisory Committee have identified the acquisition of accurate elevation data as an important priority to support many state and local programs. The 3D Nation survey has identified the seven Mission Critical Activities. These activities will be the primary drivers for new programs focusing on the acquisition of topographic and bathymetric data.

Importance of elevation data to New Hampshire

New Hampshire is the second most forested state in the nation by percent of land cover, thus the capability of lidar to produce bare-earth DEMs has been exceptionally beneficial to all of the different stakeholders surveyed. The data resolution has proven to be critical in determining its suitability for desired applications. Based on existing needs, data must support a minimum 1-meter resolution DEM in order to be fully useful. As noted above, new data are in the process of being acquired in areas of the state where this standard is not met. The more densely populated Seacoast Region, encompassing relatively low relief terrain inland from the state's 18 miles of coastline, has been targeted for acquisition of QL1 data through a legislative Capital Budget appropriation in combination with funding through the 3DEP program. This will represent the first regionally extensive QL1 dataset to become available for New Hampshire and, because of anticipated programmatic developments within state government (as described below), must become the standard for future acquisitions.

High-level summary of elevation data requirements

Statewide coverage, combining QL2 and QL3 lidar, has only recently been achieved and awareness of the data and its potential uses is still growing across the range of stakeholders. Demand for and use of the data will certainly expand in the future, as knowledge of high-precision elevation products becomes more widespread and more derivative products are generated. For example, a recent effort funded by the NH Department of Environmental Services and conducted by NH GRANIT produced statewide 2-foot topographic contours – a product that has been widely requested by the stakeholder community. The state's GIS community continues to discover what lidar data are currently available and the potential applications that might be of benefit. Extensive efforts have been made to educate different stakeholder groups about lidar and such efforts are continuing. Nonetheless, uptake has been gradual as state agency managers develop new skills for analysis and for translation into actual business uses. For example, forestry practice on managed lands, both public and private, could benefit from novel applications given the large extent of forest cover in the state. Foresters are gaining familiarity with the point cloud data and classified first returns but a business use case has yet to be demonstrated. While applications for water quality modeling also appear to have significant potential in the state, hydrologic modeling has not been widely adopted by the programs in state government that have regulatory oversight of surface waters or roles in watershed management. However, this latter case is changing given new and evolving interest in development of longer-term statewide efforts as described in the following paragraph. Leadership is setting the direction without defining the details of the data input needs, although clearly accurate, high-resolution topobathymetric data will be critical for successful implementation.

In recent years, New Hampshire has continued to experience localized but very high-impact flood events statewide. Given this trend, there is increased interest by senior leadership at the NH Department of Environmental Services and the NH Department of Transportation in the engagement of 2-dimensional hydraulic and hydrologic modeling of the state's riverine water resources A long-term goal of this effort is to develop the ability to evaluate flooding hazards and their potential environmental and infrastructure impacts on a more widespread scale, inclusive of inundation mapping and sediment transport, and the associated risks and costs. Addressing this challenge requires detailed knowledge of both surface topography and inland bathymetry. The accuracy of such evaluations will be enhanced through the availability of QL1 data on a statewide basis. An additional need is for remotely sensed bathymetry for rivers and streams to support such flood modeling and mapping efforts. Data meeting a minimum standard of QL1B is required but QL0B is preferred, especially in areas of recurring flooding. Prior experience with remotely sensed inland topobathymetric datasets in New Hampshire is limited to EAARL-B green-light lidar that was acquired for the entire 36-mile corridor of the Suncook River in 2013 in collaboration with the USGS as a pilot project. This dataset provided a topobathymetric snapshot that enabled changes in river channel cross-sections to be determined two years later (in 2015) prior to channel stabilization measures being implemented. A national elevation data program should incorporate bathymetric lidar for inland waters as a critical component. This will allow for accurate river, stream, and

wetlands bathymetry to be rapidly extracted to support expansion of modeling efforts. Increased data acquisition and management efficiencies will support more rapid construction and execution of models and improve the evaluation of flood hazards.

Needs for nearshore and offshore bathymetry are even more specialized and limited based on the number of identified stakeholders. However, because the state's short coastline represents such a scarce resource, data for the nearshore domain, including the Great Bay estuary and Hampton/Seabrook marshes, are of disproportionate value to the state's tourist economy. This importance is further elevated by vulnerability to the impacts of sea level rise. Recently implemented citizen monitoring of beach erosion through repeat profiling highlights concern about the future. Efforts supported by the Bureau of Ocean Energy Management to compile data on potential sources of offshore sand for future beach replenishment provide another example of the data needs. The UNH CCOM has expressed interest in developing wave energy models to better understand coastal and beach dynamics. Accurate, high-quality nearshore and offshore bathymetric data are critical for any such analysis. Topobathymetric data acquired by the U.S. Army of Corps of Engineers on a five-year cycle for an onshore-offshore swath of New Hampshire coastline under the Coastal Mapping Program represent one existing data resource. However, bathymetric data comparable to QL0B are required for much more extensive nearshore and offshore areas.

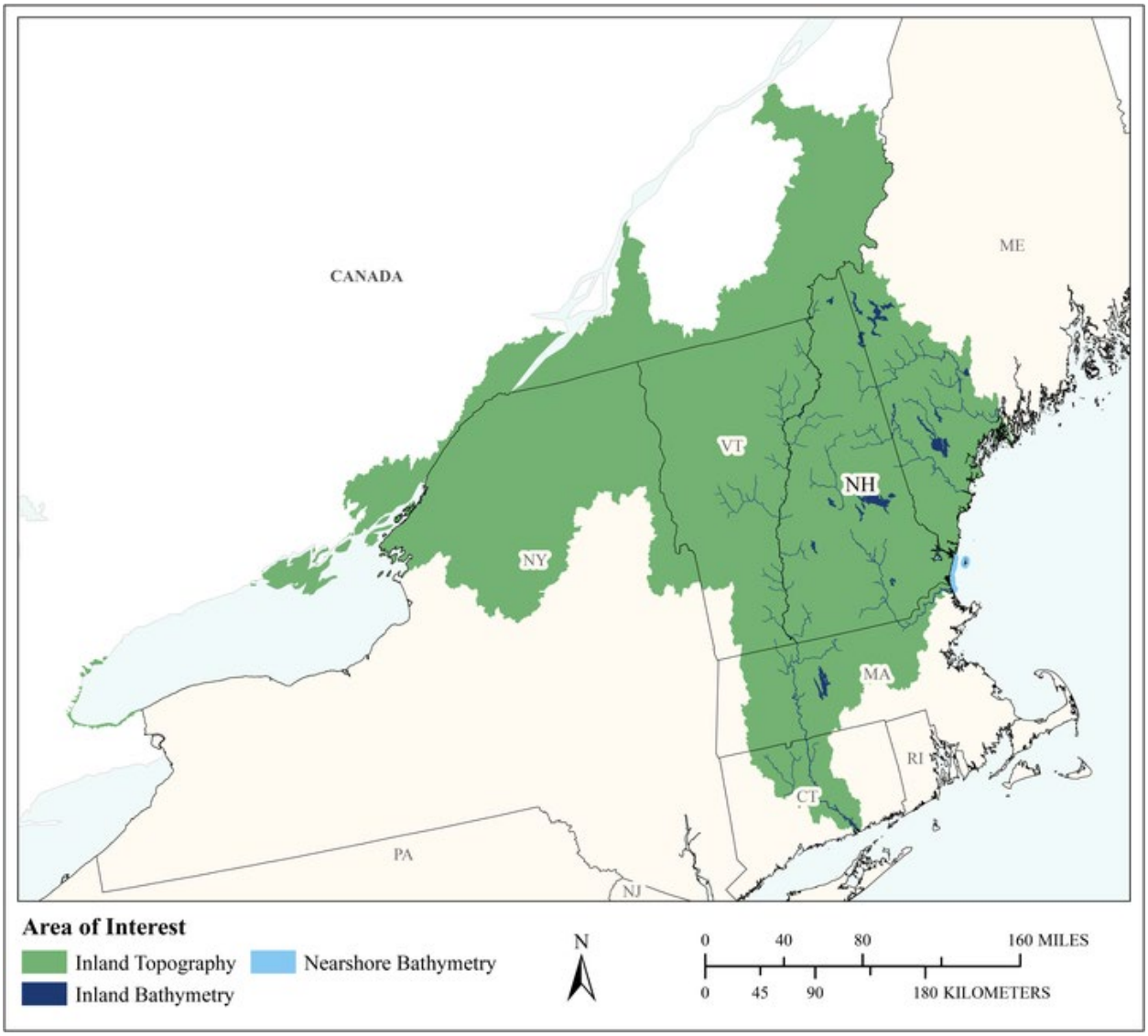
Repeat acquisition of QL1 inland topography is warranted at less than the eight-year interval that is the current standard for the 3D Elevation Program. The likelihood of significant shoreline changes due to major coastal storms continues to increase, driven by sea level rise and the frequency and severity of Nor'easters. Updated nearshore bathymetric data will therefore be critical to keep pace with these changes. Riverine environments are also subject to the increased frequency of flooding and erosion events and inland bathymetry will require monitoring at comparable time intervals.

The State of New Hampshire has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 06 – Natural Resource Management	NH Department of Environmental Services	1264	State Environmental Management	Inland Topo	QL1 HD	2-3 years	$2,205,525	$4,000,000	Major	Major	Major
				Inland Bathy	QL0B	2-3 years	$143,877	Unable to quantify	I don't know	Moderate	Moderate
				Nearshore Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
BU 14 – Cultural Resource Management	New Hampshire Department of Cultural and Natural Resources	11476	Discovery and Analysis of Archaeological and Historical Sites	Inland Topo	QL2	2-3 years	Unable to quantify	Unable to quantify	Minor	I don't know	I don't know
				Nearshore Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	Minor	I don't know	I don't know
BU 15 – Flood Risk Management	University of New Hampshire	21703	New Hampshire GIS Clearinghouse	Inland Topo	QL1	6-10 years	Unable to quantify	Unable to quantify	Major	Major	None
				Inland Bathy	QL2B	6-10 years	Unable to quantify	Unable to quantify	Moderate	Moderate	None
				Nearshore Bathy	QL2B	6-10 years	Unable to quantify	Unable to quantify	Major	Moderate	None
BU 16 – Sea Level Rise and Subsidence	NH Fish and Game Department	1218	Coastal Zone Modeling	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	Minor	Minor	Moderate
				Inland Bathy	Cross sections and/or transects meet needs	>10 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 18 – Homeland Security	NH Department of Safety	21746	Statewide Emergency Communications and Operations	Inland Topo	QL1 HD	4-5 years	Unable to quantify	Unable to quantify	Minor	Minor	Major
				Inland Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	Minor	Minor	Moderate
				Nearshore Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	None	None	Minor
BU 22 – Infrastructure Management	NH Dept. of Transportation	1168	Transportation Planning, Design, and Construction	Inland Topo	QL0	6-10 years	$3,618	Unable to quantify	Moderate	Major	Major
				Inland Bathy	QL1B	>10 years	Unable to quantify	Unable to quantify	Minor	Major	Major
BU 23 – Urban and Regional Planning	Rockingham Planning Commission	21534	Land Use and Transportation Planning	Inland Topo	QL1 HD	6-10 years	$281,285	$220,000	Major	Major	Major
				Nearshore Bathy	Cross sections and/or transects meet needs	6-10 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

MCA Title: State Environmental Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)	One or more Hydrologic Units (HUC4s)	Custom description	
Sub Area Requirements			New Hampshire coast and into Massachusetts to Merrimac River and all of Great Bay	

MCA Description	Response
Mission Critical Activity	State environmental management to include coastal, instream flow, geologic mapping of deposits, and flood hazards.
MCA Title	State Environmental Management
MCA ID	1264
Organization Type	State or U.S. Territorial government
Organization Name	NH Department of Environmental Services
Sub-Agency or Division	
Organization Mission	To help sustain a high quality of life for all citizens by protecting and restoring the environment and public health in New Hampshire.
Program Name	New Hampshire Department of Environmental Services
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	BU 03 - Coastal Zone Management
Tertiary Business Use	BU 02 - Riverine Ecosystem Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	4 foot x 12 foot dock structure

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B	QL0B	
Update Frequency	2-3 years	2-3 years and certain events.	2-3 years	
Event type(s)		During low-flow and after high-flow events		
Quality Level and/or update frequency variability across AOI	Higher priority for QL1 in more densely populated areas (SE and river valleys) but value for forestry and search & rescue in less densely populated areas			
Acceptable Horizontal Error	Up to 1 meter	Less than 50 cm	Less than 50 cm	
Acceptable Vertical Error	Up to 20 cm	Less than 10 cm	Less than 10 cm	
How far onshore needed			To the fall line	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Required	Required		Required	Required
Entire AOI under same environmental conditions	Required	Required	Required		Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required		Required	Required
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Required	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Required	Required	Required	
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Required	Required	
Full waveform	Not required	Required	Required	
Bathymetric Attributed Grid (BAG)		Required	Required	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required	Not required		
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable	Required	Nice to have	
Ground control/ground truthing	Required	Required	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Required	
Acoustic imagery of the seafloor			Required	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Not required	
Geologic and seismic data	Not required	Not required	Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Not required	
Routes			Nice to have	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Required	Not required	Not required	
Land use/land cover	Required	Nice to have	Not required	
Wetlands	Required	Nice to have	Not required	
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Not required		
Landmark features	Required	Not required	Not required	
Cultural resources	Required	Not required	Not required	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	LiDAR DEM and point cloud that are intermediate between QL3 and QL2	Boat-mounted sonar with GPS, data quality level unknown. Site-specific collection of bathymetry and topographic information in support of hydraulic modeling, total-station survey grade, for both waterbodies and adjacent floodplains.	Bathymetric data collected by the University of New Hampshire's Center for Coastal and Ocean Mapping	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				

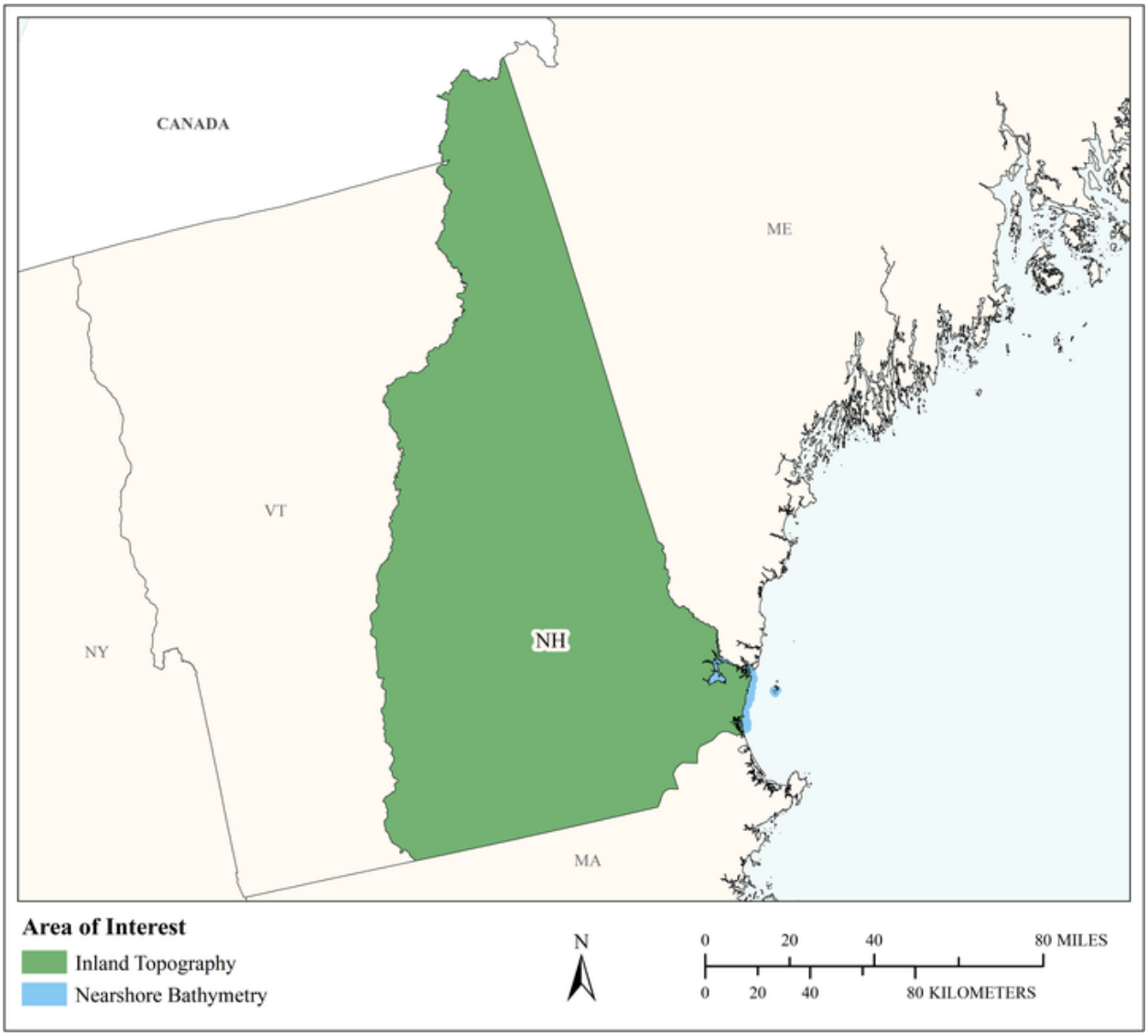
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
State Repositories	Yes	Yes		
State repositories used	New Hampshire	New Hampshire Fish & Game Department; self-collected within NHDES (Watershed Management Bureau; Dam Bureau)		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	None	Minor	
Cost savings/cost reduction	Moderate	None	None	
Cost avoidance	Major	None	None	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	None	None	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Minor	
Improved response or timeliness	Major	None	Minor	
Improved customer experience	Major	Minor	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor	Minor	
Environmental	Major	Minor	Minor	
Public safety, including life and property	Major	Minor	None	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$105,525	Moderate	Annual dollars saved/realized	$95,877	Minor	Unable to provide				
Time savings description				Reduced time for processing and manipulating field data with available 3-D dataset. Reduced time for processing field data to perform modeling with readily available dataset. This will allow for enhanced one-time site selection for long-term stations. Reduced time for surveying of specific river and floodplain investigation sites.								
Cost savings/cost reduction	Major	Annual dollars saved/realized	$50,000	Major	Annual dollars saved/realized	$41,000	Major	Unable to provide				
Cost savings/cost reduction description				Saved contractor expenditures and agency staff time.								
Cost avoidance	Major	Annual dollars saved/realized	$2,050,000	Major	Annual dollars saved/realized	$7,000	I don't know	Unable to provide				
Cost avoidance description				With authoritative 3-D data and metadata, agency staff will save staff time addressing errors.								
Increased revenues	None			Moderate	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	Major	Annual percent improvement	39%	Major	Unable to provide		Moderate	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$2,000,000	Major	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Annual dollars saved/realized	$2,000,000	Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness description				Flood hazard maps. Enhanced prediction of flood inundation by agency, in partnership with sister state and federal agencies. Could assist with flood-related response, particularly in identification of ice jam impacts. Support of mobile access made possible, but resource limitations make this difficult.								
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			I don't know			Moderate					
Environmental	Major			Moderate			Moderate					
Environmental description				Improvement of and valuations of biological habitat in support of instream flow criteria								
Public safety, including life and property	Major			Moderate			Moderate					
Public safety, including life and property description				Improved understanding of flood inundation, and stream crossing vulnerability								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes		Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes		Yes	
Curvature maps	Yes		Yes	
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes		Yes	
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes		Yes	
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Discovery and Analysis of Archaeological and Historical Sites



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Highly desirable	
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Discovery and analysis of archaeological and historical sites. Site protection and preservation planning. Discovery and analysis of Native American and other historical cultural sites and subsistence activities. Identify archeological resources – cellar holes, foundations, cemeteries, etc. Currently using lidar, not yet using bathymetry. DEMs at 1-meter post spacing are not adequate for needs, but with 2.5-foot post spacing, relevant objects can be identified. Shipwrecks and other submerged objects would be of interest, including those that were once on land as shorelines have changed.
MCA Title	Discovery and Analysis of Archaeological and Historical Sites
MCA ID	11476
Organization Type	State or U.S. Territorial government
Organization Name	New Hampshire Department of Cultural and Natural Resources
Sub-Agency or Division	
Organization Mission	The mission of the Division of Historical Resources is to preserve and celebrate New Hampshire's irreplaceable historic resources through programs and services that provide education, stewardship, and protection
Program Name	Division of Historical Resources
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Cellar holes, foundations, shipwrecks, other submerged artifacts

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2		QL0B	
Update Frequency	2-3 years		2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Horizontal Error	Up to 50 cm		Up to 1 meter	
Acceptable Vertical Error	Up to 20 cm		Up to 20 cm	
How far onshore needed			500 meters inland	
How far down the beach profile needed	Not applicable		None	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required		Not required			Not required
Entire AOI under same environmental conditions	Not required		Not required			Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Not required		Not required			Nice to have
DEM for entire AOI needs to be seamless	Highly desirable		Highly desirable			Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required		Not required	
DTM	Nice to have		Not required	
DEM	Required		Highly desirable	
Raw point cloud data	Not required		Not required	
Classified point cloud	Nice to have		Not required	
Edited/cube XYZ			Not required	
Full waveform	Not required		Not required	
Bathymetric Attributed Grid (BAG)			Not required	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)			Not required	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Not required		Not required	
Ground control/ground truthing	Not required		Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Not required	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Highly desirable		Highly desirable	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Not required	
Submerged features			Not required	
Subbottom characteristics			Not required	
Geologic and seismic data	Not required		Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Not required	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have		Not required	
Land use/land cover	Nice to have		Not required	
Wetlands	Not required		Not required	
Estuaries			Not required	
Inland surface water features	Nice to have		Not required	
Bridges/culverts	Nice to have			
Landmark features	Not required		Not required	
Cultural resources	Required		Required	
Coastal and riverine structures	Not required		Not required	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	LiDAR 2.5 ft post spacing acquired between 2011 and 2015		Not currently using	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	UNH Granit			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate		None	
Cost savings/cost reduction	None		None	

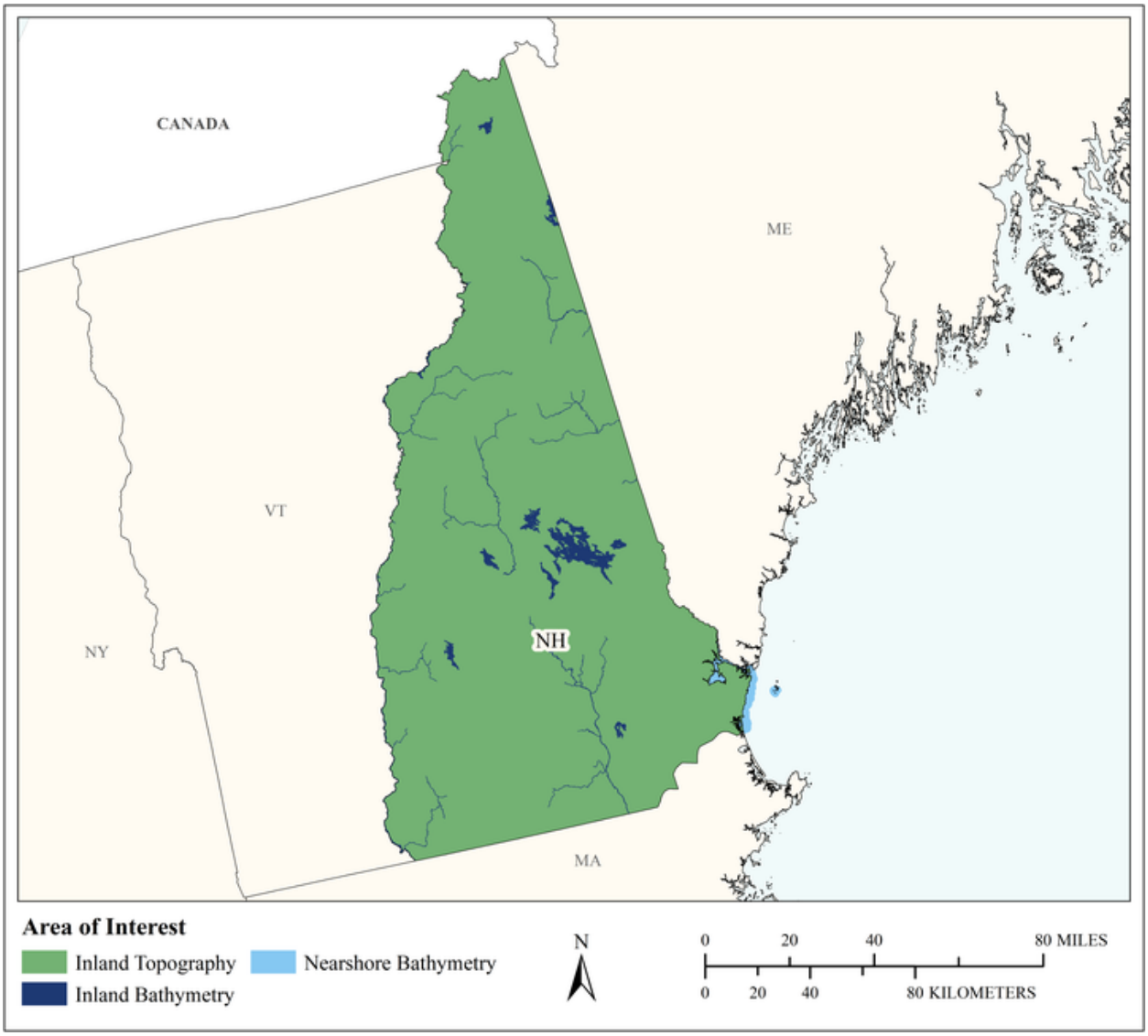
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Cost avoidance	None		None	
Increased revenues	None		None	
Mission-driven performance improvements	Moderate		None	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		None	
Improved response or timeliness	Moderate		None	
Improved customer experience	Moderate		None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate		None	
Environmental	None		None	
Public safety, including life and property	None		None	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					Major	Unable to provide				
Cost savings/cost reduction	I don't know	Unable to provide					I don't know	Unable to provide				
Cost avoidance	None						None					
Increased revenues	None						None					
Mission-driven performance improvements	Moderate	Unable to provide					Moderate	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide					Minor	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide					Moderate	Unable to provide				
Improved customer experience	Minor	Unable to provide					Minor	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor						Minor					
Environmental	I don't know						I don't know					
Public safety, including life and property	I don't know						I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes		Yes	
Hillshades	Yes		Yes	
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes		Yes	
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: New Hampshire GIS Clearinghouse



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	GIS Clearinghouse, also floodplain mapping activities.
MCA Title	New Hampshire GIS Clearinghouse
MCA ID	21703
Organization Type	Academic or Not-for-Profit
Organization Name	University of New Hampshire
Sub-Agency or Division	
Organization Mission	Earth Systems Research Center (ESRC) brings together ecologists, environmental chemists, Earth system modelers, and remote sensing scientists to study natural and human-induced changes in the Earth's water, carbon, and nitrogen metabolism. Within the ESRC, my specific project is hosting the State of NH GIS Clearinghouse, and my responses will reflect that responsibility.
Program Name	GRANIT GIS Clearinghouse
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 16 - Sea Level Rise and Subsidence
Tertiary Business Use	BU 23 - Urban and Regional Planning

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Typically, we are interested in features similar in size to building footprints.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Nice to have
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required

Inland Bathy Feature Size Requirements	Response
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B	QL2B	
Update Frequency	6-10 years	6-10 years	6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	Up to 2 meters	Up to 5 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 40 cm	
How far onshore needed			To the fall line	
How far down the beach profile needed	To MHHW		To MLLW	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable	Nice to have		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Required	Required		Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	
DTM	Highly desirable	Highly desirable	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Required	Required	Required	
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Nice to have	Not required	
Full waveform	Nice to have	Nice to have	Not required	
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Required	
Aerial and/or satellite imagery	Required	Required	Highly desirable	
Underwater videography			Not required	
Bottom texture				
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Highly desirable	Not required	Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Not required	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Not required	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Highly desirable	Nice to have	Highly desirable	
Wetlands	Nice to have	Nice to have	Nice to have	
Estuaries			Nice to have	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Highly desirable	Nice to have		
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Primarily LiDAR data, QL2 or QL3, acquired over a period of 8-10 years. Some smaller areas of the state are of lower quality and older vintage.	We do not presently have any substantive collection of bathymetric data - just coverage for isolated areas.	We do not presently have any substantive collection of bathymetric data	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes			
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	GRANIT - NH State GIS Clearinghouse			

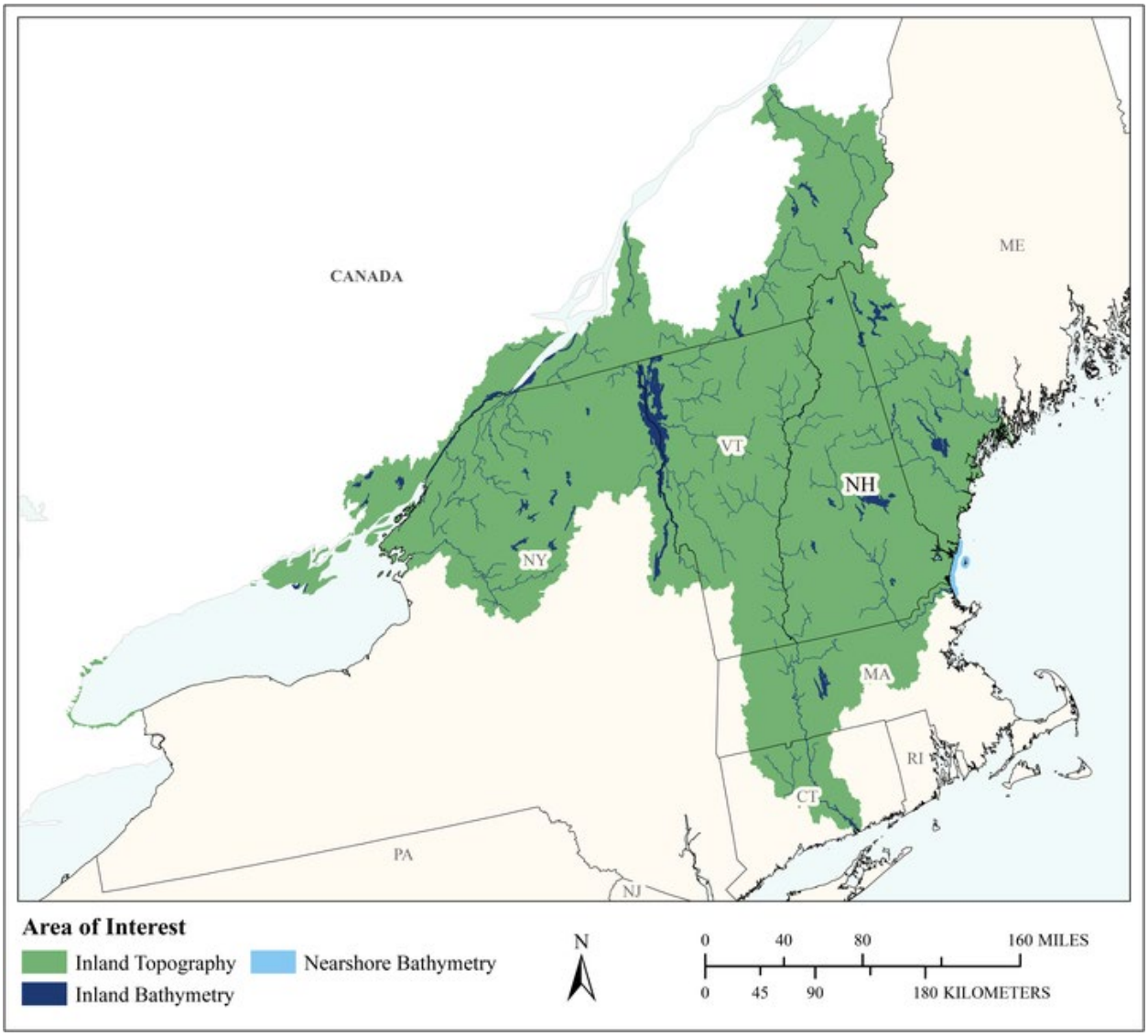
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	None	None	
Cost savings/cost reduction	Major	None	None	
Cost avoidance	Minor	None	None	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	None	None	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None	None	
Improved response or timeliness	Major	None	None	
Improved customer experience	Major	None	None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	None	None	
Environmental	Moderate	None	None	
Public safety, including life and property	Major	None	None	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Time savings description	Hours could be saved on creating seamless DEMs and derivatives (e.g. hillshades, contours).			Inland bathy could inform floodplain modeling and reduce field data collection.								
Cost savings/cost reduction	None			None			None					
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost avoidance description	Hours could be saved on creating seamless DEMs and derivatives (e.g. hillshades, contours).											
Increased revenues	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Other operational benefits	Major	Unable to provide										
Other operational benefits description												
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate			Major					
Environmental	Major			Moderate			Moderate					
Public safety, including life and property	None			None			None					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Coastal Zone Modeling



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)	One or more Hydrologic Units (HUC4s)	Custom description	
Sub Area Requirements			New Hampshire shoreline plus 10KM into Massachusetts and Maine along coasts	

MCA Description	Response
Mission Critical Activity	Coastal zone modeling to include salt marsh migration and wildlife habitat models
MCA Title	Coastal Zone Modeling
MCA ID	1218
Organization Type	State or U.S. Territorial government
Organization Name	NH Fish and Game Department
Sub-Agency or Division	
Organization Mission	As the guardian of the state's fish, wildlife and marine resources, the New Hampshire Fish and Game Department works in partnership with the public to: Conserve, manage and protect these resources and their habitats; Inform and educate the public about these resources; and Provide the public with opportunities to use and appreciate these resources.
Program Name	Great Bay NERR; Wildlife Division; Inland Fisheries Division
Total Annual Program Budget	
Primary Business Use	BU 16 - Sea Level Rise and Subsidence
Secondary Business Use	BU 07 - Wildlife and Habitat Management
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Vegetation height

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	Cross sections and/or transects meet needs	QL0B	
Update Frequency	4-5 years	>10 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI	Coastal models require higher than inland			
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	I don't know	I don't know	
Acceptable Vertical Error	I don't know	I don't know	I don't know	
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed	To MLLW		To MLLW	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs		Yes	Partial	
Cross section/transect requirement		50 cm vertical accuracy with 500 - 1000 ft spacing and at significant elevation change and/or structures	I do not know.	

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required	Not required		Not required	Not required
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Nice to have		Nice to have	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Nice to have	Nice to have		Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Nice to have	Nice to have		Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Not required	Nice to have	
DTM	Highly desirable	Not required	Nice to have	
DEM	Required	Required	Required	
Raw point cloud data	Not required	Not required	Not required	
Classified point cloud	Highly desirable	Nice to have	Nice to have	
Edited/cube XYZ		Not required	Not required	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Nice to have	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Nice to have	Not required	Not required	
Ground control/ground truthing	Not required	Not required	Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Not required	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Highly desirable	Not required	Not required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Nice to have	
Submerged features			Not required	
Subbottom characteristics			Not required	
Geologic and seismic data	Not required	Not required	Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates	Nice to have	Not required	Not required	
Land use/land cover	Nice to have	Not required	Not required	
Wetlands	Highly desirable	Not required	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Nice to have	
Inland surface water features	Highly desirable	Not required	Nice to have	
Bridges/culverts	Nice to have	Not required		
Landmark features	Not required	Not required	Not required	
Cultural resources	Not required	Not required	Not required	
Coastal and riverine structures	Highly desirable	Not required	Nice to have	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	State of New Hampshire: ARRA and LiDAR for the North East. USGS Contract. 2011-2015 resolution varies http://lidar.unh.edu/map/	Bathymetric contours mapped from soundings collected in 1960's to 1980's; past 10 years Garmin depth sounder	See prior responses: Bathymetric data collected by the University of New Hampshire's Center for Coastal and Ocean Mapping	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes	Yes	
State repositories used	http://granit.unh.edu/	NH Dept. of Environmental Services	Gulf of Maine bathymetry	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Moderate	Minor	
Cost savings/cost reduction	Moderate	None	Moderate	

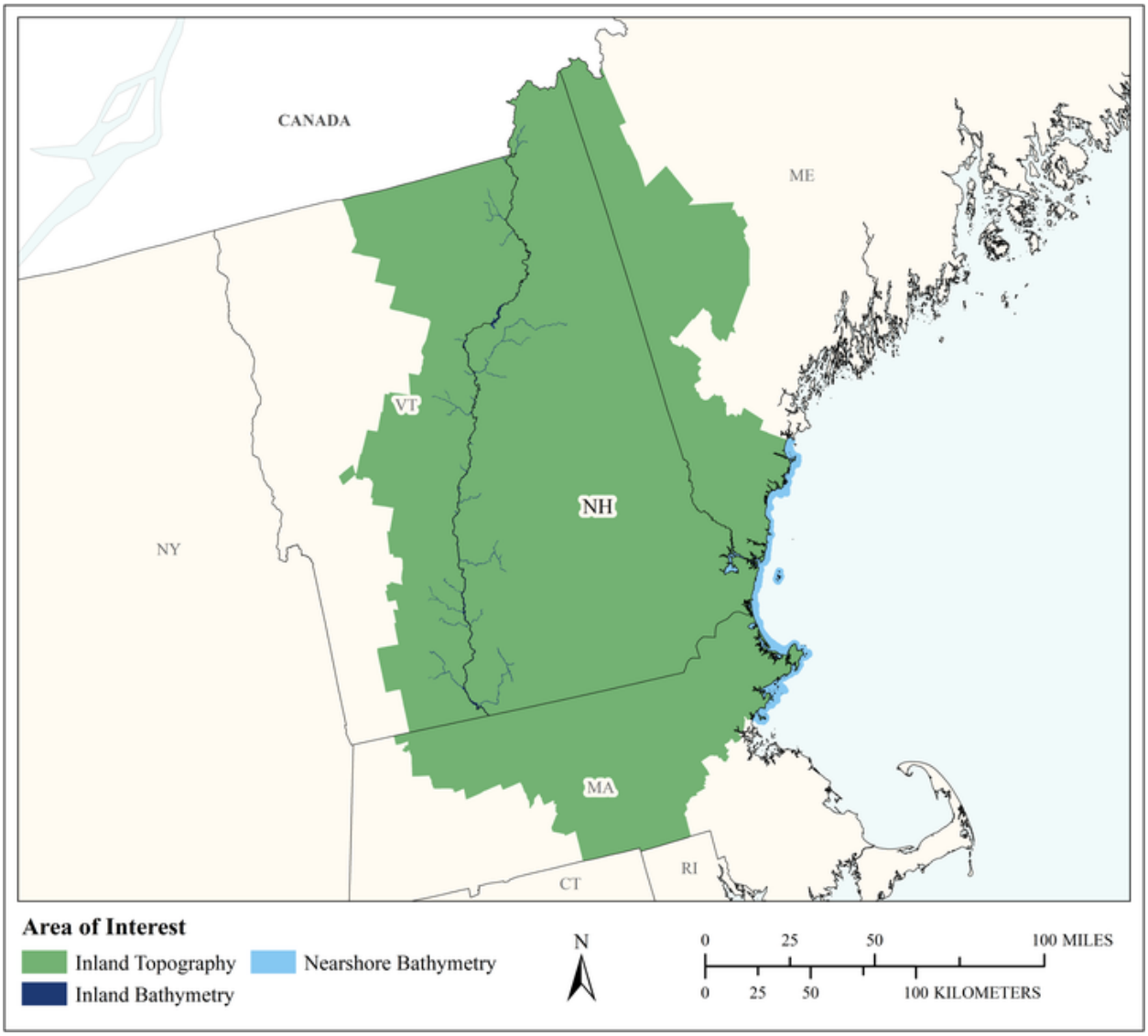
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Cost avoidance	I don't know	I don't know	Moderate	
Increased revenues	None	None	None	
Mission-driven performance improvements	Moderate	Moderate	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate	Moderate	
Improved response or timeliness	Minor	Minor	I don't know	
Improved customer experience	Minor	Moderate	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	Moderate	
Environmental	Moderate	Minor	I don't know	
Public safety, including life and property	Major	I don't know	I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Cost savings/cost reduction	I don't know	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide				
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Improved customer experience	I don't know	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Other customer service benefits				Moderate	Unable to provide							
Other customer service benefits description												
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			I don't know			I don't know					
Environmental	Minor			I don't know			I don't know					
Public safety, including life and property	Moderate			I don't know			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Statewide Emergency Communications and Operations



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Custom description	Custom description	Custom description	
Sub Area Requirements	New Hampshire, adjoining counties, and Orleans County, VT to include I-91	To the high water mark of the river adjoining Vermont	Along New Hampshire and adjoining counties	

MCA Description	Response
Mission Critical Activity	To locate, communicate and connect people in an emergency with the help they need. More specifically we use various types of GIS data to support statewide emergency operations for state, regional and local agencies on a daily basis. Additionally, we support planning, preparation, response and recovery activities through all aspects of the emergency management cycle and support the immediate and long term goals of the public safety community requiring geographic and location based information. Elevation data are needed for the statewide enhanced 9-1-1 system, to help locate cell calls to 9-1-1 on a specific floor of a building. For operations of the statewide public safety radio system, including towers, elevation data are needed to analyze the range of towers. The department also enhances the topo layer for situational awareness. They also operate the state Emergency Operations Center in response to flooding or other natural hazard events and support post event activities. Boating operations in Lake Winnepasaukee require bathymetric data for navigation and safety, safe boating. Elevation data are also needed for planning and analysis for seawalls for storm surge protection, debris planning, and mitigation activities.
MCA Title	Statewide Emergency Communications and Operations
MCA ID	21746
Organization Type	State or U.S. Territorial government
Organization Name	NH Department of Safety
Sub-Agency or Division	
Organization Mission	The multi-faceted mission of the Department of Safety encompasses protection of the lives and safety and preservation of the quality of life of New Hampshire citizens and visitors to our state on the highways, on the waterways, and in their homes and businesses. We enforce motor vehicle and highway safety laws, criminal laws, commercial vehicle regulations, fire safety, building and equipment safety laws and regulations, and boating safety laws and rules. We also provide enhanced 911 emergency communications statewide, and are responsible for homeland safety and emergency management activities.
Program Name	The New Hampshire 9-1-1 system and the New Hampshire State Emergency Operations Center.
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	BU 28 - Telecommunications
Tertiary Business Use	BU 15 - Flood Risk Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Houses to support the accurate locating of 9-1-1 calls in multi story buildings and 3D navigation as well as flood prevention modeling for hazard mitigation activities.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Other	Highly desirable
Other description	Identification of navigability of waters
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Required
Greater than 10 acres	Required
Other	Highly desirable
Other description	Identification of navigability of waters

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B	QL0B	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	
Acceptable Vertical Error	Up to 30 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed			To the fall line	
How far down the beach profile needed	To MHW		Below MLLW	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement			MHW	
Cross sections and/or transects meet needs				
Cross section/transect requirement			No transects are required at this time.	

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Required	Required		Required	Required
Entire AOI under same environmental conditions	Required	Required	Required		Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required		Required	Required
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level		Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Required	
DTM	Highly desirable	Highly desirable	Highly desirable	
DEM	Highly desirable	Highly desirable	Highly desirable	
Raw point cloud data	Nice to have	Nice to have	Highly desirable	
Classified point cloud	Highly desirable	Required	Required	
Edited/cube XYZ		Highly desirable	Highly desirable	
Full waveform	Not required	Nice to have	Highly desirable	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable	Required	Required	
Ground control/ground truthing	Required	Required	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Required	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Highly desirable	Required	Required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Not required	
Habitat distribution and classification			Not required	
Boundaries			Highly desirable	
Routes			Highly desirable	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Required	
Floating observation/navigation systems			Required	
Shorelines – current, historic, change rates	Required	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable		Nice to have	
Wetlands	Highly desirable		Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Nice to have	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Required	Highly desirable	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Current statewide topographic data available in AOR is a 10m DEM	Unknown	Not currently using bathymetric data.	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts		Yes	Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	Esri Topo map service, Software embedded DEM's Radio Propagation and site to site Path Profiles			
Data that meet my needs are not available				

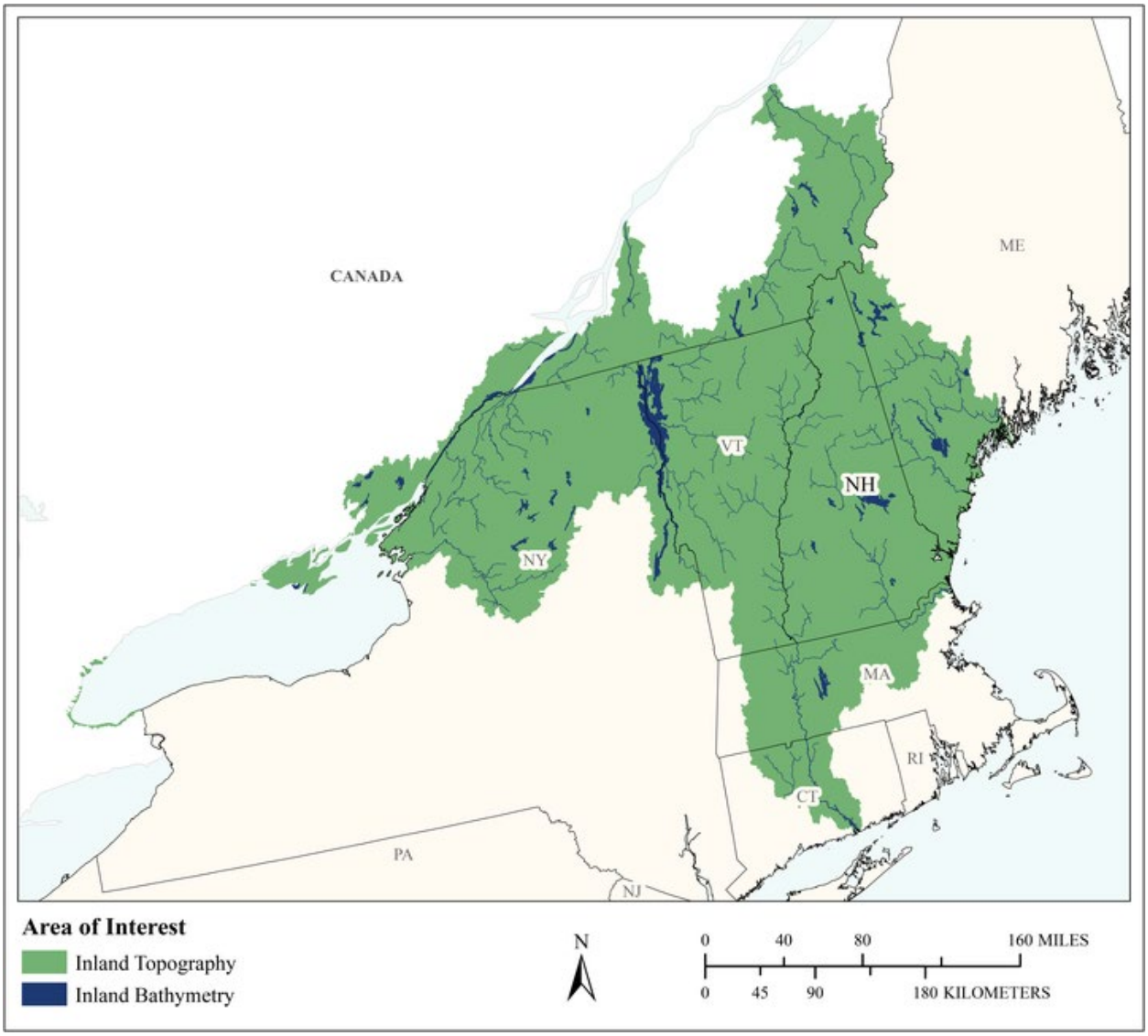
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None	None	None	
Cost savings/cost reduction	None	None	None	
Cost avoidance	None	None	None	
Increased revenues	None	None	None	
Mission-driven performance improvements	Moderate	Moderate	None	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate	None	
Improved response or timeliness	Moderate	Moderate	None	
Improved customer experience	None	Moderate	None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	Moderate	None	
Environmental	None	Moderate	None	
Public safety, including life and property	Moderate	Major	None	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Time savings description	Higher resolution 3D topographic data will enable us to offer more intelligent services and products not currently available.											
Cost savings/cost reduction	Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Increased revenues	None			Moderate	Unable to provide		Moderate	Unable to provide				
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Other operational benefits				Minor	Unable to provide		Minor	Unable to provide				
Other operational benefits description				More accurate bathymetric data will assist us in integrating point and vector datasets on the many water bodies in the state patrolled and responded on by our public safety agencies who use boats.								
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Value added to products or services description	Identifying areas in the state where radio communications have dead spots. Radio communication has state, regional and local impacts. Proactive analysis with good data can identify areas without good coverage that need to be filled.											
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			None					
Environmental	Minor			Minor			None					
Public safety, including life and property	Major			Moderate			Minor					
Other												
Other benefits	Moderate						Minor					
Other description	Better preparedness, response and mitigation strategies and programs											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes	Yes		
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Transportation Planning, Design, and Construction



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)	One or more Hydrologic Units (HUC4s)		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Transportation - including safe design, operation & planning of state roads and bridges that enhance the quality of life with projects and assets that foster a strong economy in balance with the environment. Includes damage assessment and coastal resilience, post storm data collection. Transportation planning as well as infrastructure. In house surveys used to acquire high accuracy data. DOT acquires its own data as needed per project using surveyed cross sections; statewide survey grade data is not needed. Bridge abutments are needed, and cannot be captured with lidar.
MCA Title	Transportation Planning, Design, and Construction
MCA ID	1168
Organization Type	State or U.S. Territorial government
Organization Name	NH Dept. of Transportation
Sub-Agency or Division	
Organization Mission	Mission: Transportation excellence enhancing the quality of life in New Hampshire.
Program Name	The Ten Year Plan reviewed through public hearings and approved by the state legislature every two years.
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 23 - Urban and Regional Planning
Tertiary Business Use	BU 21 - Aviation Navigation and Safety

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Not required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Not required
Other	Required
Other description	Bridge Foundations

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Features that define roadway geometry for design and construction, such as curbs, guard rails, small culverts, catch basins, manholes, ledge, signs.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL1B		
Update Frequency	6-10 years	>10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI	QL1 may be adequate for some mission critical tasks. Engineering work requires the most accurate data. Planning requirements are less stringent.			
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need		
Acceptable Vertical Error	Up to 10 cm	Up to 20 cm		
How far onshore needed				
How far down the beach profile needed	To MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial	Partial		

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross section/transect requirement	Cross Sections are required perpendicular to highways, rivers, and streams. QL1 Longitudinal sampling density is adequate for most points in the x-Sect., but fill-in with on the ground survey is required for key design features.	River & Stream crossings of roads and coastal transportation infrastructure. For design projects, cross sections 50-100 ft apart are needed. For H&H modeling, floodplain modeling standards apply (50 cm vertical accuracy and 500-1000' spacing) to include cross sections at structures.		

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Other	Nice to have					
Other description	Tide may be a consideration					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Nice to have			Nice to have	
DEM for entire AOI needs to be seamless	Nice to have	Nice to have			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Not required		
DTM	Required	Required		
DEM	Required	Not required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Highly desirable	Highly desirable		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Nice to have		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required	Required		
Land use/land cover	Required	Required		
Wetlands	Required	Required		
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Required	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Lidar from several contracts nearly state-wide coverage of QL2 data.	Sonar and other depth measurements by Land Surveyors. Low tide QL2 from lidar nearly 10 years old, and cross section data from HEC RAS models.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast		Yes		
NCEI				
Open Topography				
NOAA nautical charts		Yes		
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes	Yes		

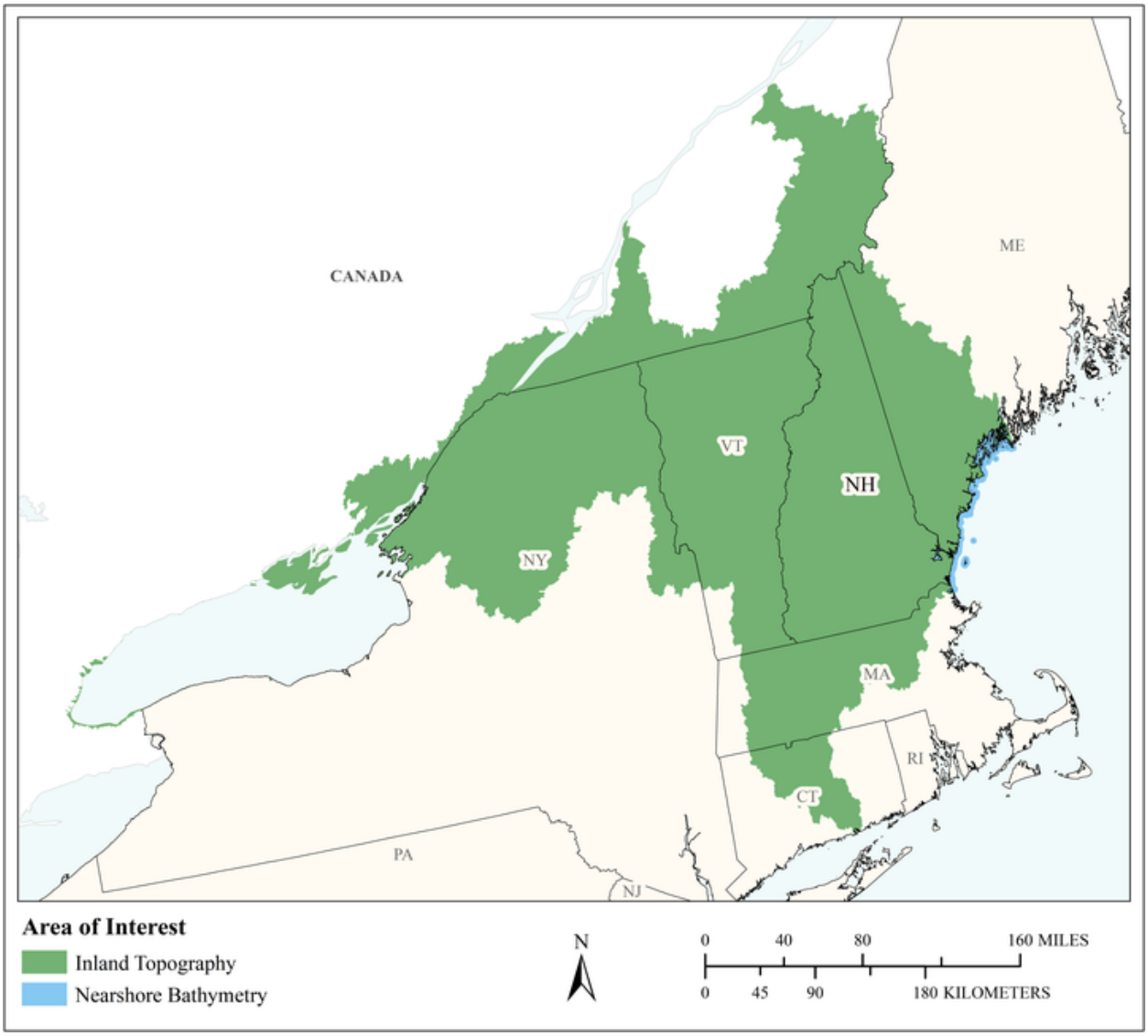
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State repositories used	NH Granit GIS, state servers	NH Granit @ UNH		
Other	Yes	Yes		
Other description	In-house topographic measurements and prior lidar contract data	In-house and consultant land surveyors		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Minor		
Cost savings/cost reduction	Minor	Minor		
Cost avoidance	Moderate	Minor		
Increased revenues	Minor	None		
Mission-driven performance improvements	Moderate	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor		
Improved response or timeliness	I don't know	Minor		
Improved customer experience	I don't know	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor		
Environmental	Moderate	Moderate		
Public safety, including life and property	Major	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$3,618	Major	Unable to provide							
Time savings description	Obvious savings, but no data to provide estimate with yet. May be even less, insignificant savings of time. Very likely to save a significant number of hours, but we are unable to estimate at this time.											
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide							
Improved response or timeliness description	Needed to use the data before answering this question. Remains to be seen, critical path aspects EIS & permits are not necessarily related to 3d mapping.			Not necessarily related to 3d data.								
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide							
Other customer service benefits	Major	Unable to provide										
Other customer service benefits description	Asset Management.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Minor								
Education or outreach description	3d data and the associated modelling & visualization tools are effective for outreach			3d data and the associated modelling & visualization tools are effective for outreach								
Environmental	Major			Major								
Environmental description	There is a lot of potential benefits, and our mission critical activities balance with environmental services			There is a lot of potential benefits, and our mission critical activities balance with environmental services								
Public safety, including life and property	Major			Major								
Public safety, including life and property description	Knowing low point along roads and other 3d features can provide a means for increased safety and protection of properties adjacent to highways			Knowing low point along roads and other 3d features can provide a means for increased safety and protection of properties adjacent to highways								
Other	3d Design											
Other benefits	Moderate			Moderate								
Other description	Working with models rather than 2d plan is becoming the norm.											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Land Use and Transportation Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)		Custom description	
Sub Area Requirements			Along the 2 HUC6s for Saco River and Merrimac River	

MCA Description	Response
Mission Critical Activity	Land development and zoning. Parks and transportation planning.
MCA Title	Land Use and Transportation Planning
MCA ID	21534
Organization Type	Regional, County, City, or other local government
Organization Name	Rockingham Planning Commission
Sub-Agency or Division	
Organization Mission	Rockingham Planning Commission is one of nine regional planning commissions in New Hampshire established by RSA 36:46. The Commission's region consists of twenty-seven communities within Rockingham County. Operating as a non-profit local government organization, the Commission serves in an advisory role to local governments in order to promote coordinated planning, orderly growth, efficient land use, transportation access and environmental protection.
Program Name	Regional Planning Program
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 03 - Coastal Zone Management
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	We have often used road edges, trail networks and other points to allow georeferencing.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD		Cross sections and/or transects meet needs	
Update Frequency	6-10 years		6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need		The best horizontal accuracy achievable for the vertical accuracy I need	
Acceptable Vertical Error	Less than 5 cm		Less than 10 cm	
How far onshore needed			To Mean Higher High Water (MHHW)	
How far down the beach profile needed	To MHHW		To MHHW	
Tide correction requirement			MHW	
Cross sections and/or transects meet needs			Yes	
Cross section/transect requirement			I do not know.	

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable		Highly desirable			Highly desirable
Entire AOI under same environmental conditions	Required		Highly desirable			Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable		Highly desirable			Required
DEM for entire AOI needs to be seamless	Highly desirable		Highly desirable			Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable		Highly desirable	
DTM	Required		Required	
DEM	Required		Required	
Raw point cloud data	Nice to have		Nice to have	
Classified point cloud	Required		Required	
Edited/cube XYZ			Not required	
Full waveform	Not required		Not required	
Bathymetric Attributed Grid (BAG)			Not required	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Highly desirable		Nice to have	
Ground control/ground truthing	Required		Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Highly desirable		Highly desirable	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have		Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights				
Sea ice conditions			Highly desirable	
Habitat distribution and classification			Highly desirable	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable		Highly desirable	
Land use/land cover	Highly desirable		Highly desirable	
Wetlands	Highly desirable		Highly desirable	
Estuaries			Highly desirable	
Inland surface water features	Highly desirable		Highly desirable	
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable		Nice to have	
Cultural resources	Highly desirable		Nice to have	
Coastal and riverine structures	Highly desirable		Nice to have	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	LiDAR for the NE (2011) USGS Task Orders: G10PD02143 & G10PD01027		I have little to no Bathymetric data.	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes		Yes	
State repositories used	NH GRANIT		NH GRANIT	
Other	Yes		Yes	
Other description	On Site		On Site	
Data that meet my needs are not available				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Minor	
Cost savings/cost reduction	Major		Minor	
Cost avoidance	Moderate		Minor	
Increased revenues	Minor		Minor	
Mission-driven performance improvements	Major		Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		Minor	
Improved response or timeliness	Moderate		Minor	
Improved customer experience	Major		Moderate	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major		Moderate	
Environmental	Major		Moderate	
Public safety, including life and property	Major		Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$33,286				I don't know	Unable to provide				
Time savings description	All of our data resides projected. LiDAR and associated data has increased our abilities to create product for clients. LiDAR data is often used for verification of other datasets. Sometimes the LiDAR is used to inform other efforts within our office. LiDAR has saved from field verification.											
Cost savings/cost reduction	Major	Annual dollars saved/realized	$20,000				I don't know	Unable to provide				
Cost avoidance	Moderate	Annual dollars saved/realized	$28,000				I don't know	Unable to provide				
Cost avoidance description	Infrastructure in peril in our region has been calculated but there is no way to know what might have been affected if not for the study, but there are potentially huge impacts in our region.											
Increased revenues	Major	Annual dollars saved/realized	$200,000				I don't know	Unable to provide				
Increased revenues description	We have already had huge projects that were possible due to the access to high quality data, there is no reason to expect this would change.											
Mission-driven performance improvements	Major	Annual percent improvement	7%				I don't know	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$60,000				I don't know	Unable to provide				
Improved response or timeliness	Major	Annual dollars saved/realized	$160,000				I don't know	Unable to provide				
Improved customer experience	Moderate	Unable to provide					I don't know	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major						I don't know					
Education or outreach description	LiDAR data has allowed us to assess the potential for future loss. And convey that to the public at large.											
Environmental	Major						I don't know					
Environmental description	LiDAR data has allowed us to assess the potential for future loss.											
Public safety, including life and property	Major						I don't know					
Public safety, including life and property description	LiDAR data has allowed us to assess the potential for future loss. And convey that to the public at large											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	
Contours	Yes			
Hillshades	Yes			
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

New Jersey

Current status of elevation data for New Jersey

New Jersey is a relatively small state comprising just over 8,500 square miles within four major physiographic regions. The largest portion of the state, approximately 4,700 square miles, lies within the Coastal Plain, with the remainder in the Piedmont, Highlands, and Ridge and Valley provinces. These differing regions provide for a wide variety of landscape types, open spaces and natural communities, the preservation of which has great support from both New Jersey residents and government entities. This has resulted in the preservation of over 1.2 million acres of open space and farmland throughout the state, much of which has been preserved to maintain and improve habitats for the many natural plant and animal species found in New Jersey.

This preservation is particularly important in New Jersey which is also the most densely populated state in the United States, and one of the most highly urbanized. Situated between the metropolitan regions of New York City and Philadelphia, both with major ports, New Jersey has long been home to several major population centers and supported a significant amount of industrial development which now accounts for over fifty billion dollars in annual output. This urban and industrial development has occurred as the state continues to support a major agricultural sector that generates over a billion dollars annually, including several hundred million through active fisheries and shellfisheries. The challenges facing New Jersey to maintain its agricultural and industrial sectors, its significant natural resource base, and its critical population centers, all while ensuring the health and safety of its people and natural environment are complex.

As a coastal state surrounded almost entirely by the Atlantic Ocean and its connected river and bay systems on the east, and the Delaware River and Bay system on the west, tidal water related processes have major effects on the day-to-day life in New Jersey. The benefits of this proximity to the ocean and bay include a major tourist industry centered on the beaches and coastal bays that support numerous water-based activities, vibrant commercial and recreational fin and shell fisheries, and direct access to major port facilities and all the goods and service that flow through them, among many others. The detriments to this proximity include the destruction that frequent storms bring to coastal communities which are being exacerbated by the effects of climate change and sea level rise. The state, for example, is still dealing with the aftermath of Superstorm Sandy which devastated large portions of many Atlantic coastal and Delaware Bay communities in 2012. That storm brought to light the fact that better resiliency planning to contend with climate change effects, particularly with regards to sea level rise, must be included in all future environmental protection and urban development scenarios.

Critical to developing these planning scenarios is the availability of accurate and frequently collected elevation data, both terrestrial and bathymetric. Elevation has been identified as a critical framework data set for New Jersey for several years, as reflected in the inclusion of a chapter on elevation data in the New Jersey Geospatial Strategic Business Plan (https://njgin.state.nj.us/oit/gis/NJ_NJGINExplorer/docs/StrategicBusinessPlan.pdf) This plan identifies nine critical framework data sets for the state, discusses the present status of each of those data sets, what needs to be done to improve them, and what approaches should be undertaken to provide for their regular update and improvement in the future.

The implementation of the elevation plan is the focus of the Elevation Task Force which is a standing committee of the New Jersey Geospatial Forum (GSF). The GSF is composed of geospatial professionals representing a wide variety of New Jersey state, county, municipal, private, non-governmental, and educational organizations, as well as several federal entities (https://www.nj.gov/njgf/#!/). Coordinating elevation projects through the task force ensures that the implementation of the business plan for

elevation data is done in an efficient manner that addresses the wide variety of elevation data needs identified by the member groups.

A major emphasis of the plan continues to be placed on the collection of high-resolution terrestrial elevation data, primarily from lidar, used to build and update bare-earth elevation models. These models form the basis for both inland riverine flood hazard analyses and mapping and coastal storm surge modeling both of which are of high importance to the state. Terrestrial lidar also is used to help develop many other types of data from vernal pool maps to impervious surface layers to potential solar farm locations, among many others. Lidar point clouds are used to model forest canopy resources in the state and forest fire potential. They are used to generate building footprints and building locations that are critical to emergency response planning. And tidally coordinated collections are important to providing accurate marsh surface elevations need to properly model potential marsh migrations due to sea level rise as well as calculate marsh vegetation volumes used in carbon sequestration modeling.

The task force and plan also realize the importance of topo-bathymetric and bathymetric elevation data. Besides being situated between the Atlantic Ocean and the Delaware Bay, New Jersey has several large tidal bays that are a major part of New Jersey's coastal environmental. Because of their size, relatively shallow depths, and large open water extents, these bays directly affect the impact that coastal storms have on New Jersey. As the propagation of waves associated with storm events is directly dependent on water depths and bottom topography, having accurate bathymetric models for the bays, along with accurate nearshore bathymetry for the Atlantic coast and Delaware Bay shorelines determined using both lidar and beach profile surveying, is critical to developing realistic storm surge models. While some bathymetric data have been collected for portions of the bays, much of the bays remain unmapped, or mapped only with relatively old or coarse data. As coastal resiliency planning is becoming increasingly important in the state, collecting more bathymetric lidar is of major importance to the task force.

In addition to the importance of bathymetric data of the bays and nearshore coastal waters in resiliency planning, they also have many other uses. The bays, for example, support both extensive recreational activities and significant populations of fin and shellfish, birds, and marshes. Accurate bathymetric elevation data are critical to maintaining all of these. Channel depths and locations must be accurately mapped to support the large amount of boat traffic in the bays. Bottom elevations and water depths control the distribution of submerged aquatic vegetation (SAV) which support both types of fisheries, and to properly protect and improve SAV beds, accurate bathymetric elevation profiles are needed. Similarly, offshore bathymetric data are needed to locate potential offshore sand deposits that can be used to rebuild dune systems critical to New Jersey's shore protection plan, as well as determining suitable locations for wind farm installations.

Prior to the writing of the plan, there was no group in the state that was charged with overseeing the development and maintenance of statewide elevation data. With the latest revisions of the strategic plan, the New Jersey Department of Environmental Protection (NJDEP) is now identified as the lead agency for elevation data acquisition, with major project coordination accomplished through the Elevation Task Force of the NJGSF. Initially, New Jersey relied primarily on elevation models produced by USGS and based on older topo-quad elevation data. The NJDEP had worked with the USGS to develop a statewide 10-meter resolution DEM from the original 30-meter topo-quad data which became the base elevation model used throughout the state for several years.

During this same period, the first major New Jersey lidar data collection project was completed. This project was done in conjunction with FEMA and covered two counties, Camden and Burlington, which had experienced widespread flooding in 2004 due to the failure of several important dams. The failures were caused by a significant rain event that dumped over 12 inches of rain on the counties in a 24-hour period.

This initial collection predated the development of lidar collection standards, had some quality issues, and was only of high enough resolution to support a 3-meter DEM. But based on the great improvement these data provided over existing elevation data, particularly in accuracy and consistency, it was clear from this initial collection that lidar would be a primary technology in developing, updating, and maintaining the framework elevation data of the state.

While the potential importance of lidar generated elevation data as a framework data set was recognized after this initial collection, there was no existing plan in place to collect and distribute additional lidar data. As a result, between 2004 and 2011, there were 12 additional major lidar collection projects undertaken in the state, most of which were done with little coordination. The positive result of this collection activity was that after completion of a 2010 project covering Atlantic and Ocean Counites, there was some lidar data available for all areas of the state (Figure 1).

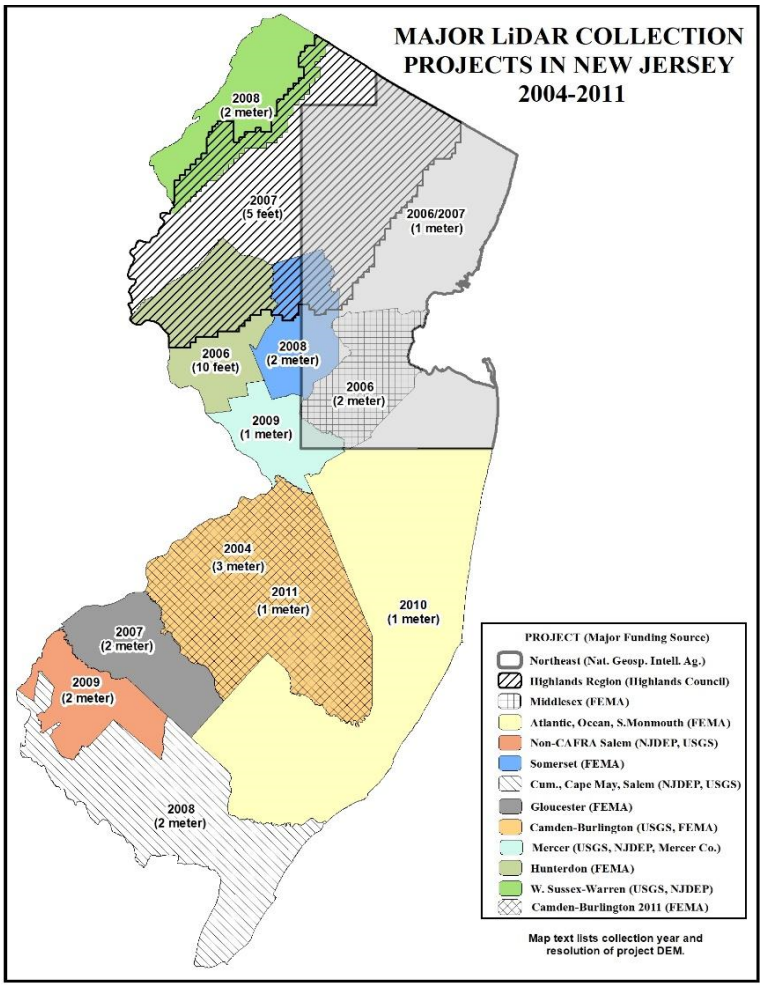


Figure 1. Major NJ LiDAR Collections, 2004-2011

On the negative side, as also shown in Figure 1, this lack of coordination resulted in multiple projects being done by different agencies over the same time frame and often covering overlapping areas of interest. In addition (as shown in Table 1 included at the end of this document), most of these projects were done using very different standards. There were variations in coordinate systems used, accuracy targets, point collection densities and spacing, point file types, point classification systems, DEM resolutions, tiling systems, and final deliverables, among others. So while critical elevation data were

generated in each of these collections, the lack of coordination in planning the projects and in collecting and developing the data, resulted both in the inefficient use of resources available for lidar projects as well as in limiting the usefulness of the data for statewide elevation analyses.

Once the data from the 2010 collection were made available, NJDEP as the elevation steward, developed a workflow to reprocess all the original point cloud data to a standard NJ State Plane Projection, and to resample these to generate a standard 10-foot resolution DEM (Figure 2). This resolution was used since, while some of the later collections would support higher resolutions DEMs, collection point densities in several of the early collections would only support a DEM of this resolution. This was not a trivial task in that there were upwards of 25,000 individual point files in a variety of file types generated in the 13 major projects.

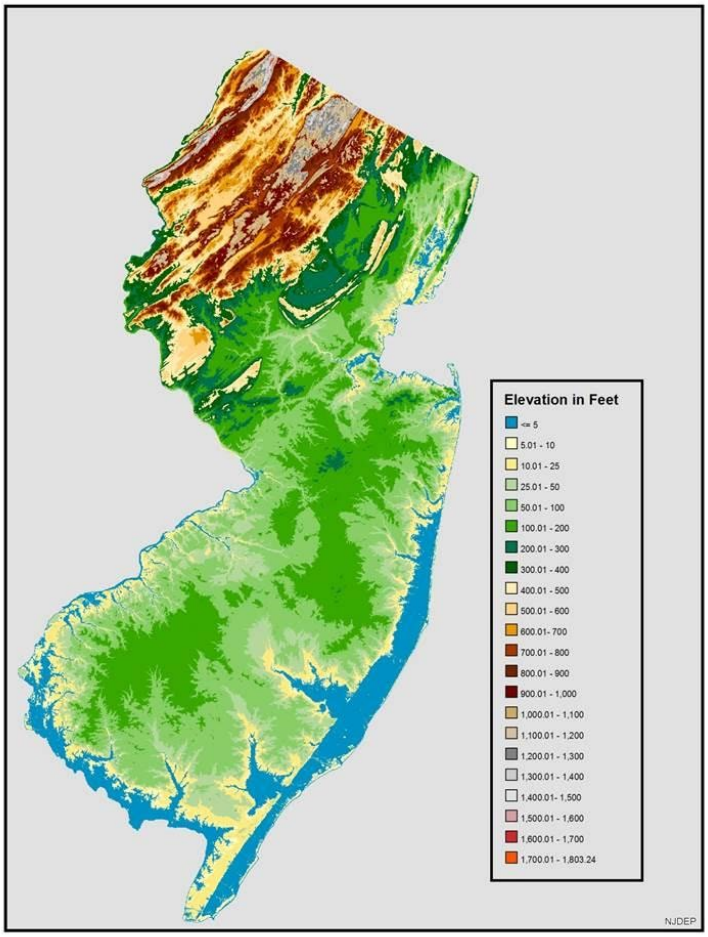


Figure 2. NJ Statewide LiDAR Derived 10-foot DEM

It is worth noting that even though the data from the 2011 FEMA collection of Camden and Burlington Counties were of Quality Level 2 (QL2), those data were not used in the statewide DEM project. FEMA was only interested in developing bare-earth models in a buffer zone around the watercourses in those two counties, and classified points only in those buffer zones. Therefore, points in the major portion of those counties were not classified, and bare-earth models for the full counties were not generated. This is a good example of why coordination in major projects at all levels should be a priority. Had the state and other interested parties known that FEMA was collecting the data, it is possible that they would have co-

funded the project with FEMA so that all the point data could be classified. As it was, there was a large amount of lidar data collected that really was not used. Those two counties were re-collected in 2014 as part of another project. But with better coordination, there clearly were opportunities to save resources and provide more accurate data for these two counties several years before the 2014 project.

The previous lack of coordinated planning and standardization of lidar data specifications were two issues that were the focus of the elevation section of the 2012 and 2015 revisions of the Geospatial Strategic Business Plan. As a result, there has been much better coordination in the planning of subsequent major collection projects and in the setting of basic standards to be used for these projects. Between 2011 and 2015, there were two major reacquisition projects undertaken focusing on New Jersey counties (Figure 3).

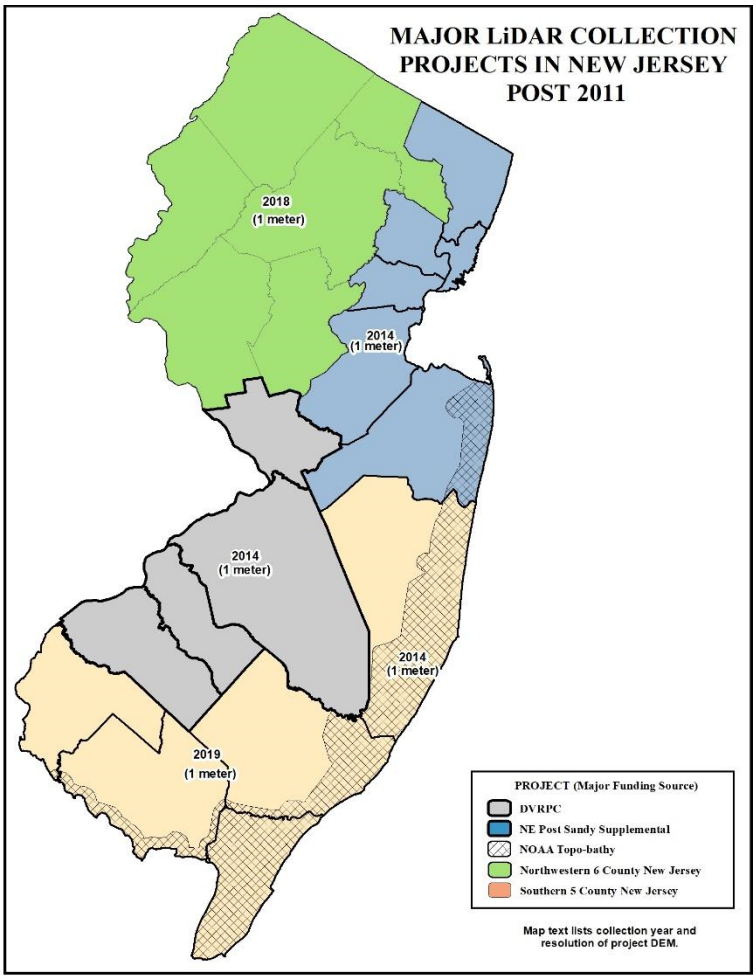


Figure 3. Major NJ LiDAR Collections, Post 2011

These projects did involve coordination among multiple partners with input from the Geospatial Forum, and followed standards outlined in the Lidar Base Specifications developed through the National Geospatial Program. One project covering six NE counties was done in conjunction with USGS as a post-Superstorm Sandy project, and the other covering four New Jersey counties was a project done under the auspices of the Delaware Regional Planning Commission (DVRPC). The DVPRC is a Pennsylvania/New Jersey regional planning agency covering a total of nine counties comprising the greater Philadelphia metropolitan area and is an active participant in the NJGSF and Elevation Task Force. Importantly, both collections were done to the latest USGS QL2 standards, which the state has adopted as the minimum

lidar point density and accuracy standards for its framework data set, and produced hydro-flattened bare-earth elevation models at the same 1-meter resolution.

In addition to these two collections, NOAA also completed a major post-Sandy topo-bathy coastal collection in 2014 covering the coastal strip from South Carolina through New York (Figure 2). While this collection did not follow all standards outlined in the Lidar Base Specifications (for example, the DEM generated did not include any hydro-flattened water areas), the point densities and point accuracies of the topo points did meet the standards for QL2 data. Once all data from these three projects were available, the statewide 10-foot resolution DEM was updated using the new data points. Because the data were collected to more standard specifications, the processing of these three new collections and the updating of the statewide model did not involve as much additional processing as was needed to generate the first statewide model.

After 2015, New Jersey, working closely with USGS through the Broad Agency Announcement (BAA) for the 3D Elevation Program, had two proposals accepted to reacquire lidar for a total of 11 counties, both also to be collected to meet QL2 standards (Figure 3). One proposal covering six counties in northwestern New Jersey was to be completed in the spring of 2017 and involved a partnership between OGIS, NJDEP, the New Jersey Department of Transportation (NJDOT), the New Jersey Highland Council, and the USGS. This collection would replace several older collections which were completed between 2006 and 2009. Unfortunately, extremely poor weather conditions that spring, which included four nor'easters with significant snowfall in March, led to the project being suspended until 2018 with only about 15% of the area collected during 2017. The collection was completed in 2018 with all the final data products delivered in 2019.

The second proposal accepted through the BAA program covers five counties in southern New Jersey, including Salem and Cumberland Counties which are located along Delaware Bay. Both counties experienced significant flooding due to Superstorm Sandy and neither had been re-collected as part of the other post-Sandy collections. This reacquisition is critical to developing data that more accurately reflect existing elevation conditions for these flood prone areas.

The southern New Jersey five county collection was planned and financed through a partnership involving OGIS, USGS, FEMA, and several bureaus within NJDEP. It was also to be undertaken during the winter/spring 2018, along with the completion of the northwestern project. However, while weather conditions in the northwestern part of the state did allow the remainder of that northwestern collection to be completed, abnormal amounts and frequency of rain and some snow in the southern counties resulted in above normal flood levels throughout the southern collection area. Therefore, this collection was also suspended for one year, with the collection moved to late winter/spring of 2019. The spring season in 2019 was also characterized by above normal precipitation. But the collection was finally completed with all data products delivered in the fall of 2020. With the completion of these two projects, New Jersey now has QL2 data all less than five years old available for the entire state. This is seen as a major accomplishment for the state, as it significantly improves the quality of this critical framework elevation data set.

NJDEP has updated the statewide elevation model with the data delivered from the NW six county project and is in the process of preparing the south New Jersey collection data to again update the model. The initial update will be to the 10-foot resolution of the existing model. However, as a higher resolution statewide model can now be generated, the Elevation Task Force is entertaining developing a higher resolution model based on the needs of the user community. The GSF recently distributed an elevation needs survey to its members to identify the elevation products and elevation criteria they would like to have developed. The results of this survey will be used to direct the development of elevation projects in the future.

Funding Sources and Partners

Since, in the past, there had been little overall state level coordination for undertaking lidar projects, the specifics of how projects were planned, managed, and funded varied greatly. Some of the details of the projects are included in Table 1, although a lack of standardization in documenting projects has resulted in details of some of the projects not being easily uncovered. There are projects, such as that done for Gloucester County in 2007, which were completely planned and financed by a single entity, in this case FEMA. In reading the project documentation, it is interesting to note that while the data were considered of sufficient quality to meet FEMA needs for flood plain mapping, because of lack of funds, there was no independent ground-truth checkpoint surveying done for performing an independent accuracy assessment. Had the project planning involved other partners, it is conceivable that additional funds from other entities with an interest in the data could have been added to the project to perform the QA/QC assessment.

At the other extreme is the northwestern New Jersey project which was planned through the Elevation Task Force of the Geospatial Forum, using the BAA proposal process. This project directly involved the Office of GIS within the Office of Information Technology, NJDEP, NJDOT, the New Jersey Highlands Council, USGS, and NRCS in planning and funding. Each was involved in some capacity in all stages of the project and contributed financially to its completion. USGS served as the overall project manager, provided the contract mechanism for the project, provided the contractor, and oversaw the day-to-day contract management tasks. NJDEP, because of an official arrangement allowing for the creation of joint funding agreements between USGS and NJDEP, served as the primary financial contact for the state, collected all funds provided by the various state organizations, and deposited these into a single account from which the USGS invoices were paid. NJDEP staff also served on the technical project team for the state, along with representatives of OGIS and the Highlands Council.

A similar partnership process was used for the ongoing southern New Jersey project, and with the establishment of the Geospatial Forum and the Elevation Task Force, the intent is to develop, manage, and fund all future major New Jersey projects in a similar manner. While the active membership on the Elevation Task force is a small percentage of the organizations participating in the full NJGSF, the task force is open to all interested parties. In addition, the chair of the task force gives a report at each of the NJGSF quarterly meetings on the status of any ongoing projects, as well as on any plans being developed for future projects. In this way, a large participant base is kept up to date on all task force projects. The general meetings also provide an opportunity for stakeholders not sitting on the elevation task force to discuss any projects that they may be planning that could benefit the larger community. The intent is to widen the partnership base for these major projects, so funding, planning, and data development are all done as effectively as possible.

It should also be noted that the chair of the Elevation Task Force is the regional USGS representative. This has been extremely beneficial in coordinating the efforts of the state with various federal partners and has directly resulted in the successful completion of six or seven major projects completed in New Jersey over the last ten years. Importantly, the elevation data collected through this partnership, especially those collected in the recent projects and in any future projects undertaken through the Geospatial Forum and Elevation Task Force, can be incorporated into the national 3DEP database since the projects use the USGS QL2 standards as the minimum standard for the collections.

Importance of elevation data to New Jersey

New Jersey is a coastal state with approximately 35% of the state having tidally inundated areas extending into 16 of the 21 counties in the state. As such, coastal flooding, whether due to normal daily tide cycles or to the extreme tidal flooding accompanying coastal storm events, is a major focus of data analysis and planning initiatives undertaken in the state.

Critical to all the studies is an accurate and current bare-earth elevation model. The importance of good ground elevation data was never more clearly demonstrated as when Superstorm Sandy hit the New Jersey coastline in 2012. All 16 coastal counties were directly affected by coastal flooding, with significant damage done in the nine counties having Atlantic coast or lower Delaware Bay shoreline. Existing flood hazard maps generated using older elevation data did not adequately predict the flood hazard zones. In addition, because the existing elevation models did not reflect current topography, surge depth grids used for planning purposes did not accurately predict surge amounts or extents.

Since that event, a major focus of many entities in the state has been on coastal resiliency planning, with several of the recent lidar projects undertaken primarily to generate accurate post-Sandy elevation data in these tidally influenced areas of the state. The new data have been used to improve flood hazard maps, develop a series of tide level water elevation depth surfaces, generate storm surge extent and depth grids from SLOSH model output, and inundation surfaces based on sea level rise predictions, among others. All the data sets are used in a variety of resiliency planning efforts by many groups to better enable New Jersey to protect its inhabitants, environmental resources, and infrastructure during these storm events. And all these data sets, and the effectiveness of the planning efforts, are dependent on accurate and current elevation data.

While lidar is the primary source of elevation data for these uses, it should be noted that important elevation data are also generated using other methods covered in the survey. For example, Stockton University, working through the NJDEP Bureau of Coastal Engineering, maintains a beach profiling network consisting of some 171 sites at which locations bathymetric survey profiles are routinely generated. These survey-generated shoreline elevation data are critical to measuring the effects of storm events on coastal dune and beach fronts. The surveyed profiles, along with targeted pre- and post-Sandy coastal lidar collections done in 2012 by USGS, were used in change analyses of the coastal New Jersey shoreline to estimate volumes of sand moved by the storm, as well as to document the spatial pattern of the erosion and deposition. In addition, the profile elevations and lidar bare-earth models can be used together to improve the accuracy of many of the other storm surge products that are being developed.

There are also important bathymetric data that are collected using side scan sonar. NJDOT is charged with maintaining the navigable state waterway channels, and by necessity collects much of the channel profile data using sonar. Besides the use of these data for channel mapping and maintenance, they can be used in conjunction with bathymetric lidar data and surveyed profile data to generate more accurate bathymetric models of New Jersey's coastal bays and shorelines. The bays comprise a significant portion of the coastal area of the state, and significantly affect how storm surges affect the surrounding upland areas. Accurate bathymetric elevations are critical inputs to models used to predict coastline and bay shore accretion/erosion cycles since the bottom elevations and water depths affect wave propagation and intensity, both of which affect shoreline erosion potential. Elevation data from all these sources are being used to develop models of shoreline dynamics.

Besides using bathymetric data from multiple sources to map the channels within the tidal bays, maintaining access to the major ports Philadelphia and the Port of New York-New Jersey is critical to the economy of the state and the entire mid-Atlantic region. The Port of New York-New Jersey is the biggest port on the east coast and is the third largest port in the nation. Maintaining the channels to allow for unimpeded ship access to the ports is a critical and ongoing operation dependent on having accurate bathymetric data for the ports and harbors.

Sonar is also used for generating some non-channel bathymetric surfaces of both coastal and inland waterbodies and watercourses. Several groups such as The Nature Conservancy and the Division of Fish, Game and Wildlife of the NJDEP use sonar to collect bathymetric data used in the study of fishery and shellfishery resources. Accurate mapping of submerged aquatic vegetation habitat, which affects both

types of fishery resources, is dependent on having accurate bottom elevation data. So where topo-bathy lidar has been collected, those data are being used in conjunction with some sonar generated elevation data to improve aquatic vegetation mapping and fishery and shellfishery resource analyses.

In addition to the various coastal management data sets that are based on ground or bottom elevations, elevation data from other point cloud returns are also being used to develop other data sets. For example, a statewide building footprint data set was recently developed which used all the available lidar point clouds as the primary data input to generate the footprint vectors. These building locations are being evaluated with all the various storm surge and sea level rise surfaces to help in developing effective storm response plans. Lidar point clouds and the associated intensity images were also used in conjunction with aerial imagery to map impervious surfaces throughout the state. Having these impervious surfaces mapped and being able to evaluate the elevations of these areas is important in understanding the movement of water across the land surfaces again enabling better long-range planning for storm events.

All the above uses of elevation data are also applicable to the non-coastal areas of the state. New lidar generated bare-earth elevation models are used to improve flood hazard mapping for interior and riverine areas. The models are used to more accurately delineate watershed boundaries which greatly improves any modeling done to evaluate potential impacts of flooding and run-off. In addition, the bare-earth models are used to generate stream flow lines which are used to update and improve the statewide waterbody and stream network data sets. These data sets have been incorporated into the National Hydrography Dataset, and both the waterbody layer and the stream network layer are being updated using new lidar elevation data. The flow lines and small area watershed boundaries generated from the elevation models are particularly important in mapping headwater streams and contributing areas, which often are not visible on the imagery used to do much of the original streamline mapping. Without the elevation model generated data, these critical water features may not be mapped and not get the protection that they require.

Elevation data are also used to improve mapping of both important vegetation and animal resources in New Jersey. Projects are presently underway to use elevation data to improve the mapping of wetlands across the state by examining various topographic indexes that are based on elevation data in conjunction with land use/land cover data. The intent is to identify potential wetland areas that are not presently mapped as well as refine existing wetland delineations. In addition to the bare-earth elevation values, the elevations of other returns in the point clouds are being used to generate vegetation height maps that will enable more accurate classification of wetland vegetative associations.

These kinds of elevation based analysis are also extremely important to animal species mapping that has been ongoing in New Jersey, best represented by the New Jersey Landscape Project (https://www.state.nj.us/dep/fgw/ensp/landscape/). The project is an ecosystem-level approach for the long-term protection of imperiled species and their important habitats in New Jersey. The development of the habitat models is dependent on accurate land use/land cover maps, particularly where wetlands and riparian corridors are located, so that as mapping of these data types are improved through the use of elevation data, the delineation of the habitat areas for critical species is improved.

Besides the uses discussed above, there are many more uses of elevation data which cannot be described in detail in this document. A list of some of these additional important uses would include:

- Land use change mapping;
- Contour generation;
- Ground water recharge modeling;
- Sediment discharge modeling;
- Flow accumulation and flow direction modeling;

- Storm water management;
- Dam breach studies and dam retention basin design;
- Forest fire fuel estimation;
- Forest harvesting analysis;
- Vernal pool mapping;
- Viewshed analysis;
- Historical property analysis;
- Coastal wetland restoration;
- Storm surge and wind damage modeling/assessment;
- Archeological site analysis;
- Infrastructure planning and protection; and
- Solar PV suitability mapping.

High-level summary of elevation data requirements

For topographic elevation data, New Jersey has set the minimum standards for the framework elevation data to be QL2 as outlined in the latest USGS Basic LiDAR Specifications, v 1.3 (https://pubs.usgs.gov/tm/11b4/pdf/tm11-B4.pdf). Most importantly, these standards call for point densities of at least two pts/meter, nominal point spacing of .7 meter or better, NVA at the 95% confidence interval of .196 meter or better, and hydro-flattened bare-earth tiled DEMs of 2-foot resolution or better, with all water bodies greater than two acres in size and watercourses greater than 100 feet in width flattened. Classified point clouds are to be delivered as LAS 1.4 files with point record format six. The minimum standards call for nine classes.

As a coastal state, New Jersey will also require all major collections covering any tidal areas to be tide coordinated, with the standards being +/- 2 feet of mean low water. Although the Lidar Base Specifications do include tide coordination as a possible requirement, there are no specific coordination standards included in the document. As important, there are no guidelines included as to how tide coordination is to be planned and accommodated for in flight planning to ensure that this important specification is met. With sea level rise and coastal resiliency planning becoming more important issues, it is critical that tide coordination receive a more detailed discussion in future updates of the base specification standards.

There is also much interest in higher quality level lidar data particularly for point densities. As mentioned earlier, the NJDEP has produced a statewide building footprint layer primarily using lidar point clouds. While it is possible to generate footprints with point densities of a few points per meter, the success and accuracy of the point classifications is greatly improved with high point densities. Higher point densities would also be beneficial developing more detailed elevation models particularly in coastal areas where the terrain is relatively flat. Very small elevations differences can make large differences in tidal inundation extents and these small differences may not be accurately modeled with lower point density or lower accuracy data sets.

While QL2 data seems to be suitable for most statewide topographic elevation data uses, there certainly is interest in higher quality data. The issue really becomes what data level can be realized with the available funds to cover the greatest area. Again, partnerships fostered through the New Jersey Forum, and with federal partners through the support of 3DEP, will become increasingly more important as the use and importance of elevation data increase.

In identifying a standard for collection frequency, New Jersey would like to see all areas re-collected at least every eight years, as is the original 3DEP target. The initial focus of the New Jersey elevation task force was to get complete lidar coverage for the entire state. Once that was accomplished, the focus was to get QL2 level data for the entire state. Both of those targets have now been accomplished, and the focus of the task force and the GSF will be to come up with a reacquisition plan that both satisfies user needs for elevation data, as well as ensures that the plan is fundable and sustainable. Based on the last two lidar projects undertaken in New Jersey, the state can expect to spend somewhere between $180 and $250 dollars per square mile for lidar data collection, processing, and independent QA/QC, depending on whether there are tide coordination requirements needed for a major portion of the project extent. With the five non-tidal counties covering 2,121 square miles and the tidal counties covering 5,660 square miles, a projected cost of reacquiring the entire state could run between 1.75 and 2 million dollars. If the 8-year cycle is followed, the state would need approximately one-quarter of that amount for four years starting in 2022, and then again starting in 2030.

The state generally has been able to fund an ortho-imagery project every five years and having lidar also collected on a five-year cycle would be extremely beneficial. As land use data generated from the imagery show, New Jersey continues to undergo a large amount of year to year change and having elevation data that are more frequently collected to support the change analysis would be extremely beneficial. However, neither imagery nor lidar elevation data projects have a stable source of funding. Cases for both data types to be identified and funded as capital budget items have been made for several years, although at this point, neither has been so designated. The GSF, Elevation Task Force, and the major government entities that participate in both, such as OGIS and NJDEP, will continue to push for state level funding sources for both data types.

While QL2 elevation data are the agreed upon minimum standard for topographic data in the state, the quality need for bathymetric elevation data is not as well defined. This may be primarily a reflection of the relatively limited availability of bathymetric lidar data when compared to topographic data, which results in topo-bathy and bathymetric lidar being used in fewer applications. That is changing as topo-bathy and bathymetric lidar systems become more refined and collections using these systems become more common.

In addition, the required quality level is very dependent on whether it is inland, nearshore, or offshore bathy that is needed. Each of these areas present very different challenges to collecting bathymetric data that often dictate what quality level is realistic. Since there is not as much topo-bathy and bathymetric data available as there is topographic data, users may not be able to accurately define an acceptable and realistic quality level for each of these areas.

And while it may be sufficient to re-collect most topographic elevation data on a five to eight-year cycle, this cycle may be too long for bathymetric data. The dynamics of nearshore and offshore areas result in more frequent changes in bottom elevations which would benefit from more frequent collections of bathymetric elevations. At this point, it is difficult to propose a collection cycle for bathymetric data since much of the collection of bathymetric data is very project dependent. But as resiliency planning becomes a more important undertaking for New Jersey, the collection of topo-bathy and bathymetric data will become a major topic of discussion in the GSF and the Elevation Task Force.

Additional comments

The NJGSF and the Elevation Task Force will continue to promote using partnerships to plan, fund, and complete major elevation projects in the state. The partnership with the USGS has proven successful in multiple projects, as seen through the BAA proposal process and previous imagery and lidar projects, so continued collaboration is recommended for future collection projects. It has shown to both benefit the state and the 3DEP program by providing high-quality data to both while maximizing the use of available

resources. It is anticipated that that partnership will remain the base of the future planning for elevation projects. And to that base will be added additional partners on the state level to expand those that have already participated in recent elevation projects.

As may be evident from some of the responses that were provided by New Jersey study participants, there are some areas where it would be beneficial to expand what may be included in the 3DEP program. Topo-bathy and bathymetric projects will certainly see more focus and importance in New Jersey in the future, so expanding the 3DEP program to better incorporate these types of projects under the 3DEP umbrella or expanding the partnership between federal entities to better coordinate topographic and bathymetric collections would be helpful. In addition, continuing the development of the Lidar Base Specifications to include standards for non-topographic data types so that acceptable federal standards for all types would be outlined in a single, consistent document would also be helpful. The use and importance of elevation data in New Jersey will only continue to increase in the future, and the NJGSF and the Elevation Task Force look forward to working with all federal partners to continue to generate and improve the collection and distribution of elevation data.

The State of New Jersey has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Table 1. Specifications of NJ Lidar Collection Projects, 2004 - 2011

Project	Camden, Burlington	Middlesex	Highlands	NGA Northeast	Gloucester	Hunterdon	Cape May, Cumberland	Western Sussex	Somerset	Mercer	Non-CAFRA Salem	Atlantic, Ocean.	Camden, Burlington
							CAFRA Salem	Western Warren				Southern Monmouth	
Collection Year	2004	2006	2006/2007	2006/2007	2007	2007	2008	2008	2008	2009	2009	2010	2011
Collection Month	?	October/November	Nov./ Feb.	December/February	March/April	March	April	April	January	March/April	March	April	March/April
Approx. Area (sq. mi.)	1,100	317	1,675	1,493	353	437	860	578	279	228	275	1,612	1,050
Leaf On/Off	On	?	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off
Tide Coordinated	No	No	No	No	No	No	Yes	No	No	No	No	Yes	No
Tide Window	N/A	N/A	N/A	N/A	N/A	N/A	(+/-) 3 hrs. MLW	N/A	N/A	N/A	N/A	2 hrs mean low water	N/A
Nominal Point Spacin	?	1.37 m.	not reported	.7 m	.7 m.	not reported	.8 m.	1.4 m.	.8 m.	0.56 m.	.72 m.	1 m.	2 ft.
Point Density	?	not reported	0.74/sq. m.	not reported	not reported	not reported	1.58/sq. m.	not reported	not reported	3.15/sq. m.	1.92/sq. m.	not reported	2.7/sq. m.
Vertical Accuracy (FV	?	.265 m (.87 feet)	.162m (.53 ft.)	.185m (.61 feet)	.19 m (.623 ft.)	.185 m (.363 ft.)	.13 m. (.43 ft)	not reported	.114 m (.374 feet)	.185 m (.363 ft)	.294 m (.964 ft.)	.35 ft	.222 m (.73 ft)
Horizontal Accuracy	?	3 feet	not reported	1 m	1 m	not reported	1 m	1.5 ft	.5 m	1 m	1 m	.6 m	3 ft
Coordinate System/u	UTM/Meters	NJSPF	NJSPF	UTM	NJSPF	NJSPF	NJSPF	NJSPF	UTM	NJSPF	NJSPF	NJSPF	UTM
Horozontal Units	Meters	Feet	Feet	Meters	Feet	Feet	Feet	Feet	Meters	Feet	Feet	Feet	Meters
Vertical units	Meters	Feet	Feet	Meters	Feet	Feet	Meters	Feet	Meters	Feet	Feet	Feet	Meters
Horizontal Datum	NAD83	NAD83	NAD83	NAD83	NAD83	NAD83	NAD83	NAD83	NAD83	NAD83	NAD83	NAD83, NSRS 2007	NAD83
Vertical Datum	NAVD88	NAVD88	NAVD88	NAVD88	NAVD88	NAVD88	NAVD88	NAVD88	NAVD88	NAVD83	NAVD88	NAVD88	NAVD88
Collection standard	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Quality level	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
LAS version	1	1	1	LAS files not available	1.1	1	1.1	1	1.1	1.1	1.1	1.2	1.2
Number of Retruns	1	4	3	?	4	4	4	2	2	4	4	4	4
Classes	3,5	1,2	1,2,12,30	?	1,2,7,9	1,2,9	1,2,9,12	1,2	1,2,3,4	1,2,9,12	1,2,9,12	1,2,7,9,11	1,2,7,9,11
Intensity Values	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Tiling	USGS QQ	USGS QQ	NJ Ortho Grid	Project specific	NJ Ortho Grid	NJ Ortho Grid	NJ Ortho Grid	NJ Ortho Grid	Project specific	NJ Ortho Grid	NJ Ortho Grid	NJ Ortho Grid	Project specific
Bare Earth DEM (Y/N)	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Partial
DEM Resolution	3 meters	2 meter	5 feet	1 meter	2 meter	10 feet	2 meter	2 meter	2 meter	1 meter	2 meter	1 meter	2 meter
DEM Format	ESRI grid	Geotif	ASCII	IMG	ESRI grid	ASCII	ESRI grid	ESRI Tin (not delivered)	ASCII	ESRI grid	ESRI grid	ESRI grid	Not delivered
Hydro-flattened	Yes	No	No	No	No	No	Yes	?	No	No	Yes	Yes	N/A
Hydro-enforced	No	No	No	?	No	Yes	Yes	?	No	Yes	Yes	No	N/A
Breaklines Delivered	No	No	No	No	No	Yes	No	No	No	No	No	Yes	No
Contours	No	No	Yes	No	No	No	No	Yes	Yes	No	No	No	No
Agency	FEMA	Not clear	Highlands Council	USGS	FEMA	FEMA	USGS	FEMA	USGS	USGS	USGS	FEMA	FEMA
Partners			USGS	NGA			NJDEP			Mercer Co.,NJDEP	NJDEP	None	

Table 1. Specifictions of NJ LiDAR Collection Projects, 2004-2011

Summary Table

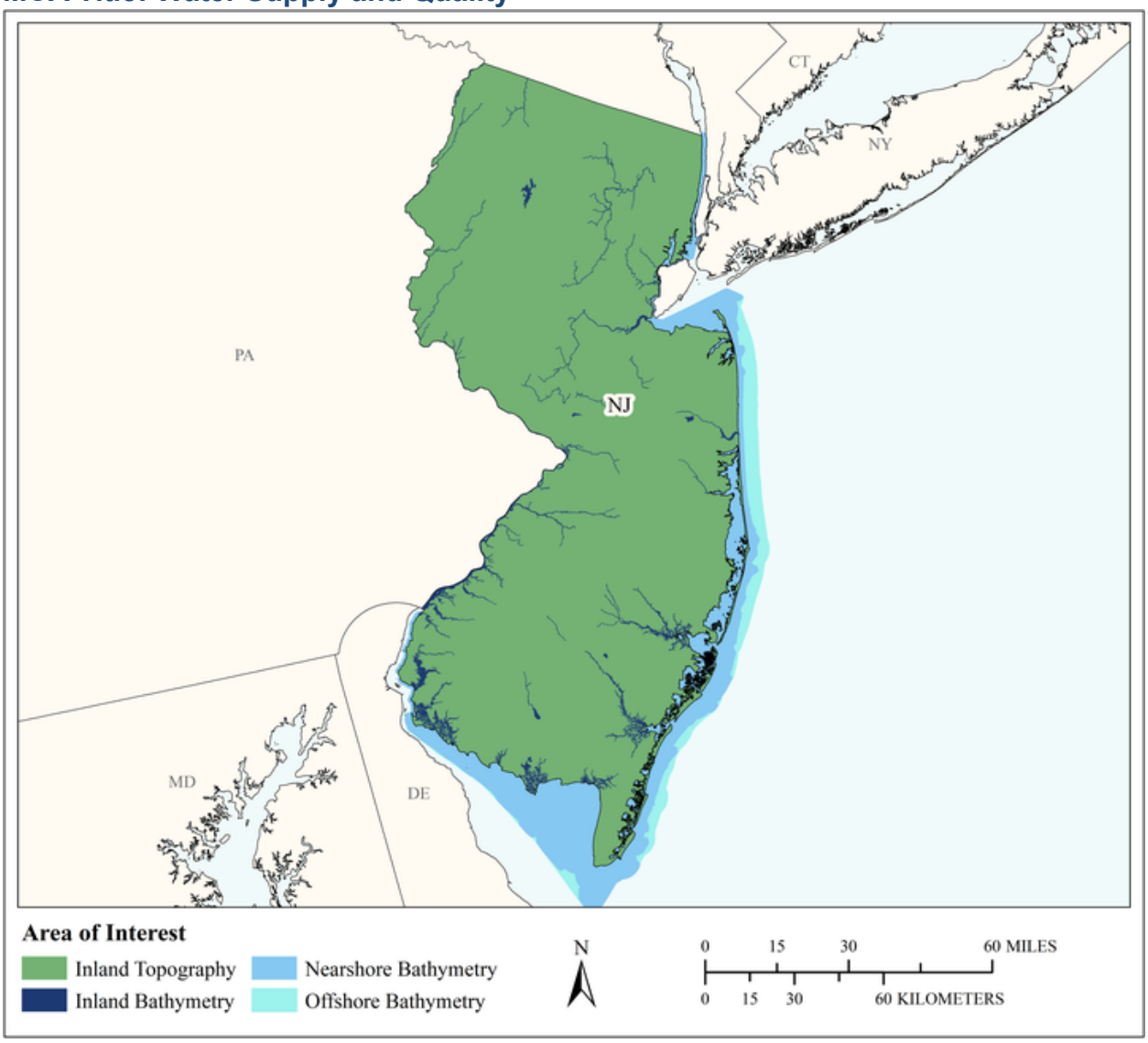
MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	State of New Jersey	60293	Water Supply and Quality	Inland Topo	QL2	4-5 years	$41,761	$11,185	Moderate	Major	Moderate
				Inland Bathy	QL1B	6-10 years	$180,662	$18,879	Moderate	Major	Moderate
				Nearshore Bathy	QL1B	4-5 years	$33,222	$54,730	Moderate	Moderate	Moderate
				Offshore Bathy	Order 1a	4-5 years	$335	$1,679	Minor	Major	Major
BU 02 – Riverine Ecosystem Management	The Nature Conservancy	21502	Environmental Conservation	Inland Topo	QL1	4-5 years	$1,206	$2,261	None	None	None
				Inland Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	None	None	None
				Nearshore Bathy	QL1B	2-3 years	$1,356	Unable to quantify	None	None	None
BU 03 – Coastal Zone Management	Stockton University	1350	Topographic and Bathymetric Surveys of the New Jersey Coastline	Nearshore Bathy	QL0B	Event driven	$41,012	$7,537	None	I don't know	I don't know
BU 03 – Coastal Zone Management	NJDEP	1455	New Jersey Coast Elevation and Bathymetry for Coastal Resiliency Planning	Inland Topo	QL2	2-3 years	$154,247	$26,965	Moderate	Moderate	Moderate
				Inland Bathy	QL2B	2-3 years	$66,191	$38,804	Moderate	Moderate	Moderate
				Nearshore Bathy	QL2B	2-3 years	$112,808	$190,829	Moderate	Moderate	Moderate
				Offshore Bathy	Special Order	2-3 years	$72,000	$2,100	Moderate	Moderate	Moderate
BU 03 – Coastal Zone Management	NJDEP	21588	Wetland and Species Distribution Modeling	Inland Topo	QL0 HD	2-3 years	$234,334	$41,127	Minor	Moderate	Moderate
				Inland Bathy	QL0B	2-3 years	$100,666	$58,958	Minor	Moderate	Moderate
				Nearshore Bathy	QL0B	Annually	$113,016	$190,903	Minor	Moderate	Moderate
				Offshore Bathy	Order 2	Annually	$10,712	$4,703	Minor	Moderate	Moderate
BU 03 – Coastal Zone Management	Rutgers University	21729	Coastal Resiliency Planning and Hazard Mitigation	Inland Topo	QL2	2-3 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
				Nearshore Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 04 – Forest Resource Management	State of New Jersey	60294	Forest Resources Management	Inland Topo	QL2	2-3 years	$29,779	$43,168	Major	Major	Major

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 06 – Natural Resource Management	Barnegat Bay Partnership	21620	Collaborative Approach to Research, Educate, and Restore the Barnegat Bay	Inland Topo	Cross sections and/or transects meet needs	4-5 years	$6,120	Unable to quantify	Moderate	Major	None
				Inland Bathy	Cross sections and/or transects meet needs	4-5 years	Unable to quantify	Unable to quantify	Moderate	Major	None
				Nearshore Bathy	Cross sections and/or transects meet needs	4-5 years	Unable to quantify	Unable to quantify	Moderate	Major	Minor
BU 07 – Wildlife and Habitat Management	New Jersey Division of Fish and Wildlife	1219	Land Management for Wildlife	Inland Topo	QL1 HD	4-5 years	$125	$361	Moderate	Moderate	Moderate
				Inland Bathy	QL4B	4-5 years	$1,003	$606	None	None	None
				Nearshore Bathy	QL4B	4-5 years	$459	$26	None	None	None
				Offshore Bathy	Special Order	4-5 years	$265	$18	Moderate	Major	Major
BU 08 – Agriculture	State of New Jersey	60295	Agriculture and Precision Farming	Inland Topo	QL2	2-3 years	$8,720	$6,913	Major	Major	Minor
BU 09 – Fisheries Management and Aquaculture	NJ Division of Fish and Wildlife	21701	Freshwater Fisheries Management	Inland Topo	QL2	Event driven	$7,742	$16,722	None	Moderate	None
				Inland Bathy	QL0B	Event driven	$15,070	$6,859	Moderate	Moderate	Moderate
BU 09 – Fisheries Management and Aquaculture	NJ Division of Fish and Wildlife	21721	Shellfisheries Management	Nearshore Bathy	QL1B	2-3 years	$39,949	$2,933	Moderate	Moderate	Minor
BU 09 – Fisheries Management and Aquaculture	NJ Division of Fish and Wildlife	21734	Marine Fisheries Conservation	Nearshore Bathy	QL0B	Hard to know. Sand mining projects would influence frequency as would large coastal storms.	$118,298	$8,688	I don't know	I don't know	Minor
				Offshore Bathy	Special Order	Event driven	Unable to quantify	Unable to quantify	I don't know	I don't know	Minor
BU 10 – Geologic Assessment	State of New Jersey	60296	Geologic Assessment and Hazard Mitigation	Inland Topo	QL2	4-5 years	$1,589,895	$27,910	Major	Major	Major

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 12 – Renewable Energy Resources	State of New Jersey	60297	Renewable Energy Resources	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	None
				Inland Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Offshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 14 – Cultural Resource Management	State of New Jersey	60298	Cultural Resources Preservation and Management	Inland Topo	QL1	4-5 years	$1,380	$1,207	Minor	Minor	Minor
BU 15 – Flood Risk Management	NJ DEP Bureau of Flood Control	1453	Provide Coastal and Riverine Mitigation Guidance to NJ Residents, Local Officials and Developers	Inland Topo	Cross sections and/or transects meet needs	4-5 years	$55,291	$30,753	Moderate	Major	Major
				Inland Bathy	Cross sections and/or transects meet needs	4-5 years	$1,989	Unable to quantify	Moderate	I don't know	Minor
				Nearshore Bathy	Cross sections and/or transects meet needs	6-10 years	$10	$203,814	Major	Moderate	Moderate
BU 16 – Sea Level Rise and Subsidence	State of New Jersey	60299	Sea Level Rise and Subsidence	Inland Topo	QL1 HD	4-5 years	$396,532	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Minor
				Offshore Bathy	Order 2	6-10 years	Unable to quantify	Unable to quantify	Major	Major	Moderate
BU 17 – Wildfire Management	State of New Jersey	60300	Wildfire Management, Planning, and Response	Inland Topo	QL1	4-5 years	$40,467	Unable to quantify	Major	Major	Major
BU 20 – Marine and Riverine Navigation	New Jersey DOT	21486	Maintenance and Construction of Navigation Channels and Transportation Infrastructure	Inland Topo	(a) QL0 HD (b) QL2	2-3 years	$571,000	Unable to quantify	None	None	None
				Inland Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	None	None	None
				Nearshore Bathy	QL0B	2-3 years	$2,100,000	Unable to quantify	None	None	Minor
BU 22 – Infrastructure Management	State of New Jersey	60301	Infrastructure and Construction Management	Inland Topo	QL0 HD	4-5 years	$338,479	$996,075	Minor	Moderate	Major
BU 23 – Urban and Regional Planning	NJ Highlands Council	1154	Preserve Land and Protect Water Quality	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	Minor	Major	None

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 23 – Urban and Regional Planning	County of Mercer, NJ	1393	Land Use and Transportation System Planning	Inland Topo	QL1	6-10 years	$12,537	$5,427	Minor	Minor	Moderate
				Inland Bathy	Cross sections and/or transects meet needs	>10 years	$109,045	$1,507	Minor	Minor	Moderate
BU 23 – Urban and Regional Planning	State of New Jersey	60302	Urban and Regional Planning	Inland Topo	QL2	4-5 years	$2,026,525	$233,963	Moderate	Major	Major
				Inland Bathy	QL2B	6-10 years	$82,536	$104,416	Moderate	Moderate	Major
				Nearshore Bathy	QL2B	4-5 years	$184,365	$194,498	Moderate	Moderate	Moderate
BU 27 – Recreation	State of New Jersey	60303	Recreation	Inland Topo	QL1	4-5 years	$1,728	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	4-5 years	$1,040	Unable to quantify	Major	Major	Moderate
				Nearshore Bathy	QL0B	4-5 years	$130,365	Unable to quantify	Major	Major	Moderate
				Offshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

MCA Title: Water Supply and Quality



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Fate and transport of contaminants. Pollution risk mitigation. Runoff and sedimentation analyses. Point- or non-point source pollution modeling. Management of contaminants and marine debris - point, non-point, vessel, and atmospheric pollution; spills; trash.
MCA Title	Water Supply and Quality
MCA ID	60293
Organization Type	State or U.S. Territorial government
Organization Name	State of New Jersey
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL1B	Order 1a
Update Frequency	4-5 years	6-10 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Nice to have	Highly desirable	Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable	Required	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Nice to have	Required
DTM	Required	Highly desirable	Nice to have	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Nice to have	Nice to have	Nice to have	Nice to have
Classified point cloud	Highly desirable	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Nice to have
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Nice to have	Required
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Required
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Highly desirable
Bottom type			Nice to have	Highly desirable
Submerged features			Nice to have	Highly desirable
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Nice to have	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Not required
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Highly desirable
Floating observation/navigation systems			Nice to have	Highly desirable
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Nice to have
Wetlands	Highly desirable	Highly desirable	Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Moderate	Moderate
Cost savings/cost reduction	Major	Minor	Moderate	Moderate
Cost avoidance	Major	Minor	Minor	Moderate
Increased revenues	Minor	None	Minor	Minor
Mission-driven performance improvements	Major	Minor	Minor	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Moderate	Minor

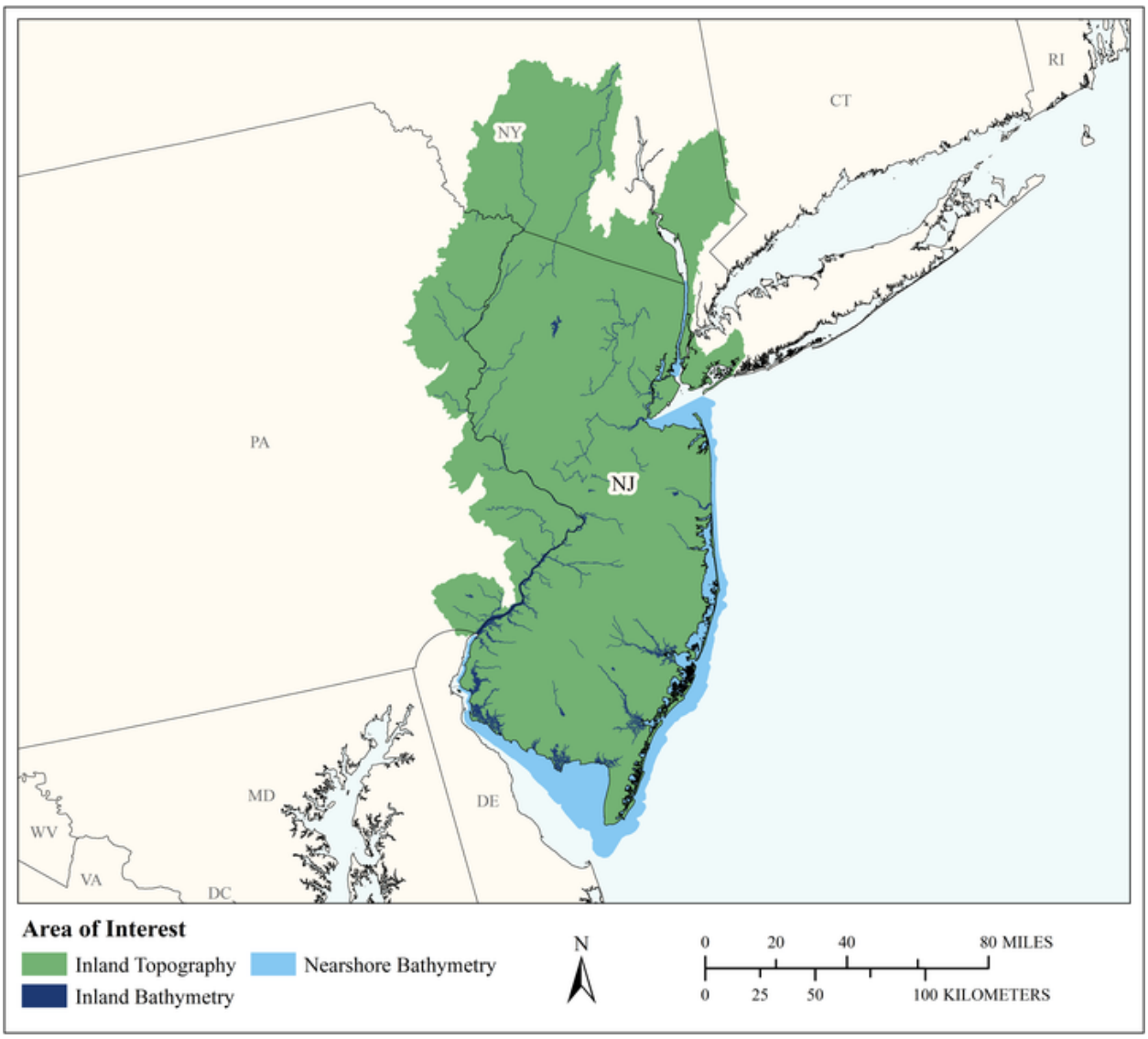
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	Moderate	Moderate
Improved customer experience	Major	Minor	Moderate	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	Minor
Environmental	Major	Moderate	Moderate	Minor
Public safety, including life and property	Major	Minor	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide		None		
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		None		
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$41,761		Annual dollars saved/ realized	$180,662		Annual dollars saved/ realized	$33,222		Annual dollars saved/ realized	$335
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$11,185		Annual dollars saved/ realized	$18,879		Annual dollars saved/ realized	$54,730		Annual dollars saved/ realized	$1,679
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate			Minor		
Environmental	Major			Major			Moderate			Major		
Public safety, including life and property	Moderate			Moderate			Moderate			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes		Yes	Yes
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes	Yes	
Hydrologic Flow Accumulation Grids	Yes	Yes	Yes	
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Environmental Conservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more Hydrologic Units (HUC8s)	One or more Hydrologic Units (HUC8s)	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Environmental conservation. Includes forest management, stream channel analysis, conservation engineering, flooding/inundation analysis, and restoration of critical habitats.
MCA Title	Environmental Conservation
MCA ID	21502
Organization Type	Academic or Not-for-Profit
Organization Name	The Nature Conservancy
Sub-Agency or Division	
Organization Mission	To protect the lands and waters on which all life depends
Program Name	Land, Freshwater, and Coastal Protection
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	BU 03 - Coastal Zone Management
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	Trees, marsh plants, roads, buildings, etc.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL1B	
Update Frequency	4-5 years	2-3 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter	Up to 1 meter	
Acceptable Vertical Error	Up to 20 cm	Up to 20 cm	Up to 30 cm	
How far onshore needed			To Mean Lower Low Water (MLLW)	
How far down the beach profile needed	To MLLW		To MLLW	
Tide correction requirement			MHW	
Cross sections and/or transects meet needs		Partial	Partial	
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Nice to have	Nice to have		Nice to have	Not required
DEM for entire AOI needs to be seamless	Highly desirable	Nice to have	Nice to have		Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Nice to have	
DTM	Highly desirable	Nice to have	Highly desirable	
DEM	Required	Highly desirable	Required	
Raw point cloud data	Nice to have	Nice to have	Nice to have	
Classified point cloud	Nice to have	Not required	Nice to have	
Edited/cube XYZ		Not required	Not required	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Not required	Not required	
Breaklines required for standard hydro-flattening	Not required	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Not required	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Not required	Not required	Not required	
Ground control/ground truthing	Nice to have	Nice to have	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Nice to have	Nice to have	Nice to have	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Not required	
Subbottom characteristics			Not required	
Geologic and seismic data	Not required	Not required	Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates	Highly desirable	Nice to have	Nice to have	
Land use/land cover	Highly desirable	Nice to have	Nice to have	
Wetlands	Highly desirable	Nice to have	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Nice to have	
Inland surface water features	Nice to have	Nice to have	Nice to have	
Bridges/culverts	Nice to have	Not required		
Landmark features	Not required	Not required	Not required	
Cultural resources	Not required	Not required	Not required	
Coastal and riverine structures	Nice to have	Nice to have	Not required	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	10-m DEM and 3m Lidar derived DEMs	Best available data from USGS, NOAA, USACE	Best available data from NOAA	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI	Yes	Yes	Yes	
Open Topography				
NOAA nautical charts				
USACE navigation charts		Yes		
USGS Inland Waters server		Yes		
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Minor	Minor	
Cost savings/cost reduction	Moderate	Minor	Minor	
Cost avoidance	Moderate	None	None	
Increased revenues	None	None	None	
Mission-driven performance improvements	Moderate	None	None	

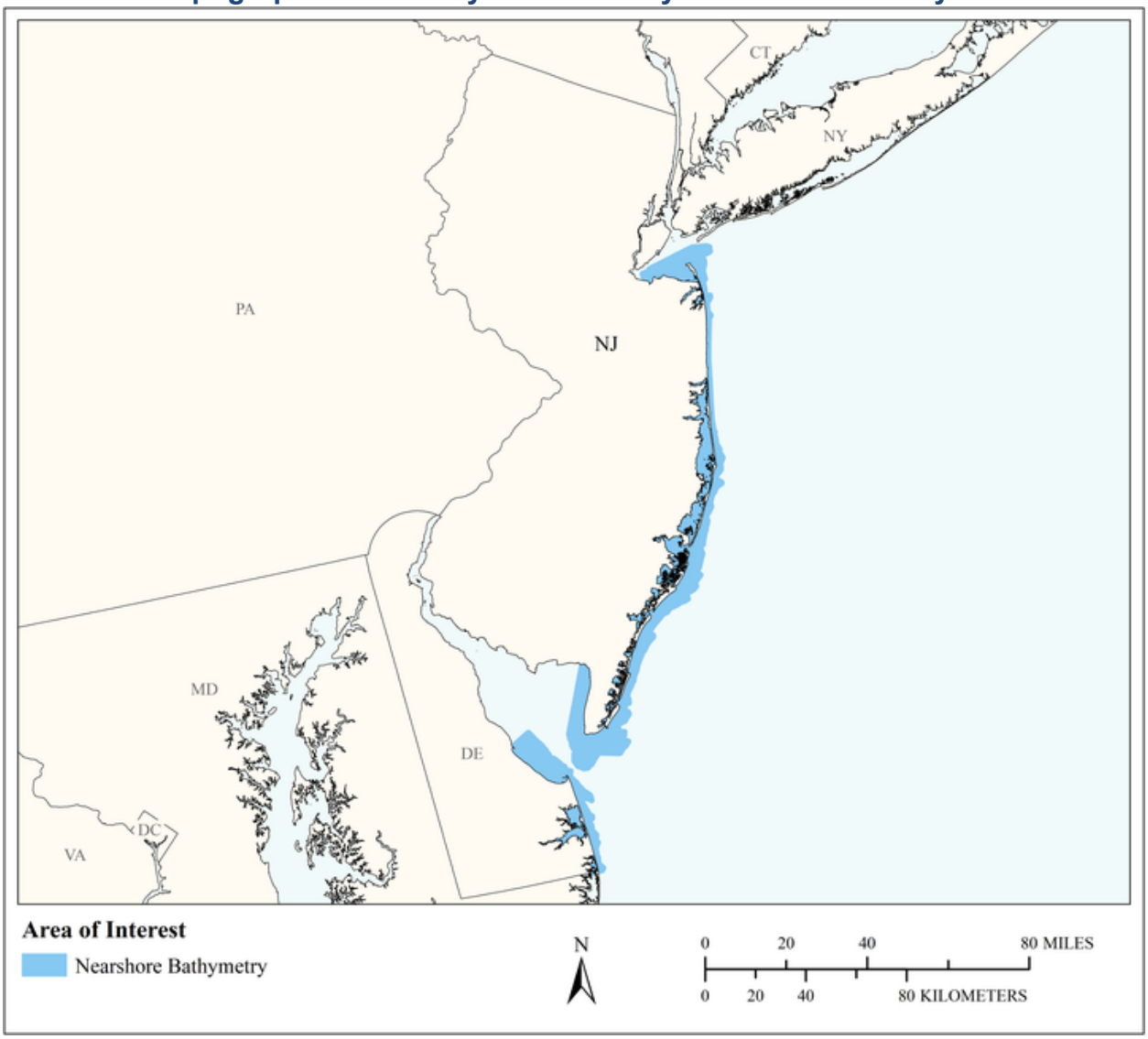
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	None	None	
Improved response or timeliness	Minor	Minor	None	
Improved customer experience	None	None	None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	None	None	
Environmental	Moderate	Minor	None	
Public safety, including life and property	None	None	None	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$1,206	None			Minor	Annual dollars saved/realized	$1,357			
Time savings description	Simple source and download of consistent data.											
Cost savings/cost reduction	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Cost avoidance	None			Minor	Unable to provide		Minor	Unable to provide				
Increased revenues	None			None			None					
Mission-driven performance improvements	Minor	Annual percent improvement	2%	Minor	Unable to provide		Minor	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Annual dollars saved/realized	$603	Minor	Unable to provide		None					
Value added to products or services description	Improved impact accuracy assessments.											
Improved response or timeliness	Moderate	Annual dollars saved/realized	$1,055	Minor	Unable to provide		Minor	Unable to provide				
Improved customer experience	Moderate	Annual dollars saved/realized	$603	None			None					
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			None			None					
Environmental	None			None			None					
Public safety, including life and property	None			None			None					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Topographic and Bathymetric Surveys of the New Jersey Coastline



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type			Required	
Geographic Area Requirements			Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements			Monmouth, Ocean, Atlantic, & Cape May Counties, NJ and Lewes County, DE	

MCA Description	Response
Mission Critical Activity	Topographic and bathymetric surveys of the New Jersey coastline. The university has been involved in collecting new elevation data along the New Jersey coast. The collect 170 transects along the beach to 5m depth every 6 months. Single beam bathymetry is also collected as requested of NJ inlets to the ebb tidal delta. The elevation data are used for management decisions and to discover if the sand supply is recovered for other beach nourishment uses by NJ DEP and USACE. Mobile lidar is collected by the university on land for FWS beach and dune system as requested to monitor change as indicated by dredging of undeveloped shorelines. The mobile lidar augments the USGS lidar.
MCA Title	Topographic and Bathymetric Surveys of the New Jersey Coastline
MCA ID	1350
Organization Type	Academic or Not-for-Profit
Organization Name	Stockton University
Sub-Agency or Division	
Organization Mission	Higher education
Program Name	New Jersey Beach Profile Network
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 26 - Education K12 and Beyond, Basic Research
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Not required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Rocks in an ocean structure. Dune slopes. Bulkhead locations. Individual sand bedforms.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order			QL0B	
Update Frequency			Event driven only – Data need to coincide with a specific event.	
Event type(s)			Changes to the shore area.	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI			Anywhere from quarterly to annual data	
Acceptable Horizontal Error			Less than 50 cm	
Acceptable Vertical Error			Less than 10 cm	
How far onshore needed			>1 kilometer inland	
How far down the beach profile needed			Below MLLW	
Tide correction requirement			NAVD88	
Cross sections and/or transects meet needs			Partial	
Cross section/transect requirement			The beach profiles have a 2000 meter transect spacing but a 2cm vertical accuracy. Other projects do have a 100-foot transect spacing with the same vertical accuracy. These close spacings are found at tidal inlets and at beach nourishment projects.	

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season			Highly desirable			
Entire AOI under same environmental conditions			Highly desirable			
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless			Highly desirable			
DEM for entire AOI needs to be seamless			Nice to have			
Amount of acceptable vertical manipulation to achieve spatial seamlessness			Up to double the required TVU at the 95% confidence level			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM			Highly desirable	
DTM			Not required	
DEM			Required	
Raw point cloud data			Not required	
Classified point cloud			Not required	
Edited/cube XYZ			Not required	
Full waveform			Not required	
Bathymetric Attributed Grid (BAG)			Not required	
Breaklines required for standard hydro-flattening				
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery			Not required	
Ground control/ground truthing			Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery			Not required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Not required	
Submerged features			Nice to have	
Subbottom characteristics			Not required	
Geologic and seismic data			Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Highly desirable	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates			Required	
Land use/land cover			Highly desirable	
Wetlands			Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features			Nice to have	
Bridges/culverts				
Landmark features			Nice to have	
Cultural resources			Not required	
Coastal and riverine structures			Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used			Dates are quarterly since 1994 in various areas. Quality control is RTK GPS controlled by Hypack Software.	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories			Yes	
State repositories used			NJ Department of Environmental Protection's geospatial database	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings			Major	
Cost savings/cost reduction			Moderate	

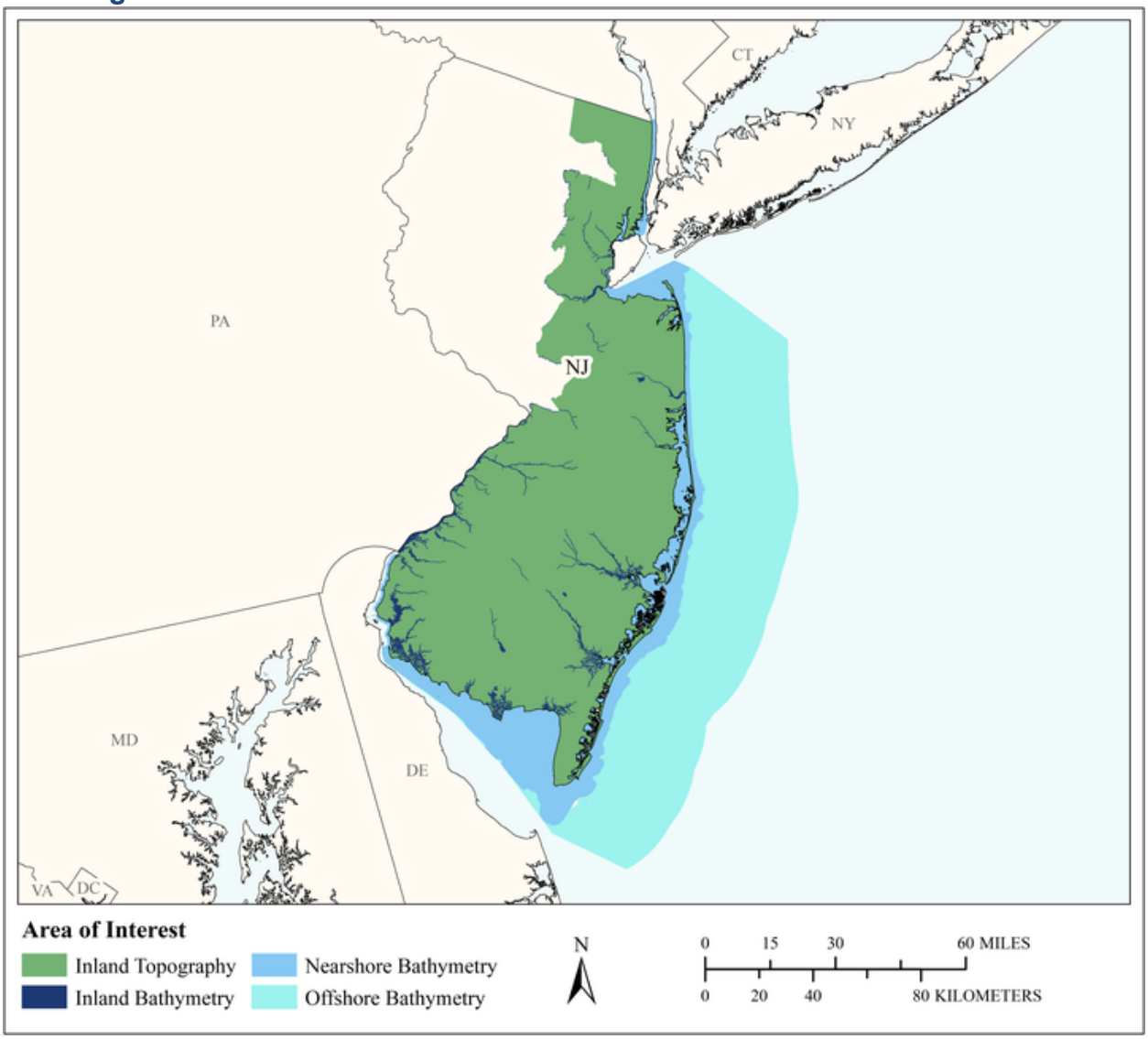
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost avoidance			Minor	
Increased revenues			Minor	
Mission-driven performance improvements			Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services			Moderate	
Improved response or timeliness			Moderate	
Improved customer experience			Moderate	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach			Minor	
Environmental			Minor	
Public safety, including life and property			Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings							Moderate	Annual dollars saved/realized	$16,582			
Cost savings/cost reduction							Minor	Annual dollars saved/realized	$4,000			
Cost avoidance							Moderate	Annual dollars saved/realized	$14,400			
Increased revenues							None					
Mission-driven performance improvements							Minor	Unable to provide				
Other operational benefits							Minor	Annual dollars saved/realized	$6,030			
Other operational benefits description							Some Improvements to data collection avoided.					
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services							Minor	Unable to provide				
Improved response or timeliness							Moderate	Annual dollars saved/realized	$7,538			
Improved customer experience							Minor	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach							None					
Environmental							I don't know					
Public safety, including life and property							I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	
Contours			Yes	
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections			Yes	
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: New Jersey Coast Elevation and Bathymetry for Coastal Resiliency Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Custom description
Sub Area Requirements	Coastal Counties of New Jersey and Gloucester & Camden Counties, NJ	Coastal Counties of New Jersey and Gloucester & Camden Counties, NJ		Lease blocks go out to 20 nautical miles (See MARCO site)

MCA Description	Response
Mission Critical Activity	Analysis of coastal erosion and inundation. Hurricane storm surge and wind damage modeling and assessment. Coastal hazard modeling and mapping. Coastal hazard mitigation. Land use and environmental planning. Coastal resiliency. Littoral zone management including dunes and beaches. Ocean Planning. Coastal and Ocean Federal Consistency reviews. Coastal Ecological Solution Project Development. Fisheries. Fish habitat. Wind farm siting.
MCA Title	New Jersey Coast Elevation and Bathymetry for Coastal Resiliency Planning
MCA ID	1455
Organization Type	State or U.S. Territorial government
Organization Name	NJDEP
Sub-Agency or Division	
Organization Mission	Office of Coastal and Land Use Planning, Coastal Management Program, Ocean Planning
Program Name	Regional Coastal Resiliency Planning Grant Programs. Land Use and Environmental Planning for State Level Programs. Multi - State Partnership for Ocean Planning Program (Mid-Atlantic Regional Ocean Council). Coastal and Ocean Federal Consistency Reviews - Policy Program. Coastal Ecological Solution Project Development Grant Programs.
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 06 - Natural Resources Conservation
Tertiary Business Use	BU 07 - Wildlife and Habitat Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Small dock, Patches of Seagrass (Submerged Aquatic Vegetation)

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B	QL2B	Special Order
Update Frequency	2-3 years	2-3 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter	Up to 1 meter	Up to 1 meter
Acceptable Vertical Error	Up to 30 cm	Up to 30 cm	Up to 30 cm	Up to 30 cm
How far onshore needed			To cover the beach slope	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			I don't know	I don't know
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have	Highly desirable	Nice to have	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Nice to have	Nice to have	Nice to have	Nice to have	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DTM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Nice to have	Nice to have	Highly desirable
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Highly desirable	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Highly desirable	Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Other			Highly desirable	
Other description			Submerged Aquatic Vegetation Mapping as a secondary product	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	Nice to have
Nautical and/or navigation charts			Nice to have	Nice to have
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Nice to have	Highly desirable
Underwater videography			Nice to have	Highly desirable
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Nice to have	Highly desirable
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Highly desirable
Lease areas			Highly desirable	Nice to have
Fixed obstructions			Highly desirable	Nice to have
Floating observation/navigation systems			Nice to have	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Nice to have	Not required
Wetlands	Highly desirable	Highly desirable	Highly desirable	Not required
Estuaries			Highly desirable	Not required
Inland surface water features	Highly desirable	Highly desirable	Highly desirable	
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Majority QL2 LiDAR - Sections different capture dates Southern Counties - being updated in fall 2018 Salem, Cumberland, Cape May, Atlantic	NOAA Topobathy Product from 2013 - QL2	NOAA 2013 Bathymetry QL2	NOAA 2013 Bathymetry Product, QL2
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast		Yes	Yes	Yes
NCEI	Yes			
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				

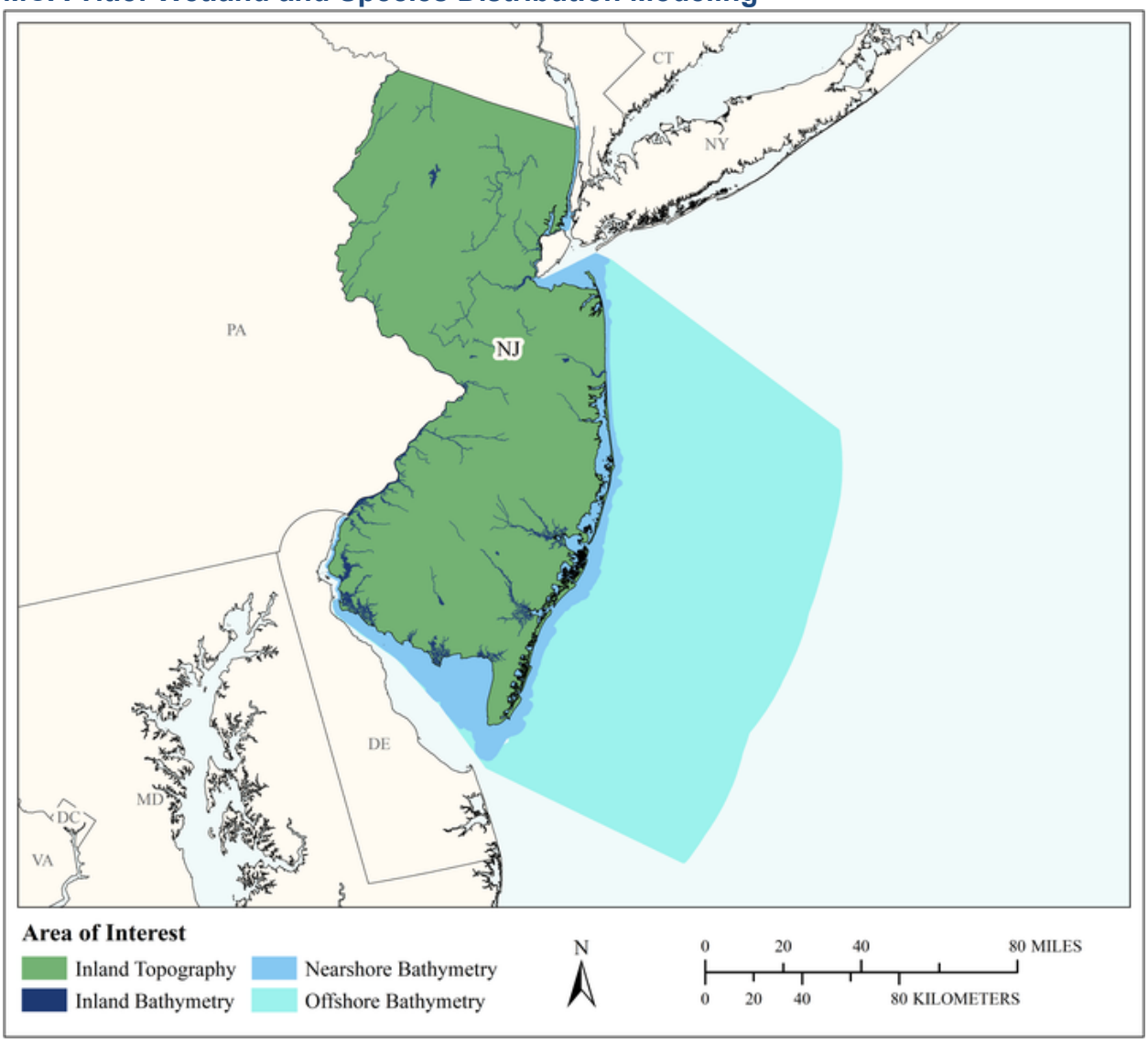
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other	Yes			
Other description	USGS and other partners LiDAR Capture			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Moderate	Moderate	Moderate
Cost savings/cost reduction	Moderate	Moderate	Moderate	Moderate
Cost avoidance	Moderate	Minor	Moderate	Minor
Increased revenues	Minor	Minor	Minor	Minor
Mission-driven performance improvements	Moderate	Moderate	Moderate	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate	Moderate	Moderate
Improved response or timeliness	Moderate	Moderate	Moderate	Moderate
Improved customer experience	Moderate	Moderate	Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	Moderate	Moderate
Environmental	Moderate	Moderate	Moderate	Moderate
Public safety, including life and property	Moderate	Moderate	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Time savings description				Potential to help with updating Submerge Aquatic Vegetation Mapping, reducing field time.								
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Annual dollars saved/realized	$72,000	Moderate	Annual dollars saved/realized	$72,000
Cost savings/cost reduction description							$1 M since Sandy split between nearshore and offshore.			$1 M since Sandy split between nearshore and offshore.		
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	None			None			None			None		
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Other operational benefits	Moderate	Unable to provide										
Other operational benefits description	Share with partners.											
Future annual operational benefits added during validation		Annual dollars saved/ realized	$154,247		Annual dollars saved/ realized	$66,191		Annual dollars saved/ realized	$40,808			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$26,965		Annual dollars saved/ realized	$38,804		Annual dollars saved/ realized	$190,829		Annual dollars saved/ realized	$2,100
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate			Moderate		
Environmental	Moderate			Moderate			Moderate			Moderate		
Public safety, including life and property	Moderate			Moderate			Moderate			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes			
Curvature maps	Yes	Yes	Yes	
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes	Yes	Yes
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Wetland and Species Distribution Modeling



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Custom description
Sub Area Requirements				New Jersey out to 50 nautical miles

MCA Description	Response
Mission Critical Activity	Coastal wetland restoration modeling. Species distribution modeling. Freshwater wetland modeling. BU 30 – Maritime and Land Boundary Management would be an additional Business Use for NJ DEP.
MCA Title	Wetland and Species Distribution Modeling
MCA ID	21588
Organization Type	State or U.S. Territorial government
Organization Name	NJDEP
Sub-Agency or Division	
Organization Mission	To protect the quality of our air, water, land and historic and natural resources for all New Jersey residents
Program Name	NJDEP Division of Science, Research, and Environmental Health
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 01 - Water Supply and Quality
Tertiary Business Use	BU 17 - Wildfire Management, Planning, and Response

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Individual plants

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B	QL0B	Order 2
Update Frequency	2-3 years	2-3 years	Annually	Annually
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Less than 50 cm	Up to 1 meter	Up to 5 meters
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm	Less than 10 cm	Up to 2 meters
How far onshore needed			1 kilometer inland	
How far down the beach profile needed	To MHHW		To MHHW	
Tide correction requirement			MHW	MHW
Cross sections and/or transects meet needs	Partial	Partial	Partial	Partial
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Up to double the required TVU at the 95% confidence level	I don't know	I don't know	Up to double the required TVU at the 95% confidence level	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Nice to have	Nice to have
DTM	Highly desirable	Highly desirable	Nice to have	Nice to have
DEM	Highly desirable	Required	Highly desirable	Highly desirable
Raw point cloud data	Nice to have	Highly desirable	Nice to have	Highly desirable
Classified point cloud	Nice to have	Highly desirable	Nice to have	
Edited/cube XYZ		Highly desirable	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Highly desirable
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Nice to have	Highly desirable
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Highly desirable	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Highly desirable
Sea ice conditions			Not required	Nice to have
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Highly desirable	Highly desirable
Routes			Highly desirable	Highly desirable
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates	Required	Highly desirable	Highly desirable	
Land use/land cover	Required	Highly desirable	Highly desirable	Highly desirable
Wetlands	Required	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Highly desirable	Highly desirable	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Highly desirable	Nice to have	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	RTK-GPS	Best available	Best available	Best available
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	Yes
NCEI		Yes		Yes
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server		Yes		
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Moderate	Moderate	Moderate
Cost savings/cost reduction	Moderate	Moderate	I don't know	Moderate
Cost avoidance	Moderate	Minor	I don't know	Minor
Increased revenues	Moderate	I don't know	I don't know	Moderate
Mission-driven performance improvements	Moderate	Minor	Moderate	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None	I don't know	None	None

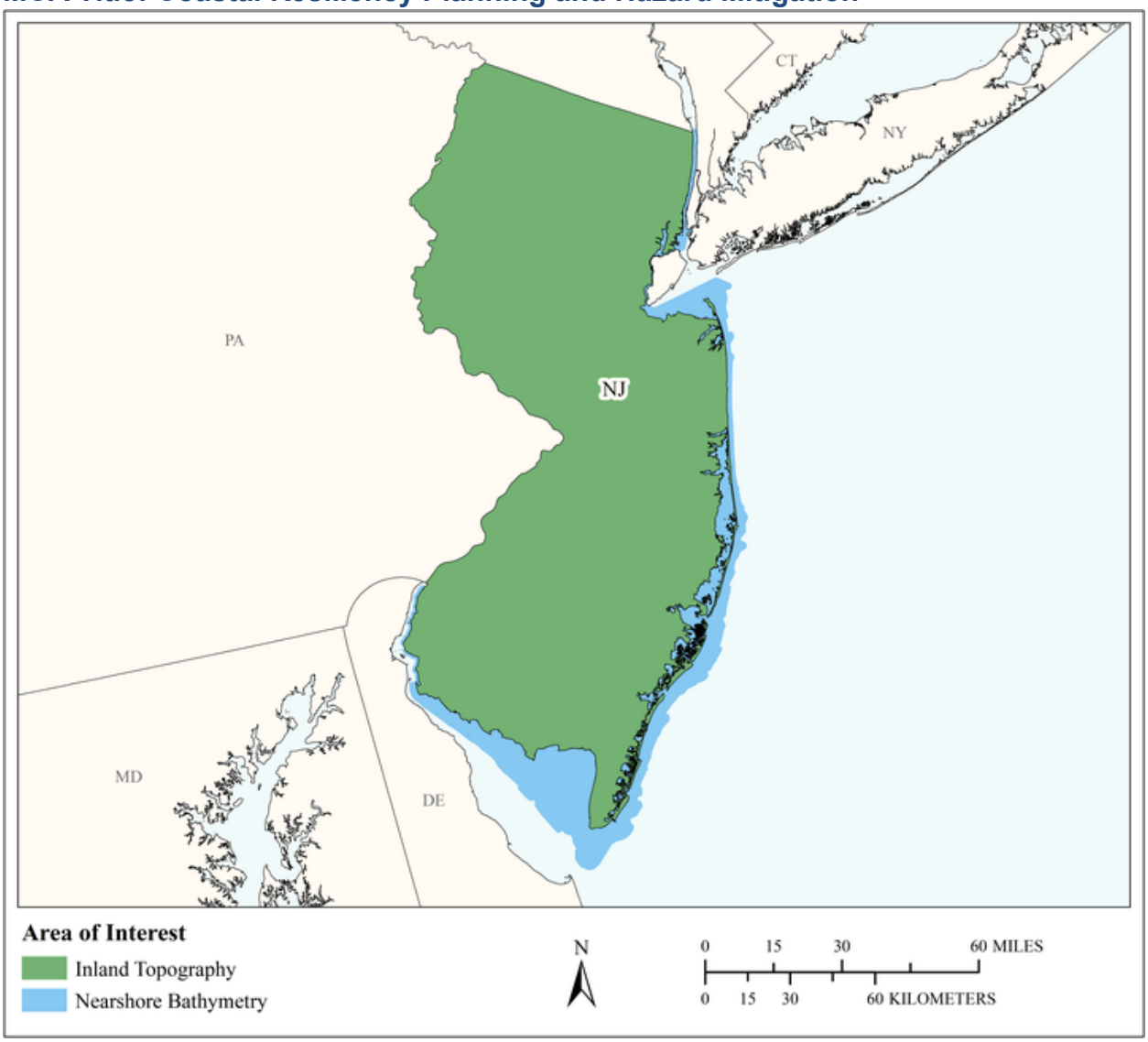
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	None	I don't know	None	None
Improved customer experience	None	I don't know	None	None
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	Minor	Minor
Environmental	Minor	Moderate	Moderate	Moderate
Public safety, including life and property	Minor	Moderate	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$13,025	Moderate	Annual dollars saved/realized	$10,854	Moderate	Annual dollars saved/realized	$10,130	Minor	Annual dollars saved/realized	$2,173
Cost savings/cost reduction	None			None			I don't know	Unable to provide		None		
Cost avoidance	Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Minor	Annual dollars saved/realized	$2,894
Increased revenues	None			Minor	Unable to provide		Minor	Unable to provide		Moderate	Annual dollars saved/realized	$4,342
Mission-driven performance improvements	Moderate	Annual percent improvement	20%	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$221,309		Annual dollars saved/ realized	$89,812		Annual dollars saved/ realized	$102,886		Annual dollars saved/ realized	$596
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Annual dollars saved/realized	$2,894	Minor	Annual dollars saved/realized	$724	Minor	Annual dollars saved/realized	$724	Minor	Annual dollars saved/realized	$1,085
Improved response or timeliness	Minor	Annual dollars saved/realized	$4,342	Minor	Annual dollars saved/realized	$2,894	Minor	Annual dollars saved/realized	$2,894	Minor	Annual dollars saved/realized	$2,894
Improved customer experience	Moderate	Annual dollars saved/realized	$2,894	None			None			Minor	Annual dollars saved/realized	$724
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$30,997		Annual dollars saved/ realized	$55,340		Annual dollars saved/ realized	$187,285			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			Minor			Minor		
Environmental	Moderate			Moderate			Moderate			Moderate		
Public safety, including life and property	Moderate			Moderate			Moderate			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps		Yes		
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Coastal Resiliency Planning and Hazard Mitigation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Coastal resiliency planning and hazard mitigation. Lidar is needed for estimation of damage and mitigation strategies; bathymetry is needed for back bay regions. BU 23 - Urban and Regional Planning is an additional Business Use for this MCA.
MCA Title	Coastal Resiliency Planning and Hazard Mitigation
MCA ID	21729
Organization Type	Academic or Not-for-Profit
Organization Name	Rutgers University
Sub-Agency or Division	
Organization Mission	Advancing the development and application of geospatial information system science and technology to address issues in the environment, agriculture and natural resources.
Program Name	NJAdapt www.njadapt.org
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 16 - Sea Level Rise and Subsidence
Tertiary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Intertidal creeks and ponds less than 5m wide

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2		QL1B	
Update Frequency	2-3 years		4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter		Up to 1 meter	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Vertical Error	Up to 30 cm		Up to 20 cm	
How far onshore needed			1 kilometer inland	
How far down the beach profile needed	To MLLW		To MLLW	
Tide correction requirement			Tide correction using Mean High Water (MHHW)	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have		Highly desirable			Highly desirable
Entire AOI under same environmental conditions	Highly desirable		Highly desirable			Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable		Highly desirable			Nice to have
DEM for entire AOI needs to be seamless	Highly desirable		Highly desirable			Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable		Highly desirable	
DTM	Highly desirable		Highly desirable	
DEM	Required		Required	
Raw point cloud data	Highly desirable		Nice to have	
Classified point cloud	Required		Nice to have	
Edited/cube XYZ			Nice to have	
Full waveform	Nice to have		Nice to have	
Bathymetric Attributed Grid (BAG)			Nice to have	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable		Highly desirable	
Ground control/ground truthing	Highly desirable		Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Highly desirable		Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Not required		Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Required	
Tide/wave heights			Required	
Sea ice conditions			Not required	
Habitat distribution and classification			Not required	
Boundaries			Nice to have	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable		Nice to have	
Land use/land cover	Highly desirable		Nice to have	
Wetlands	Highly desirable		Nice to have	
Estuaries			Nice to have	
Inland surface water features	Highly desirable		Nice to have	
Bridges/culverts	Nice to have			
Landmark features	Nice to have		Nice to have	
Cultural resources	Nice to have		Nice to have	
Coastal and riverine structures	Highly desirable		Required	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	State QL2 aerial LiDAR, Rutgers developed mobile based LiDAR in coastal and riverine areas.		USGS produced 1m grid cell seamless topo-bathy	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	New Jersey			
Other	Yes		Yes	
Other description	Rutgers repository		USGS	
Data that meet my needs are not available				

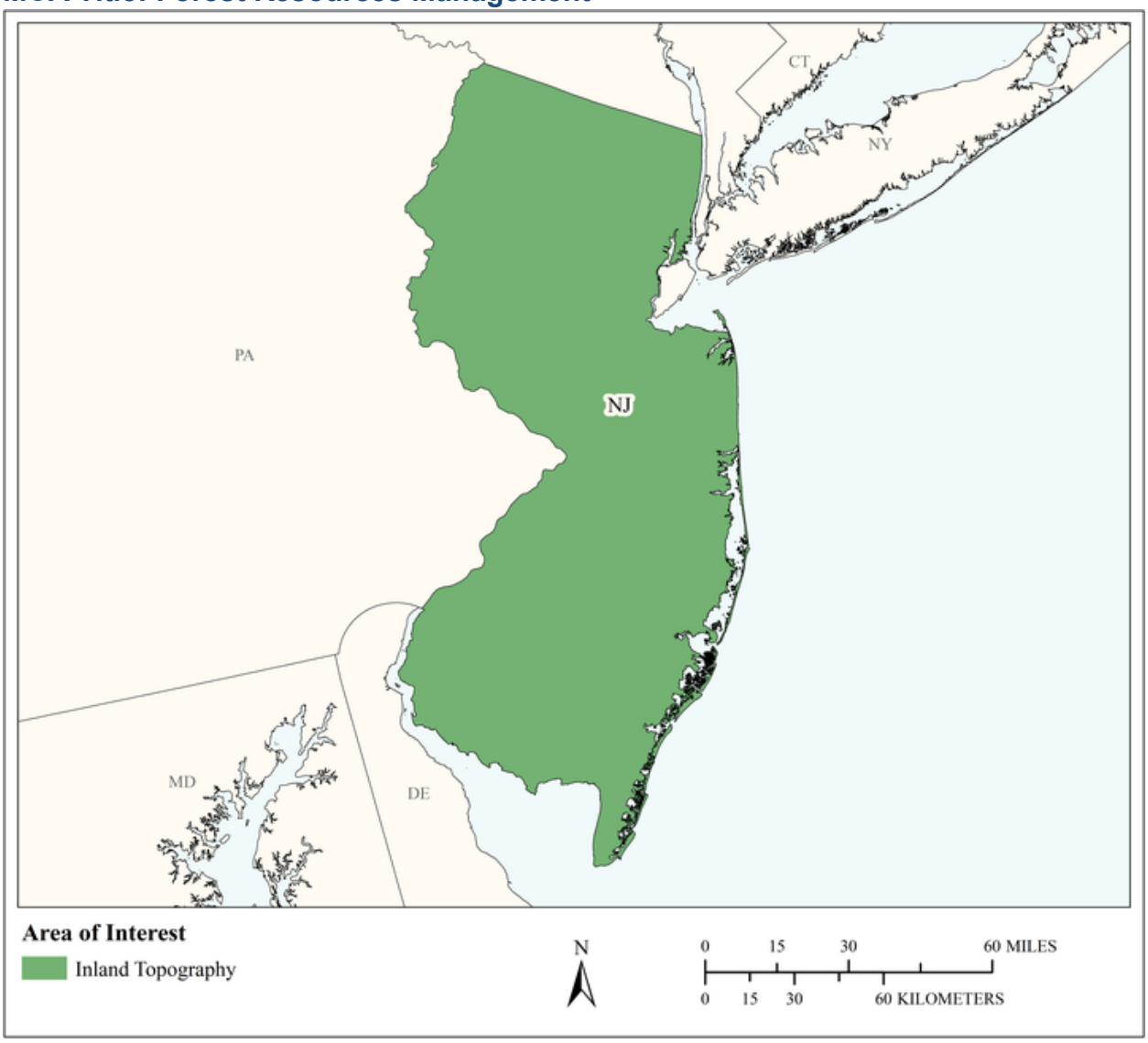
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Major	
Cost savings/cost reduction	Moderate		Moderate	
Cost avoidance	Minor		I don't know	
Increased revenues	None		None	
Mission-driven performance improvements	Major		Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		Major	
Improved response or timeliness	Moderate		Moderate	
Improved customer experience	Major		Major	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major		Major	
Environmental	Major		Major	
Public safety, including life and property	Major		Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide					Major	Unable to provide				
Cost savings/cost reduction	Moderate	Unable to provide					Moderate	Unable to provide				
Cost avoidance	Moderate	Unable to provide					Major	Unable to provide				
Increased revenues	None						Moderate	Unable to provide				
Mission-driven performance improvements	Moderate	Unable to provide					Major	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Major	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide					Major	Unable to provide				
Improved customer experience	Moderate	Unable to provide					Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate						Major					
Environmental	Moderate						Major					
Public safety, including life and property	Moderate						Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes		Yes	
Hillshades				
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps	Yes		Yes	
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness			Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Forest Resources Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Forest health assessment. Determination of standing inventory of forest resources. Prescribed burn planning. Analysis of carbon stocks for trade. Harvest systems planning.
MCA Title	Forest Resources Management
MCA ID	60294
Organization Type	State or U.S. Territorial government
Organization Name	State of New Jersey
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Highly desirable			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

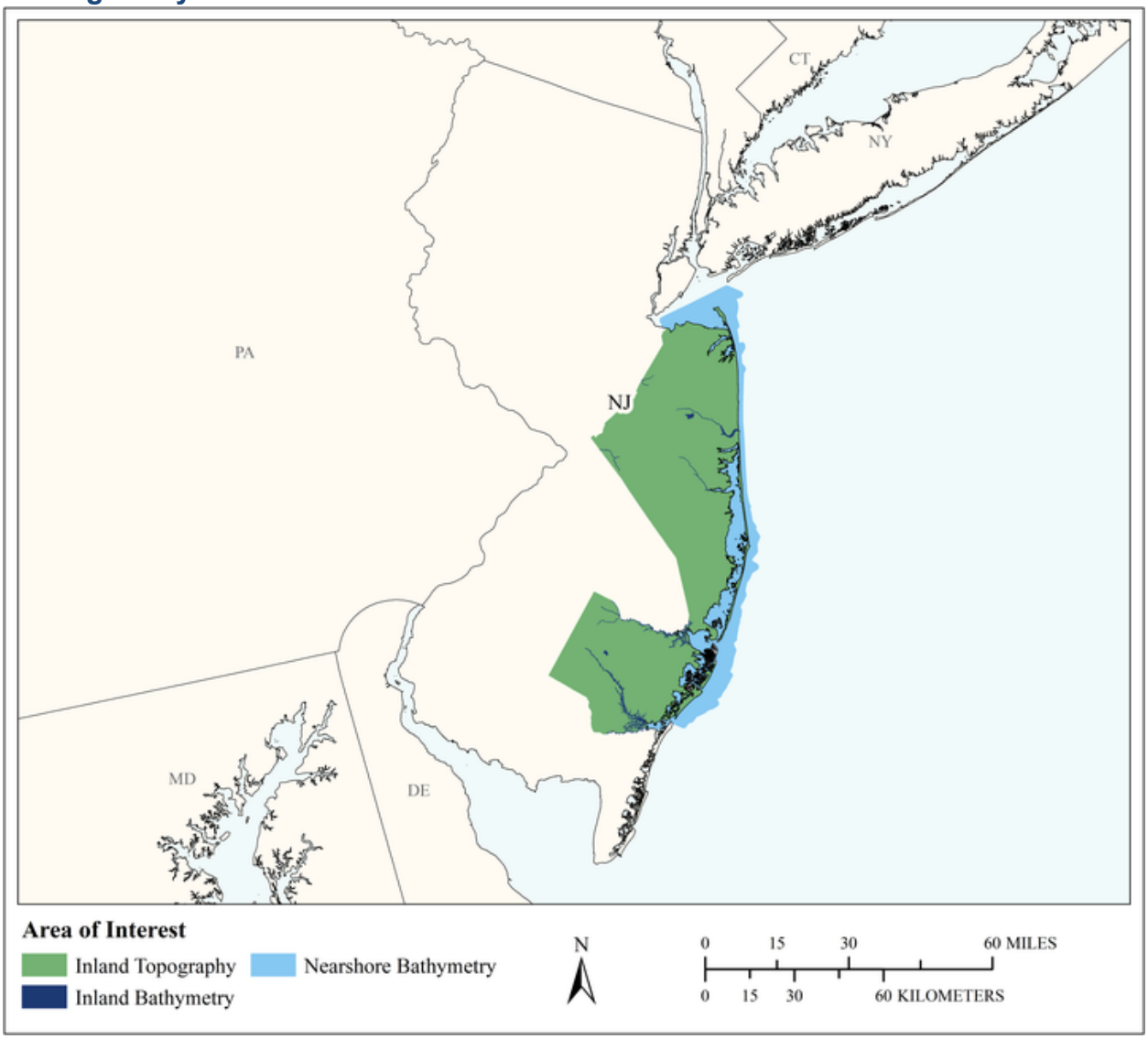
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$29,779									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$43,168									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Collaborative Approach to Research, Educate, and Restore the Barnegat Bay



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements	Atlantic, Ocean, and Monmouth Counties, NJ	Atlantic, Ocean, and Monmouth Counties, NJ	Atlantic, Ocean, and Monmouth Counties, NJ	

MCA Description	Response
Mission Critical Activity	1. Land Use- To improve and sustain collaborative regional approaches to responsible land use planning and open space protection in the watershed that protect and improve water quality, water supply, living resources, soil function and hydrology. 2. Living Resources- To protect, restore and enhance habitats in the Barnegat Bay and its watershed to ensure healthy and sustainable natural communities of plants and animals now and in the future. 3. Water Quality- To protect and improve water quality throughout Barnegat Bay and its watershed by addressing the causes of water quality degradation to achieve swimmable, fishable and drinkable water, and to support aquatic life. 4. Water Supply- To ensure adequate water supplies and flow in the Barnegat Bay Watershed for ecological and human communities now and in the future.
MCA Title	Collaborative Approach to Research, Educate, and Restore the Barnegat Bay
MCA ID	21620
Organization Type	National Estuary Program
Organization Name	Barnegat Bay Partnership
Sub-Agency or Division	
Organization Mission	The Barnegat Bay Partnership is a partnership of federal, state, municipal, academic, business, and private organizations that work together with the communities of the Barnegat Bay watershed to help restore, protect, and enhance the natural resources of the Barnegat Bay ecosystem.
Program Name	1. Mid-Atlantic Coastal Wetland Assessment (MACWA) 2. State of the Bay Monitoring
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	BU 01 - Water Supply and Quality
Tertiary Business Use	BU 03 - Coastal Zone Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Nice to have
Other	Required
Other description	Marsh surface

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	We are interested in vegetative cover from forbs to trees and anthropogenic structures such as docks, houses, duck blinds, bridges, dams, fish ladders etc. Sea grass.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	Cross sections and/or transects meet needs	Cross sections and/or transects meet needs	Cross sections and/or transects meet needs	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Up to 1 meter	Less than 50 cm	
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm	Less than 10 cm	
How far onshore needed			To cover the beach slope	
How far down the beach profile needed	To MHHW		Below MLLW	
Tide correction requirement			MHW	
Cross sections and/or transects meet needs	Yes	Yes	Yes	
Cross section/transect requirement	Generally our quality control accuracy is set to no greater than 2 cm variability and a sampling density representative to 10% of the area of interest.	Preferred vertical accuracy is less than 2cm but acceptable up to 10cm, sampling density is approximately 10% of area of interest.	Preferred vertical accuracy is less than 2cm but acceptable up to 10cm, sampling density is approximately 10% of area of interest.	

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have

Hydrologic Processing Required	Response
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Required	Required		Required	Required
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level		Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	
DTM	Highly desirable	Highly desirable	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Highly desirable	Highly desirable	
Classified point cloud	Nice to have	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Nice to have	
Full waveform	Highly desirable	Highly desirable	Highly desirable	
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have	Required	Required	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Nice to have	
Subbottom characteristics			Required	
Geologic and seismic data	Required	Required	Required	
Water column properties - Physical			Required	
Water column properties - Chemical			Required	
Water column properties - Biological			Required	
Currents			Required	
Tide/wave heights			Required	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Highly desirable	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Required	Required	Required	
Wetlands	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Nice to have	Nice to have	Not required	
Cultural resources	Not required	Not required	Not required	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We currently use many sources of topographic data across a broad time span including: RTK-GPS, National Wetlands Inventory Mapper, NRCS Soil Survey, Aerial/LiDAR imagery from ESRI, NOAA, Google, Bing, drone imagery.	We are currently using USACOE bathymetric data and are acquiring sidescan imagery in collaboration with EPA Region 3	Not much, some bathy from side scan sonar	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes	Yes	Yes	
NCEI	Yes	Yes	Yes	
Open Topography				
NOAA nautical charts		Yes	Yes	
USACE navigation charts		Yes	Yes	
USGS Inland Waters server		Yes		
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				

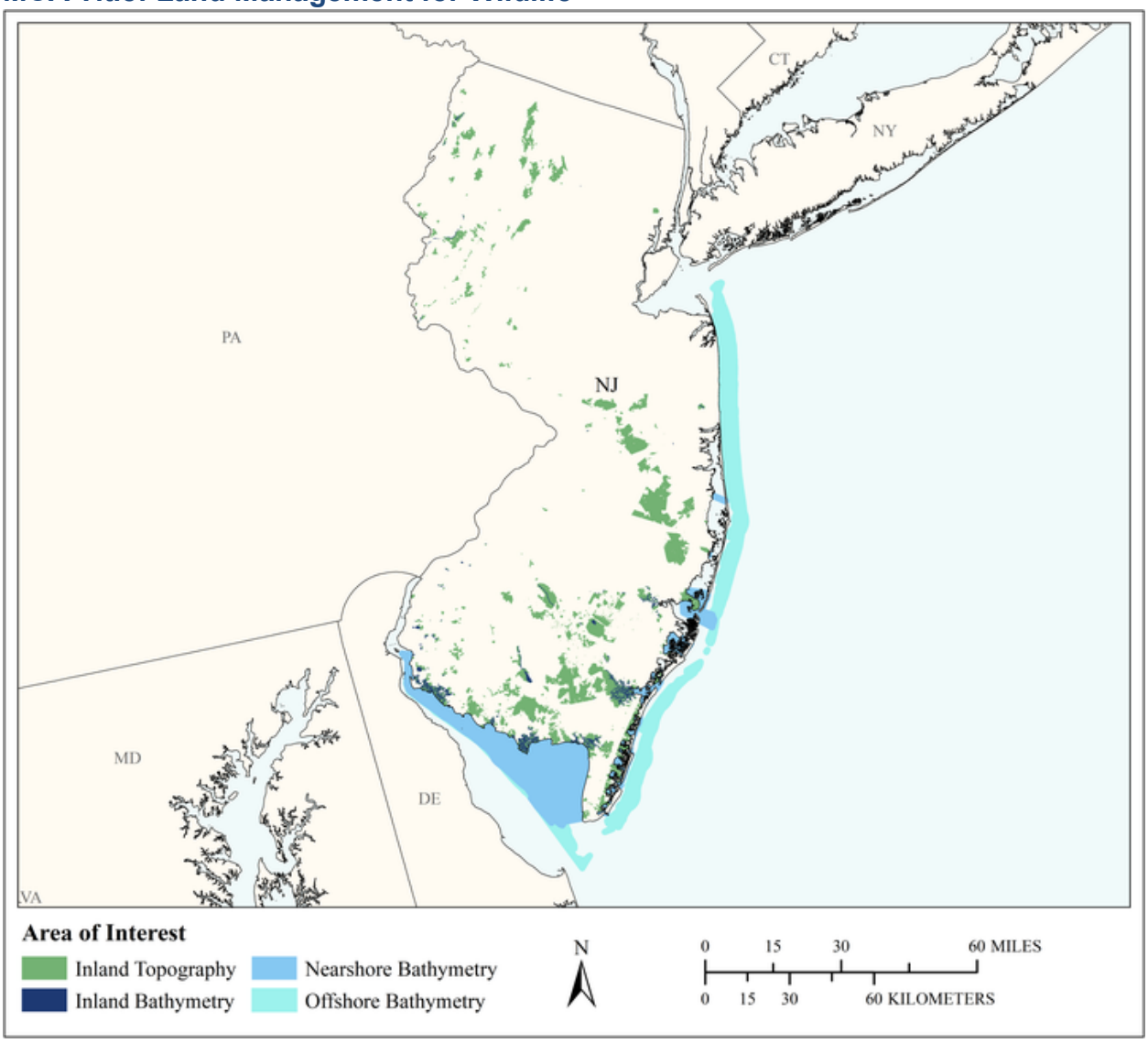
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Moderate	Major	
Cost savings/cost reduction	I don't know	Moderate	Minor	
Cost avoidance	None	Minor	Minor	
Increased revenues	I don't know	None	Minor	
Mission-driven performance improvements	Major	Moderate	Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Moderate	
Improved response or timeliness	Major	Moderate	Moderate	
Improved customer experience	I don't know	None	None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Moderate	
Environmental	Major	Moderate	Major	
Public safety, including life and property	I don't know	None	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$6,120	Moderate	Unable to provide		Moderate	Unable to provide				
Time savings description	Fewer field visits to RTK. With 4 sites visited twice per year at 6 hours per person per day plus provisional project specific monitoring, approximately 120 hours could be saved.											
Cost savings/cost reduction	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Increased revenues	Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Increased revenues description	We can share more specific resiliency data with stakeholders and communities.											
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Value added to products or services description	We will better be able to provide resilience data and contribute to restoration planning and monitoring.											
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate					
Environmental	Major			Major			Major					
Public safety, including life and property	None			None			Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes	Yes	Yes	
Curvature maps	Yes	Yes	Yes	
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes	Yes	Yes	
Viewshed maps		Yes	Yes	
Hydrologic Flow Direction Grids		Yes	Yes	
Hydrologic Flow Accumulation Grids		Yes	Yes	
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes	Yes	Yes	
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Land Management for Wildlife



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Respondent provided own shapefile, KML, or geodatabase	Respondent provided own shapefile, KML, or geodatabase	Respondent provided own shapefile, KML, or geodatabase	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements	New Jersey Division of Fish and Wildlife Management Area	New Jersey Division of Fish and Wildlife Management Area	New Jersey Division of Fish and Wildlife Management Area	

MCA Description	Response
Mission Critical Activity	Maintain, manage, restore, and enhance the habitats, on New Jersey's Wildlife Management Area system in order to promote and protect wildlife and wildlife-related recreation throughout the state. Conservation and management of diverse game and nongame (endangered, threatened, and special concern) wildlife species and their associated habitats.
MCA Title	Land Management for Wildlife
MCA ID	1219
Organization Type	State or U.S. Territorial government
Organization Name	New Jersey Division of Fish and Wildlife
Sub-Agency or Division	
Organization Mission	The mission of the New Jersey Division of Fish and Wildlife is to protect and manage the State's fish and wildlife to maximize their long-term biological, recreational and economic values for all New Jerseyans.
Program Name	Statewide Development Operations and Maintenance of State Wildlife Management Areas.
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Patch of habitat, group of trees or farm field. Bulkheads, tops of submerged structures, submerged vegetation

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have

Inland Bathy Feature Size Requirements	Response
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL4B	QL4B	Special Order
Update Frequency	4-5 years	4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 60 cm	Less than 50 cm	Less than 50 cm	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm	Up to 60 cm	Up to 60 cm	Less than 1 meter
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed	To MLLW		Below MLLW	
Tide correction requirement			MHW	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Not required	Not required	Highly desirable	Not required	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Nice to have	Highly desirable	Nice to have	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have	Nice to have	Highly desirable
DTM	Highly desirable	Nice to have	Nice to have	Highly desirable
DEM	Required	Nice to have	Required	Required
Raw point cloud data	Nice to have	Not required	Not required	Highly desirable
Classified point cloud	Highly desirable	Not required	Not required	
Edited/cube XYZ		Not required	Not required	Nice to have
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Not required	Not required	Highly desirable

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Not required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Not required	Nice to have
Tide Predictions			Not required	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Not required	Not required	Highly desirable
Ground control/ground truthing	Nice to have	Not required	Not required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	Highly desirable
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Highly desirable	Required
Underwater videography			Not required	Nice to have
Bottom texture			Nice to have	Highly desirable
Bottom type			Nice to have	Required
Submerged features			Nice to have	Required
Subbottom characteristics			Not required	Highly desirable
Geologic and seismic data	Not required	Not required	Not required	Highly desirable
Water column properties - Physical			Not required	Highly desirable
Water column properties - Chemical			Not required	Highly desirable
Water column properties - Biological			Not required	Highly desirable
Currents			Not required	Highly desirable
Tide/wave heights			Not required	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Not required	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Not required	Nice to have
Lease areas			Not required	Nice to have
Fixed obstructions			Nice to have	Highly desirable
Floating observation/navigation systems			Nice to have	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Highly desirable	Nice to have
Estuaries			Highly desirable	Nice to have
Inland surface water features	Highly desirable	Highly desirable	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Highly desirable	Nice to have	
Cultural resources	Not required	Not required	Not required	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Statewide NJDEP DEM, QL2, 10' resolution	None.	None.	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Statewide NJDEP DEM; https://www.nj.gov/dep/gis/listall.html NJGIN: https://njgin.state.nj.us/NJ_NJGINExplorer/jviewer.jsp?pg=lidar			

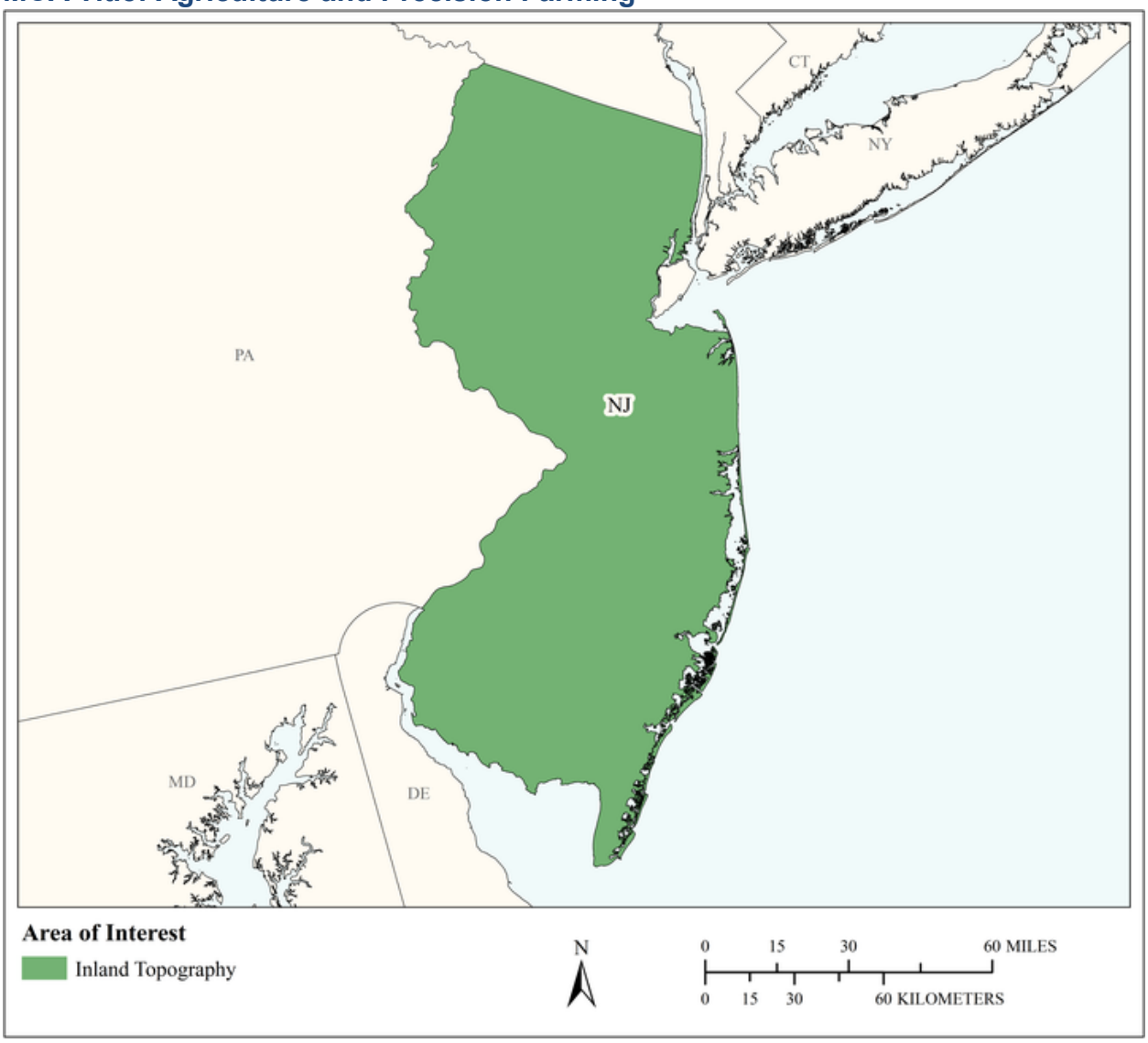
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor	Inland bathy data not available	None	Moderate
Cost savings/cost reduction	None	Inland bathy data not available	None	Minor
Cost avoidance	None	Inland bathy data not available	None	Major
Increased revenues	None	Inland bathy data not available	None	None
Mission-driven performance improvements	Moderate	Inland bathy data not available	None	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Inland bathy data not available	None	Minor
Improved response or timeliness	Minor	Inland bathy data not available	None	Minor
Improved customer experience	Minor	Inland bathy data not available	None	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	Inland bathy data not available	None	Minor
Environmental	None	Inland bathy data not available	None	Major
Public safety, including life and property	None	Inland bathy data not available	None	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	None			Minor	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Minor	Unable to provide		None			Major	Unable to provide	
Increased revenues	None			None			None			Minor	Unable to provide	
Mission-driven performance improvements	Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$125		Annual dollars saved/ realized	$1,003		Annual dollars saved/ realized	$459		Annual dollars saved/ realized	$265
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		None			Minor	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		None			Minor	Unable to provide		Major	Unable to provide	
Improved customer experience	Moderate	Unable to provide		None			None			Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$361		Annual dollars saved/ realized	$606		Annual dollars saved/ realized	$26		Annual dollars saved/ realized	$18
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			None			None			Moderate		
Environmental	Moderate			None			None			Major		
Public safety, including life and property	Moderate			None			None			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				Yes
Contours	Yes			Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes			Yes
Aspect maps	Yes			Yes
Curvature maps				
Cross sections				Yes
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Agriculture and Precision Farming



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Farm pond design. Irrigation system design. Detailed site analysis to support precision farming. Analysis of farm sedimentation and runoff. Calibration of fertilizer application, fertilizer management, and irrigation planning. Optimized terraforming.
MCA Title	Agriculture and Precision Farming
MCA ID	60295
Organization Type	State or U.S. Territorial government
Organization Name	State of New Jersey
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 08 - Agriculture and Precision Farming
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

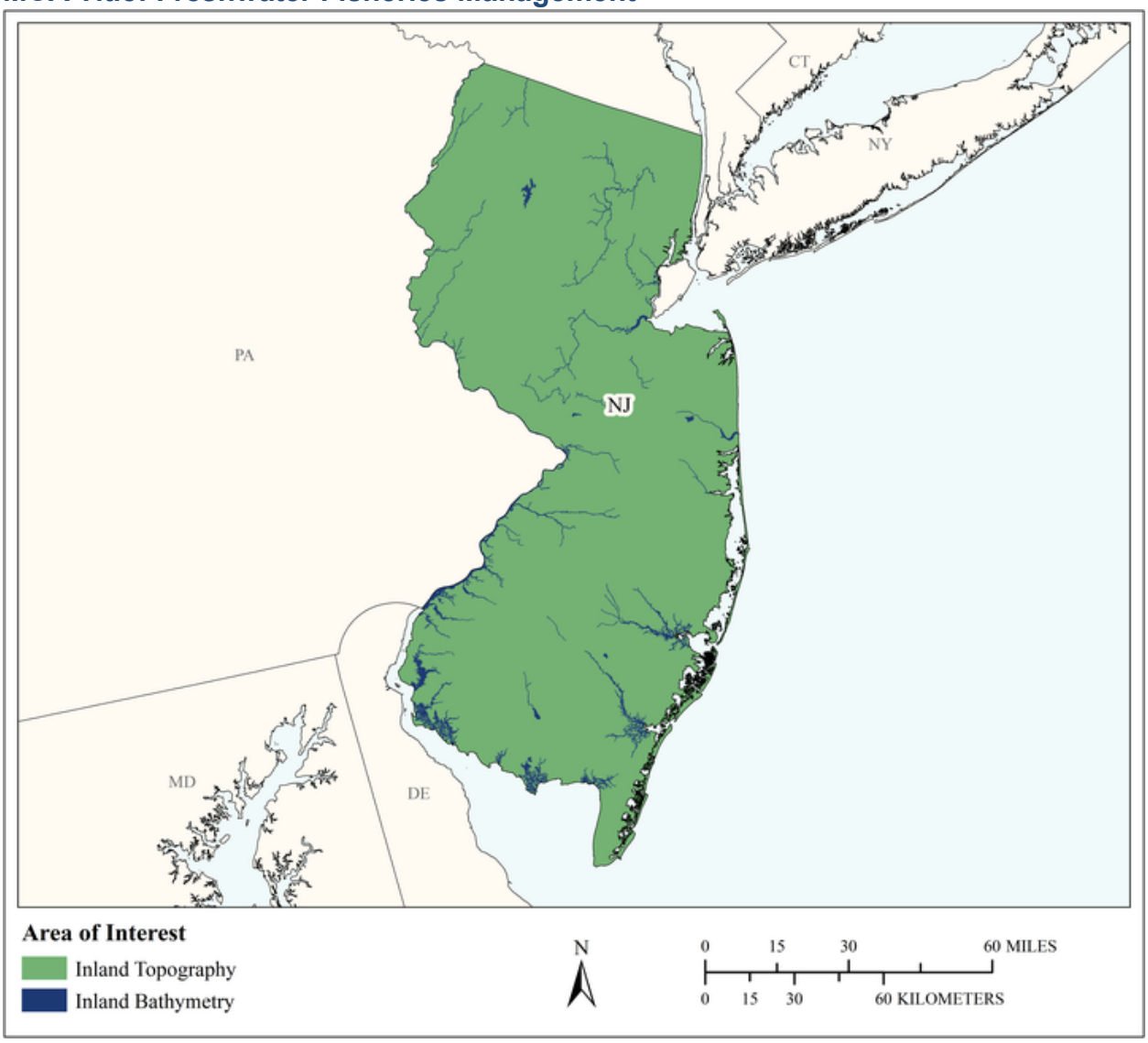
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$8,720									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$6,913									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Minor											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Freshwater Fisheries Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Freshwater Fisheries Management - protection and management of the aquatic resources in the State's 26,000 miles of freshwater streams and over 400 public lakes.
MCA Title	Freshwater Fisheries Management
MCA ID	21701
Organization Type	State or U.S. Territorial government
Organization Name	NJ Division of Fish and Wildlife
Sub-Agency or Division	
Organization Mission	The mission of the New Jersey Division of Fish and Wildlife is to protect and manage the State's fish and wildlife to maximize their long-term biological, recreational and economic values for all New Jerseyans.
Program Name	Bureau of Freshwater Fisheries
Total Annual Program Budget	
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	BU 01 - Water Supply and Quality
Tertiary Business Use	BU 27 - Recreation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.

General Geographic Area and Size	
Description of smallest 3D features	Woody debris and channel substrate in streams. Submerged vegetation, woody debris, bottom sediment composition in lakes. Riffle: A shallow area where water passes over rocks or other structures, creating turbulence or small disturbances in the flow of water. One inch to one meter in depth with various lengths/widths. Pool: Deepest areas of the stream, usually with slow current. Typically created by vertical force of water falling over logs or boulders. Run: Area of stream characterized by moderate current, continuous surface and depths greater than riffles. Boulder: Rounded rock >26 cm Sandy patches: Areas containing patches of substrate particles between 0.062 and 2 mm in diameter. (Estimate – anything > than .25 square meters) Sandy/cobble patches: Areas containing patches of mixed substrate particles between 0.062 and 2 mm (sand) and 64-256 mm (cobble). (Estimate – anything > than .25 square meters). Point bars: depositional feature accumulates on the inside bend of streams and rivers below the slip-off slope. Point bars are found in abundance in mature or meandering streams. Weirs/small dams: a low dam built across a river to raise the level of water upstream or regulate its flow. Braids: Shallow channels that divide and recombine numerous times forming a pattern resembling the strands of a braid. Braided streams form where the sediment load is so heavy that some of the sediments are deposited as shifting islands or bars between the channels.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B		
Update Frequency	Event driven only – Data need to coincide with a specific event.	Event driven only – Data need to coincide with a specific event.		

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Event type(s)	A flood, a major erosion event, dam removal, pre-post restoration, etc.	A flood, a major erosion event, dam removal, pre-post restoration, etc.		
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	I don't know	Less than 50 cm		
Acceptable Vertical Error	I don't know	I don't know		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Nice to have	
Entire AOI under same environmental conditions	Required	Highly desirable			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Nice to have	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required		
DTM	Highly desirable	Nice to have		
DEM	Required	Required		
Raw point cloud data	Not required	Not required		
Classified point cloud	Not required	Not required		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Not required		
Ground control/ground truthing	Not required	Not required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required	Nice to have		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Not required	Not required		
Cultural resources	Not required	Not required		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	This data is not used within the Bureau of Freshwater Fisheries, but it is on the horizon with certain models planned for implementation (i.e. stream flow predictions, stream temperature change along corridors). Most benefits would be in the form of "mission-driven performance" or "environmental benefits."	None. Limited use of bathymetric lake maps dating back to 1950s in NJ. Contour lines were often at 10' intervals, but varied. Submerged vegetation and other structures would often be included in these maps.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None	Inland bathy data not available		
Cost savings/cost reduction	None	Inland bathy data not available		
Cost avoidance	None	Inland bathy data not available		
Increased revenues	None	Inland bathy data not available		
Mission-driven performance improvements	None	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None	Inland bathy data not available		
Improved response or timeliness	None	Inland bathy data not available		
Improved customer experience	None	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	Inland bathy data not available		
Environmental	None	Inland bathy data not available		
Public safety, including life and property	None	Inland bathy data not available		

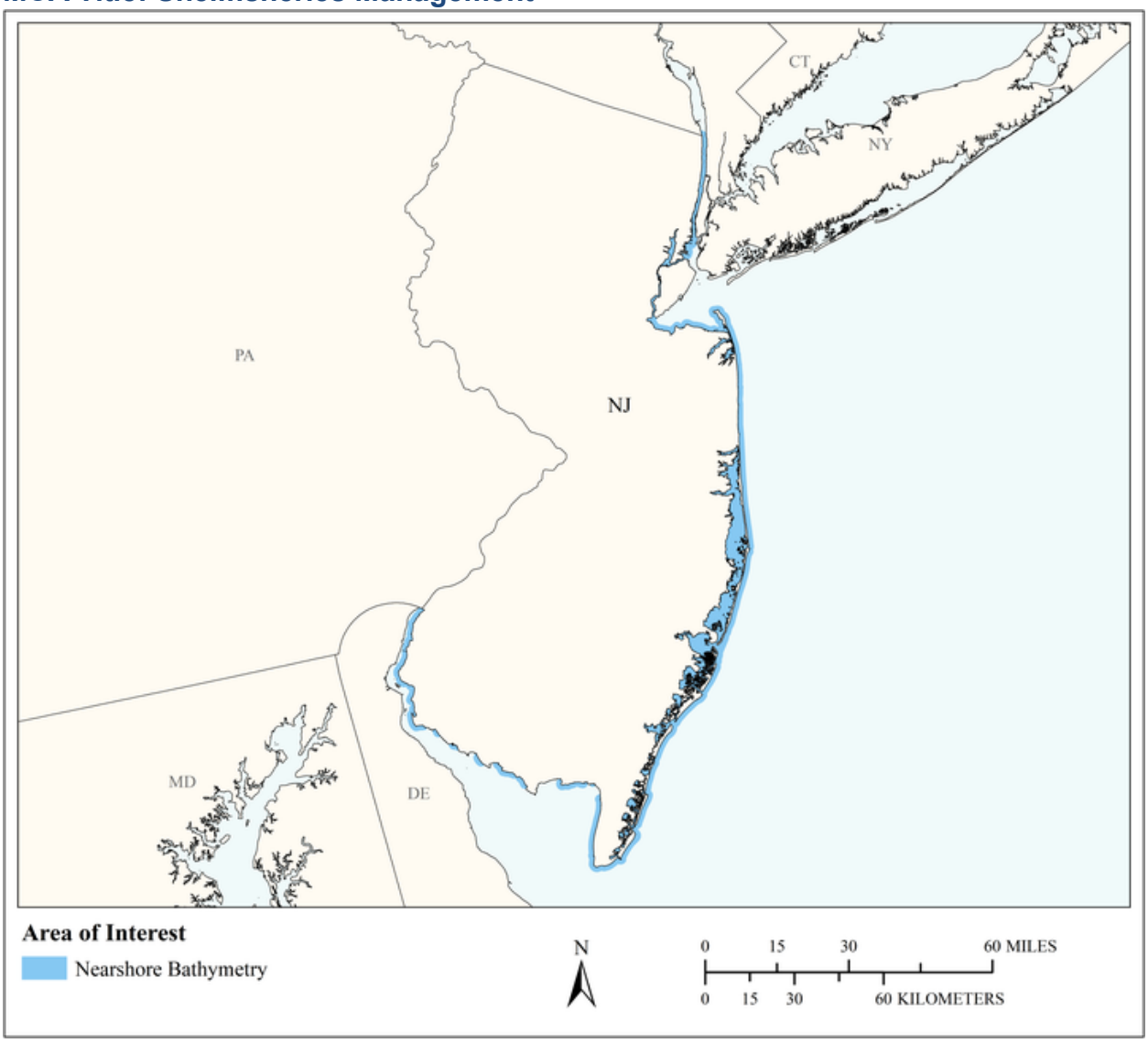
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$2,110	Moderate	Unable to provide							
Cost savings/cost reduction	None			Minor	Unable to provide							
Cost avoidance	Minor	Unable to provide		Moderate	Unable to provide							
Increased revenues	None			None								
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide							
Other operational benefits	Moderate	Unable to provide		Moderate	Unable to provide							
Other operational benefits description	Integration of 3D inland data with biological data already collected to better understand population dynamics and how it relates to flow, elevation, geomorphology and land use characteristics. Project planning improvements with better modeling, better predictions and more efficient use of biologist time.			Data would help create more streamlined project development and implementation. Help identify micro habitats in streams, to help determine where restoration should be focused and if certain projects are necessary (i.e. dredging) and predict if certain issues may arise in the future. Data would help create more streamlined project development and implementation.								
Future annual operational benefits added during validation		Annual dollars saved/ realized	$5,631		Annual dollars saved/ realized	$15,070						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Moderate	Unable to provide							
Value added to products or services description	Recreational purposes - for fishing at lakes and other waterbodies in NJ.											
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide							
Improved customer experience	Moderate	Unable to provide		Major	Unable to provide							
Improved customer experience description	Facilitation of permitting.											
Other customer service benefits	Moderate	Unable to provide		Major	Unable to provide							
Other customer service benefits description	Benefits in facilitation of habitat restoration projects/permitting. Having data in hand would cut down on time needed for review and could help provide a more accurate assessment. Facilitation of permitting.			3D bathymetric data has the potential to make decisions regarding fish stocking and fish salvages simpler when accurate depths of lakes are known. Many times this information isn't known or data was collected too long ago.								
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$16,722		Annual dollars saved/ realized	$6,859						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			Moderate								
Environmental	Moderate			Moderate								
Public safety, including life and property	None			Moderate								

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other		Large projects like dam removals, fish ladder designs or other habitat restoration projects could be better managed based on having accessible bathymetric data.		
Other benefits		Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Shellfisheries Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type			Required	
Geographic Area Requirements			Respondent provided own shapefile, KML, or geodatabase	
Sub Area Requirements			New Jersey Division of Fish and Wildlife Aquaculture Development Zone & Waterfront Development Area	

MCA Description	Response
Mission Critical Activity	Management and enhancement of shellfish population for environmental benefits as well as shellfish production for recreational and commercial users. This is to include sustainable aquaculture of native species of the state.
MCA Title	Shellfisheries Management
MCA ID	21721
Organization Type	State or U.S. Territorial government
Organization Name	NJ Division of Fish and Wildlife
Sub-Agency or Division	
Organization Mission	The mission of the New Jersey Division of Fish and Wildlife is to protect and manage the State's fish and wildlife to maximize their long-term biological, recreational and economic values for all New Jerseyans.
Program Name	Bureau of Shellfisheries
Total Annual Program Budget	
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	BU 07 - Wildlife and Habitat Management
Tertiary Business Use	BU 24 - Health and Human Services

What Needs to be Measured in 3D	Response
Bare earth ground	Not required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Bulkheads, docks, shoreline restorations, oyster reefs.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order			QL1B	
Update Frequency			2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error			Up to 2 meters	
Acceptable Vertical Error			Up to 30 cm	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed			To cover the beach slope	
How far down the beach profile needed			Below MLLW	
Tide correction requirement			MLLW	
Cross sections and/or transects meet needs			Partial	
Cross section/transect requirement			10 cm accuracy per 5 m at Capeshore, Delaware Bay, NJ.	

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season			Not required			
Entire AOI under same environmental conditions			Not required			
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless			Not required			
DEM for entire AOI needs to be seamless			Not required			
Amount of acceptable vertical manipulation to achieve spatial seamlessness						

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM			Highly desirable	
DTM			Highly desirable	
DEM			Not required	
Raw point cloud data			Highly desirable	
Classified point cloud			Highly desirable	
Edited/cube XYZ			Highly desirable	
Full waveform			Highly desirable	
Bathymetric Attributed Grid (BAG)			Highly desirable	
Breaklines required for standard hydro-flattening				
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery			Highly desirable	
Ground control/ground truthing			Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery			Not required	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data			Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Required	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Highly desirable	
Lease areas			Highly desirable	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates			Highly desirable	
Land use/land cover			Not required	
Wetlands			Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features			Not required	
Bridges/culverts				
Landmark features			Not required	
Cultural resources			Not required	
Coastal and riverine structures			Required	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used			Produce some of our own, use NOAA data and have used LiDAR.	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts			Yes	
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings			Minor	
Cost savings/cost reduction			I don't know	
Cost avoidance			I don't know	
Increased revenues			I don't know	
Mission-driven performance improvements			I don't know	

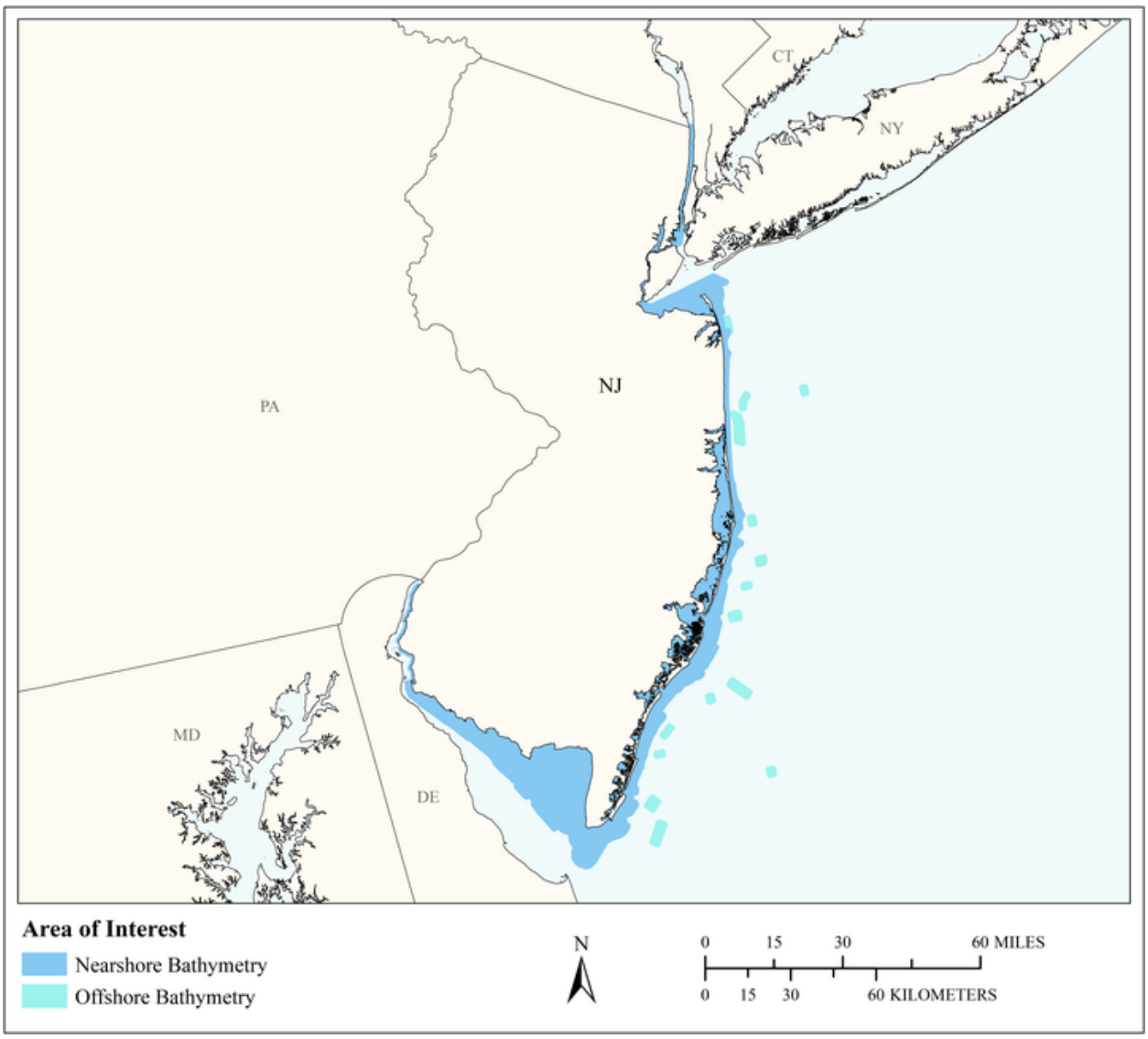
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services			I don't know	
Improved response or timeliness			I don't know	
Improved customer experience			I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach			I don't know	
Environmental			Minor	
Public safety, including life and property			I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings							Moderate	Unable to provide				
Cost savings/cost reduction							Major	Unable to provide				
Cost avoidance							Moderate	Unable to provide				
Increased revenues							Moderate	Unable to provide				
Mission-driven performance improvements							Moderate	Unable to provide				
Future annual operational benefits added during validation								Annual dollars saved/ realized	$39,949			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services							Moderate	Unable to provide				
Improved response or timeliness							Moderate	Unable to provide				
Improved customer experience							Moderate	Unable to provide				
Future annual customer service benefits added during validation								Annual dollars saved/ realized	$2,933			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach							Moderate					
Environmental							Moderate					
Public safety, including life and property							Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours			Yes	
Hillshades			Yes	
Slope maps			Yes	
Aspect maps			Yes	
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Marine Fisheries Conservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type			Required	Required
Geographic Area Requirements			Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Respondent provided own shapefile, KML, or geodatabase
Sub Area Requirements				New Jersey Division of Fish and Wildlife Artificial Reef Sites

MCA Description	Response
Mission Critical Activity	Manage, protect and enhance state marine fishery resource and habitat.
MCA Title	Marine Fisheries Conservation
MCA ID	21734
Organization Type	State or U.S. Territorial government
Organization Name	NJ Division of Fish and Wildlife
Sub-Agency or Division	
Organization Mission	The mission of the New Jersey Division of Fish and Wildlife is to protect and manage the State's fish and wildlife to maximize their long-term biological, recreational and economic values for all New Jerseyans.
Program Name	Bureau of Marine Fisheries, Artificial Reef Program
Total Annual Program Budget	
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	BU 07 - Wildlife and Habitat Management
Tertiary Business Use	BU 26 - Education K12 and Beyond, Basic Research

What Needs to be Measured in 3D	Response
Bare earth ground	Not required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Underwater wrecks, artificial reef sites, reef balls (4'x5'), rock and rubble, sand bars

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order			QL0B	Special Order
Update Frequency			Hard to know. Sand mining projects would influence frequency as would large coastal storms.	Event driven only – Data need to coincide with a specific event.
Event type(s)				Sand mining projects, large coastal storms, deposition of artificial reef material

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error			Up to 1 meter	Up to 1 meter
Acceptable Vertical Error			Up to 30 cm	Less than 1 meter
How far onshore needed			None	
How far down the beach profile needed			None	
Tide correction requirement			MLLW	MLLW
Cross sections and/or transects meet needs			Partial	Partial
Cross section/transect requirement			Nearshore transects would help map out offshore sand bars that serve as essential fish habitat. This may help with artificial reef surveys as well. Transects may be enough in some cases, but full bottom coverage of nearshore and offshore bathymetric data is preferred.	Project specific. Keel clearance for artificial reef surveys as well. Transects may be enough in some cases, but full bottom coverage of nearshore and offshore bathymetric data is preferred.

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season			Nice to have	Nice to have		Nice to have
Entire AOI under same environmental conditions			Highly desirable	Highly desirable		Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless			Highly desirable	Highly desirable		Highly desirable
DEM for entire AOI needs to be seamless			Highly desirable	Highly desirable		Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness			I don't know	I don't know		I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM			Required	Required
DTM			Nice to have	Nice to have
DEM			Required	Required
Raw point cloud data			Nice to have	Nice to have
Classified point cloud			Required	
Edited/cube XYZ			Nice to have	Nice to have
Full waveform			Not required	Not required
Bathymetric Attributed Grid (BAG)			Required	Required
Breaklines required for standard hydro-flattening				
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Not required	Not required
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery			Nice to have	Nice to have
Ground control/ground truthing			Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	Nice to have
Nautical and/or navigation charts			Nice to have	Nice to have
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery			Not required	Not required
Underwater videography			Nice to have	Nice to have
Bottom texture			Nice to have	Nice to have
Bottom type			Nice to have	Nice to have
Submerged features			Required	Required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data			Not required	Not required
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Not required	Not required
Currents			Nice to have	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Not required	Not required
Routes			Highly desirable	Nice to have
Offshore cadastral			Not required	Not required
Lease areas			Not required	Not required
Fixed obstructions				Nice to have
Floating observation/navigation systems				Nice to have
Shorelines – current, historic, change rates			Nice to have	
Land use/land cover			Not required	Not required
Wetlands			Not required	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Nice to have	Not required
Inland surface water features			Not required	
Bridges/culverts				
Landmark features			Not required	
Cultural resources			Not required	
Coastal and riverine structures			Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used			NOAA nautical charts	We are using limited sonar, boat-based depth finders and NOAA nautical charts.
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other				Yes
Other description				Limited sonar and boat-based depth finders
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings			I don't know	I don't know
Cost savings/cost reduction			I don't know	I don't know

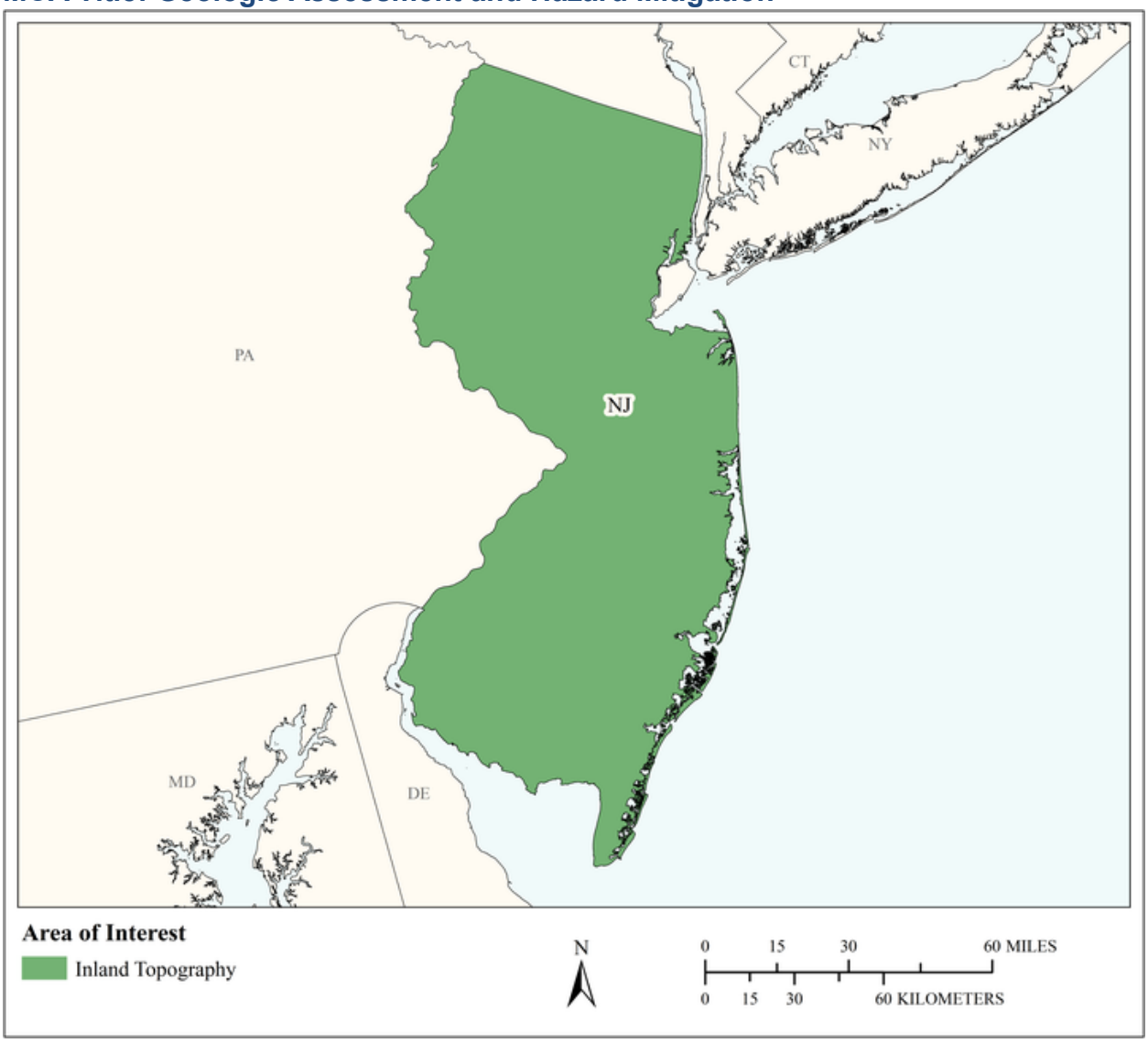
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost avoidance			I don't know	I don't know
Increased revenues			I don't know	I don't know
Mission-driven performance improvements			I don't know	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services			I don't know	I don't know
Improved response or timeliness			I don't know	I don't know
Improved customer experience			I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach			I don't know	I don't know
Environmental			I don't know	I don't know
Public safety, including life and property			I don't know	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings							I don't know	Unable to provide		I don't know	Unable to provide	
Time savings description							It is hard to know future benefits. Training would help increase recognition of benefits. If we had access to these data, understanding how to make best use of them, with training, would increase benefits.			It is hard to know future benefits. Training would increase value of data availability's associated benefits.		
Cost savings/cost reduction							I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance							I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues							None			None		
Mission-driven performance improvements							I don't know	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation								Annual dollars saved/ realized	$118,298			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services							Moderate	Unable to provide		Minor	Unable to provide	
Improved response or timeliness							I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience							Moderate	Unable to provide		Minor	Unable to provide	
Future annual customer service benefits added during validation								Annual dollars saved/ realized	$8,688			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach							I don't know			I don't know		
Environmental							I don't know			I don't know		
Public safety, including life and property							Minor			Minor		
Public safety, including life and property description							May help ensure that there are no vessel collisions with artificial reef material. We take great caution now to ensure this so with improved data we expect potentially minor future benefits.			May help with keel clearance, though we take great care currently so future benefits would likely be minor.		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours			Yes	Yes
Hillshades			Yes	Yes
Slope maps				
Aspect maps				
Curvature maps				
Cross sections			Yes	Yes
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Geologic Assessment and Hazard Mitigation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Geologic mapping and analysis. Sinkhole and steephead mapping, monitoring, and analysis. Identification of geomorphologic units. Landslide hazard mapping and assessment. Karst mapping, including springs and caves. Aquifer recharge.
MCA Title	Geologic Assessment and Hazard Mitigation
MCA ID	60296
Organization Type	State or U.S. Territorial government
Organization Name	State of New Jersey
Sub-Agency or Division	New Jersey Geological and Water Survey
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

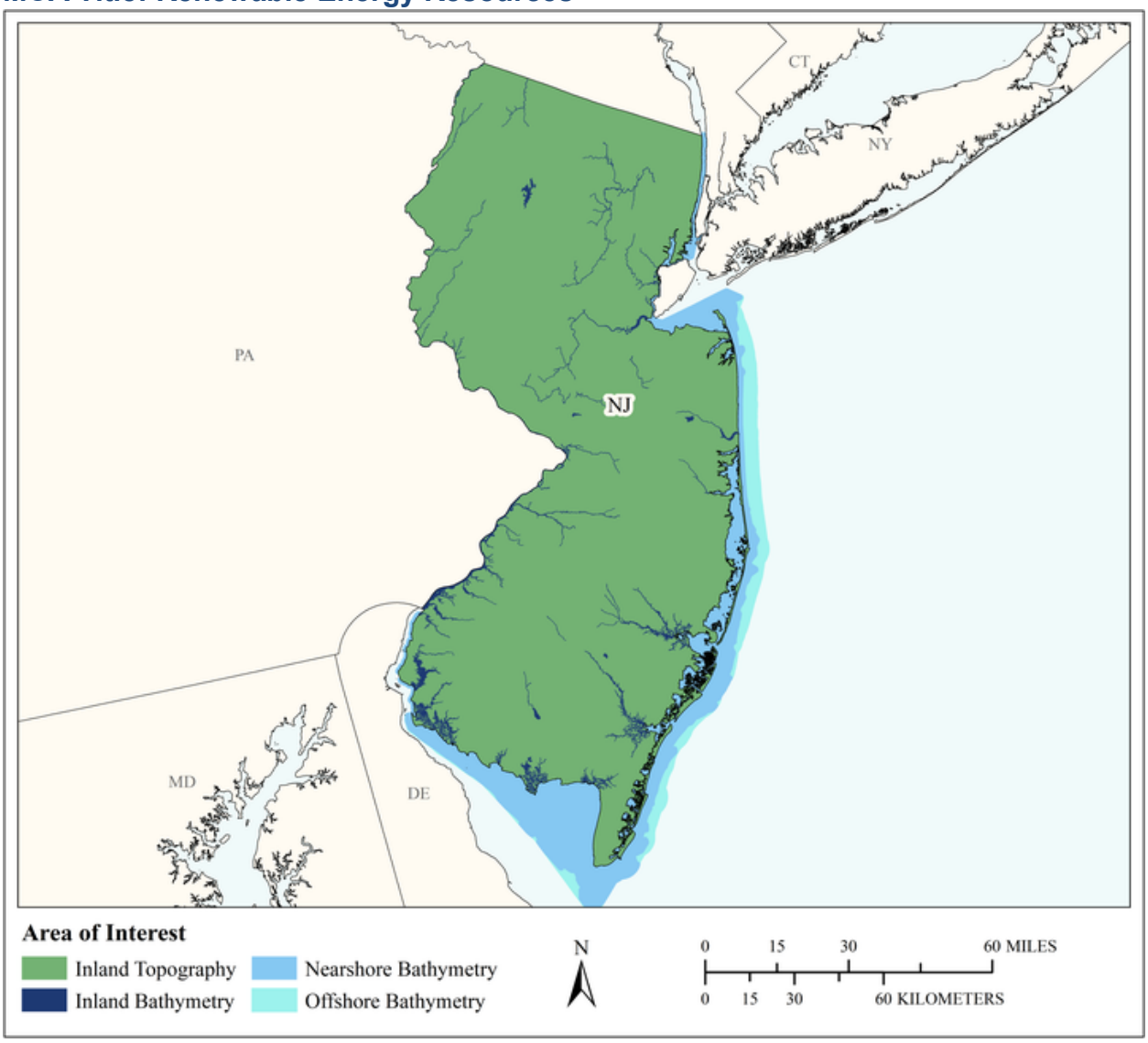
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,589,895									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$27,910									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Renewable Energy Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	New Jersey has extensively studied offshore windfarm potential and issues. Solar is another major focus for the state, both in development of major installations and in promoting residential development. Alternate energy development – solar, tidal, wind, wave, and ocean current. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Low head power potential for hydropower.
MCA Title	Renewable Energy Resources
MCA ID	60297
Organization Type	State or U.S. Territorial government
Organization Name	State of New Jersey
Sub-Agency or Division	Bureau of Energy and Sustainability
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	I don't know
Rivers and Streams	
Less than 10 ft	I don't know
10 - 50 ft	I don't know
51 - 100 ft	I don't know
101 - 500 ft	I don't know
501 - 2,500 ft	I don't know
Greater than 2,500 ft	I don't know
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	I don't know

Inland Bathy Feature Size Requirements	Response
½ - 1 acre	I don't know
1.1 – 2 acres	I don't know
2.1 – 5 acres	I don't know
5.1 – 10 acres	I don't know
Greater than 10 acres	I don't know

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	I don't know	I don't know	I don't know
Update Frequency	6-10 years	I don't know	I don't know	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	I don't know	I don't know	I don't know
Acceptable Vertical Error	Up to 20 cm	I don't know	I don't know	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					I don't know	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	I don't know	I don't know	I don't know	I don't know	I don't know
Entire AOI under same environmental conditions	Highly desirable	I don't know	I don't know	I don't know	I don't know	I don't know
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	I don't know	I don't know	I don't know	I don't know	I don't know
DEM for entire AOI needs to be seamless	Highly desirable	I don't know	I don't know	I don't know	I don't know	I don't know
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	I don't know	I don't know	I don't know
DTM	Required	I don't know	I don't know	I don't know
DEM	Required	I don't know	I don't know	I don't know
Raw point cloud data	Highly desirable	I don't know	I don't know	I don't know
Classified point cloud	Highly desirable	I don't know	I don't know	
Edited/cube XYZ		I don't know	I don't know	I don't know
Full waveform	Nice to have	I don't know	I don't know	I don't know
Bathymetric Attributed Grid (BAG)		I don't know	I don't know	I don't know
Breaklines required for standard hydro-flattening	Nice to have	I don't know		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			I don't know	I don't know
Tide Predictions			I don't know	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			I don't know	I don't know
Intensity imagery/sidescan imagery	Not required	I don't know	I don't know	I don't know
Ground control/ground truthing	Highly desirable	I don't know	I don't know	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			I don't know	I don't know
Nautical and/or navigation charts			I don't know	I don't know
Acoustic imagery of the seafloor			I don't know	I don't know
Aerial and/or satellite imagery	Highly desirable	I don't know	I don't know	I don't know
Underwater videography			I don't know	I don't know
Bottom texture			I don't know	I don't know
Bottom type			I don't know	I don't know
Submerged features			I don't know	I don't know
Subbottom characteristics			I don't know	I don't know
Geologic and seismic data	Not required	I don't know	I don't know	I don't know
Water column properties - Physical			I don't know	I don't know
Water column properties - Chemical			I don't know	I don't know
Water column properties - Biological			I don't know	I don't know
Currents			I don't know	I don't know
Tide/wave heights			I don't know	I don't know
Sea ice conditions			I don't know	I don't know
Habitat distribution and classification			I don't know	I don't know
Boundaries			I don't know	I don't know
Routes			I don't know	I don't know
Offshore cadastral			I don't know	I don't know
Lease areas			I don't know	I don't know
Fixed obstructions			I don't know	I don't know
Floating observation/navigation systems			I don't know	I don't know
Shorelines – current, historic, change rates	Nice to have	I don't know	I don't know	
Land use/land cover	Highly desirable	I don't know	I don't know	I don't know
Wetlands	Nice to have	I don't know	I don't know	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			I don't know	I don't know
Inland surface water features	Nice to have	I don't know	I don't know	
Bridges/culverts	Nice to have	I don't know		
Landmark features	Nice to have	I don't know	I don't know	
Cultural resources	Not required	I don't know	I don't know	
Coastal and riverine structures	Nice to have	I don't know	I don't know	
Overhead structures			I don't know	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	I don't know	I don't know	I don't know
Cost savings/cost reduction	Moderate	I don't know	I don't know	I don't know
Cost avoidance	Moderate	I don't know	I don't know	I don't know
Increased revenues	None	I don't know	I don't know	I don't know
Mission-driven performance improvements	Minor	I don't know	I don't know	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	I don't know	I don't know	I don't know

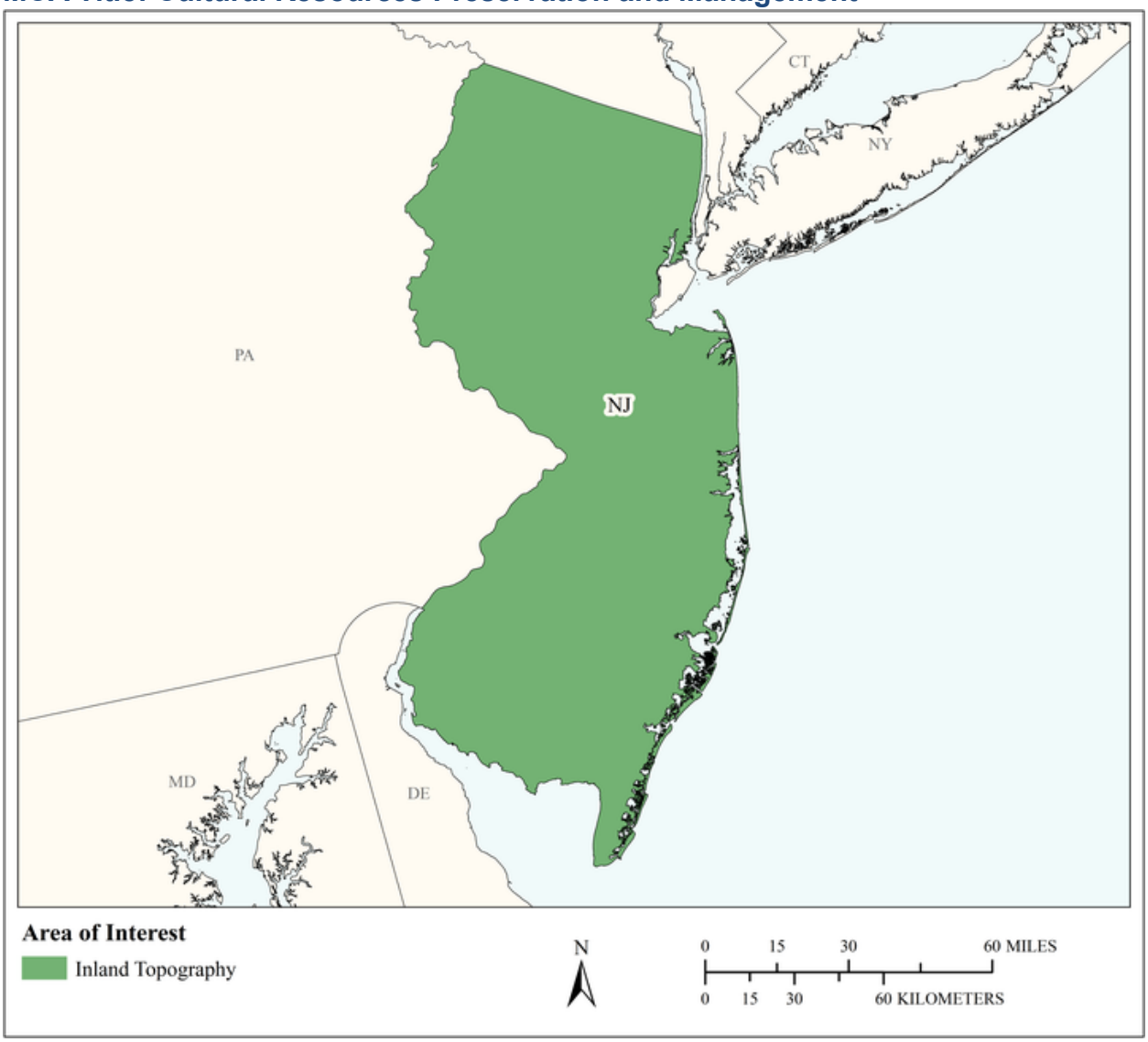
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Minor	I don't know	I don't know	I don't know
Improved customer experience	Minor	I don't know	I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	I don't know	I don't know	I don't know
Environmental	Minor	I don't know	I don't know	I don't know
Public safety, including life and property	Minor	I don't know	I don't know	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Minor	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			I don't know			I don't know			I don't know		
Environmental	Minor			I don't know			I don't know			I don't know		
Public safety, including life and property	None			I don't know			I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Cultural Resources Preservation and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Discovery and analysis of underwater archaeological and historical cultural sites. Site protection and preservation planning. Discovery and analysis of Native American and other historical cultural sites and subsistence activities. New Jersey has an active historical property group. Lidar point clouds would be beneficial in locating and cataloging structures and Native developments.
MCA Title	Cultural Resources Preservation and Management
MCA ID	60298
Organization Type	State or U.S. Territorial government
Organization Name	State of New Jersey
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Nice to have					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have					
DEM for entire AOI needs to be seamless	Nice to have					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Moderate			
Cost avoidance	Minor			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			

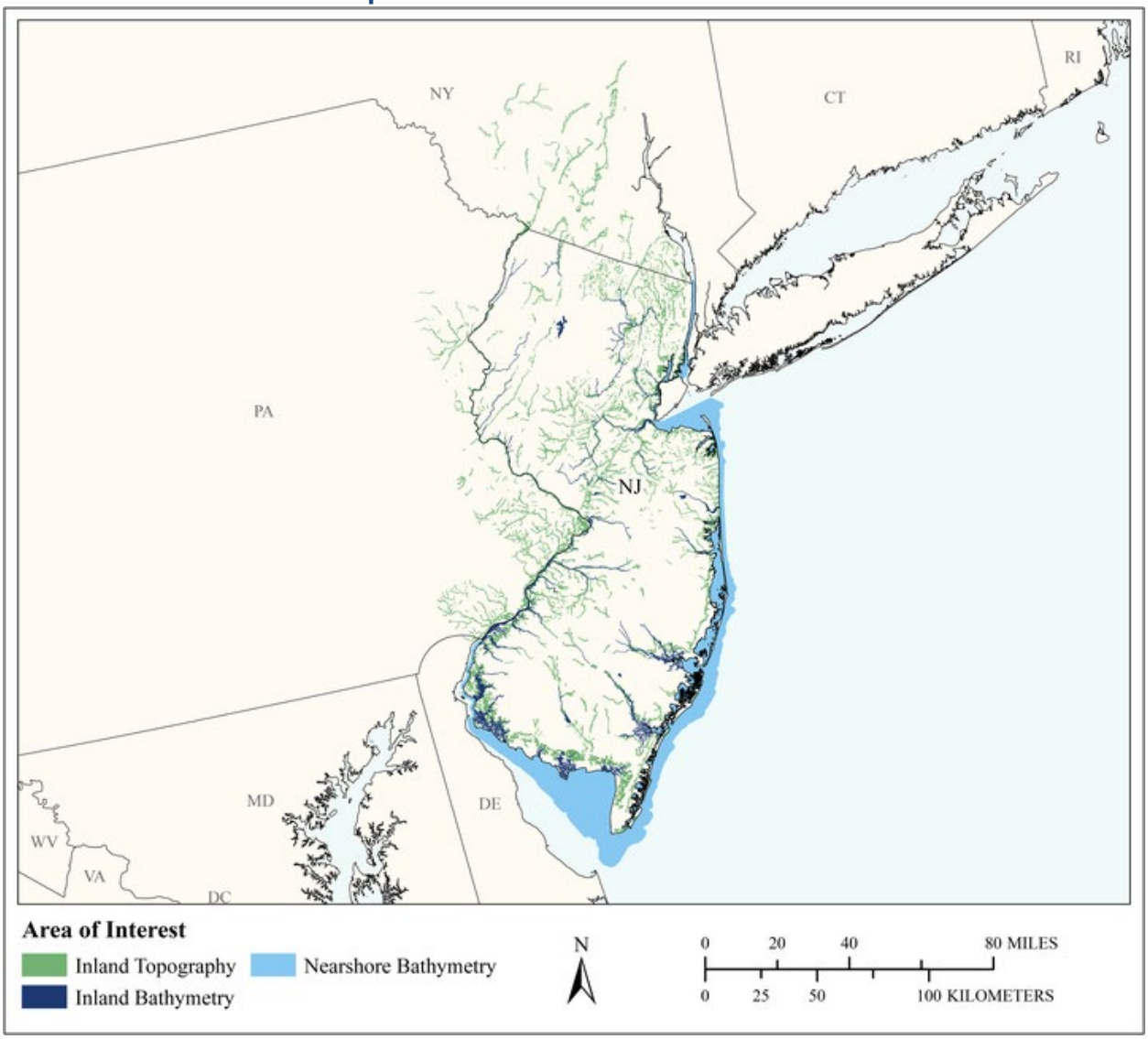
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Cost savings/cost reduction	Minor	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Moderate	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,380									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,207									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	Minor											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Provide Coastal and Riverine Mitigation Guidance to NJ Residents, Local Officials and Developers



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Custom description	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements	Coastal & riverine sections and the adjacent floodplain (500yr floodplain plus 200 foot buffer) in the HUC8s that cover New Jersey			

MCA Description	Response
Mission Critical Activity	Provide coastal and riverine mitigation guidance to NJ residents, local officials and developers. H&H modeling, contract modeling out, FEMA flood studies and non-regulatory products,
MCA Title	Provide Coastal and Riverine Mitigation Guidance to NJ Residents, Local Officials and Developers
MCA ID	1453
Organization Type	State or U.S. Territorial government
Organization Name	NJ DEP Bureau of Flood Control
Sub-Agency or Division	
Organization Mission	1) Implement flood protection and control measures to protect life and property in New Jersey from the devastating effects of flooding. This includes both large federal and smaller state flood reduction projects. 2) Adopt land use regulations in NJ for the flood hazard area, to control stream encroachments, coordinate the development, dissemination, and use of information on floods and flood damages. 3) Provide floodplain management assistance to local communities throughout the state through the National Flood Insurance (NFIP) Community Assistance Program.
Program Name	NJ Bureau of Flood Control
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 03 - Coastal Zone Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Not required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Manufactured homes, residential & non-residential structures, culverts and bridge structures and footings. Underwater bottom surface

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required

Inland Bathy Feature Size Requirements	Response
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	Cross sections and/or transects meet needs	Cross sections and/or transects meet needs	Cross sections and/or transects meet needs	
Update Frequency	4-5 years	4-5 years	6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	Up to 2 meters	Up to 5 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 50 cm	Up to 1 meter	
How far onshore needed			To cover the beach slope	
How far down the beach profile needed	Below MLLW		To MLLW	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs	Yes	Yes	Yes	
Cross section/transect requirement	Vertical accuracy is 0.2 foot.	Must meet FEMA Guidelines & Standards requirements. Cross sections may be 1000 feet apart in open reaches, with additional cross section immediately upstream and downstream of hydraulic structures (culverts, bridges, weirs, etc.)	Vertical accuracy would need to meet FEMA requirements. Believe they are 0.2 foot. Not sure of the sampling density. Transects need to cover the entire extent of flooding.Historicall y, FEMA used scattered offshore and near-shore bathy to an AdCIRC Mesh.	

Hydrologic Processing Required	Response
Hydro-flattening	Required

Hydrologic Processing Required	Response
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Required	Not required		Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Not required		Not required	Nice to have
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Required
Other	Highly desirable					
Other description	Classified structure data for entire AOI needs to be seamless					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Nice to have	
DTM	Not required	Highly desirable	Nice to have	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Nice to have	Nice to have	
Classified point cloud	Highly desirable	Highly desirable	Nice to have	
Edited/cube XYZ		Not required	Not required	
Full waveform	Not required	Not required	Not required	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Bathymetric Attributed Grid (BAG)		Not required	Nice to have	
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Not required	Highly desirable	Not required	
Ground control/ground truthing	Nice to have	Nice to have	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	
Underwater videography			Not required	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Not required	
Subbottom characteristics			Not required	
Geologic and seismic data	Not required	Not required	Not required	
Water column properties - Physical			Highly desirable	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Required	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Nice to have	Required	
Wetlands	Not required	Nice to have	Highly desirable	
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Highly desirable		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Not required	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	State lidar	None, just surveyed cross sections from flood studies	Presently using resulting products. May use near-shore data for future coastal analysis. Coastal transects from current flood studies	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast			Yes	
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts			Yes	
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	NJ DEP/OIT			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other		Yes		
Other description		Not sure.		
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available	Minor	
Cost savings/cost reduction	Minor	Inland bathy data not available	Minor	
Cost avoidance	Major	Inland bathy data not available	Moderate	
Increased revenues	None	Inland bathy data not available	None	
Mission-driven performance improvements	Major	Inland bathy data not available	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available	Minor	
Improved response or timeliness	Moderate	Inland bathy data not available	Minor	
Improved customer experience	Moderate	Inland bathy data not available	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Inland bathy data not available	Moderate	
Environmental	Moderate	Inland bathy data not available	Moderate	
Public safety, including life and property	Major	Inland bathy data not available	Moderate	

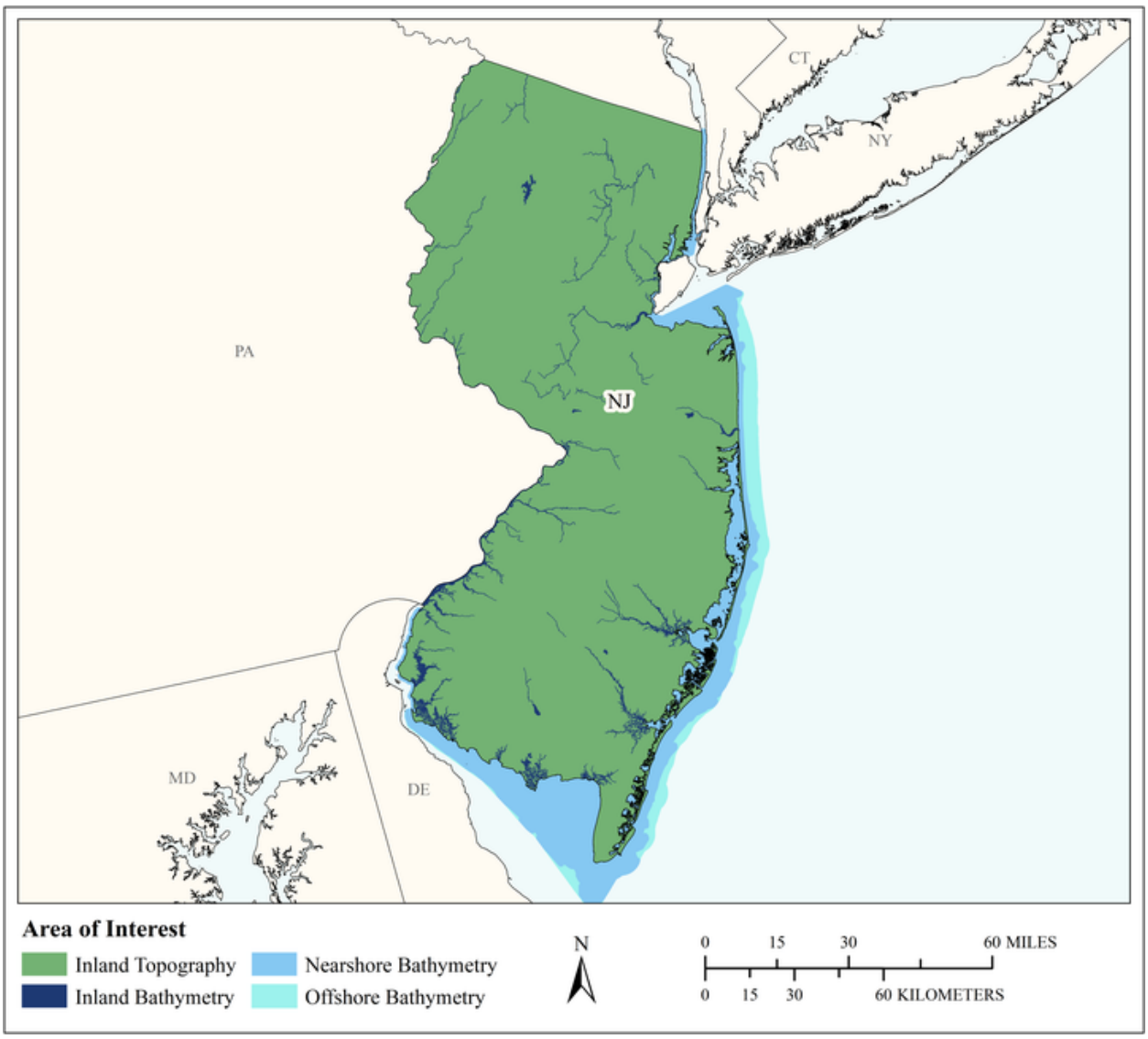
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$27,256	Moderate	Annual dollars saved/realized	$1,990	Moderate	Unable to provide				
Time savings description	Assume a 10% efficiency with 4.25 people working 14 hrs/week on related elevation projects. We average about 6 field visits/year, 2 people about 4 hours/visit. We could cut the visits in half. Assume a 5% efficiency with 4.25 people working 14 hrs/week on related elevation projects. Assume 2 people working 1 week on 4 related elevation projects per year.			1 hour per project. 2 people at 4 hours per visit at 6 visits per year.								
Cost savings/cost reduction	Minor	Annual dollars saved/realized	$500	Moderate	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction description	Most acquisitions are open source or state owned resources.											
Cost avoidance	Major	Annual dollars saved/realized	$20,300	Moderate	Unable to provide		Moderate	Annual dollars saved/realized	$10			
Cost avoidance description	Assume 300 M-H at $35/hr. Assume 280 M-H at $35/hr. This is our mission, to prevent loss of life. We will need to investigate a dollar value for this. This is our mission. We will need to investigate a dollar value for this.						Estimate 10% of budget.					
Increased revenues	Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Increased revenues description	Ability to provide better HAZUS products, and steady state, non-steady state and 2D HEC-RAS analysis.											
Mission-driven performance improvements	Moderate	Annual percent improvement	22%	Moderate	Annual percent improvement	10%	Moderate	Annual percent improvement	18%			
Mission-driven performance improvements description	We expect a 5 to 20% improvement with better products. We estimate a 10 to 25% improvement in safety and property loss. Will have to consult with FEMA. We expect a 10 to 25% improvement with better products. A guesstimate of 20% improvement.			Approximate estimate.								
Other operational benefits	Moderate	Annual dollars saved/realized	$7,236									
Other operational benefits description	On-site tool for homeowner/Floodplain Administrator/local CO/Engineer. Will free up time in the office. An on-site SFHA in/out, surface elevation & BFE analysis tool/app.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Moderate	Annual dollars saved/realized	$30,753	Moderate	Unable to provide		Moderate	Annual dollars saved/realized	$173,664			
Improved response or timeliness description	Provide customer the ability to determine design flood elevation (DFE). Provide customer the ability to view maps. Provide customer the ability to review elevations. Flood & flash flood prediction app.						After a disaster. 10 people, 1 hour each/day. After a disaster. 4 people, 1 hour each/day.					
Improved customer experience	Major	Unable to provide		Minor	Unable to provide		Moderate	Annual dollars saved/realized	$30,150			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved customer experience description			4 people, 1 hour each/day. 4 people, 0.5 hour each/day.	
Societal Benefits	**Benefits**	**Benefits**	**Benefits**	**Benefits**
Education or outreach	Moderate	Moderate	Major	
Education or outreach description	Better dissemination of current and future floodplain information.	Improved floodplain mapping products.	Internet access to coastal flooding information.	
Environmental	Major	I don't know	Moderate	
Environmental description	Better resilient development in NJ.		Better planning & construction along flooded coastal areas.	
Public safety, including life and property	Major	Minor	Moderate	
Public safety, including life and property description	Better resilient development and mitigation of current development in NJ.	Improved/increased non-regulatory products.	Keep development and activities away from high-risk areas.	

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Sea Level Rise and Subsidence



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Sea level rise planning. Modeling and mapping the effects of sea level rise or subsidence. Population and economic vulnerability assessments. Coastal inundation and infrastructure assessment. Sea Level Rise Analysis/Climate/Resiliency has recently become a major focus of NJDEP with the forming of the Climate and Flood Resilience Program and the governor's Executive Order establishing a statewide Climate Change Resilience Strategy.
MCA Title	Sea Level Rise and Subsidence
MCA ID	60299
Organization Type	State or U.S. Territorial government
Organization Name	State of New Jersey
Sub-Agency or Division	NJDEP
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 16 - Sea Level Rise and Subsidence
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL1B	QL2B	Order 2
Update Frequency	4-5 years	4-5 years	2-3 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	Up to 20 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	Up to 2 meters
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Required	Required	Highly desirable	Highly desirable	Required
Entire AOI under same environmental conditions	Highly desirable	Required	Required	Highly desirable	Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Required	Required	Highly desirable	Required
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have	Highly desirable	Highly desirable
DTM	Required	Required	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Highly desirable	Nice to have	Nice to have
Classified point cloud	Required	Nice to have	Highly desirable	
Edited/cube XYZ		Not required	Not required	Not required
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Not required	Not required	Not required
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	Required
Tide Predictions			Required	Required
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Required
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Highly desirable	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Required
Nautical and/or navigation charts			Highly desirable	Required
Acoustic imagery of the seafloor			Nice to have	Not required
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Not required	Not required
Bottom texture			Not required	Not required
Bottom type			Nice to have	Nice to have
Submerged features			Nice to have	Not required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Not required
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Not required
Water column properties - Biological			Not required	Not required
Currents			Nice to have	Nice to have
Tide/wave heights			Required	Required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Required
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Not required	Not required
Lease areas			Not required	Not required
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Required	Required	Highly desirable	Highly desirable
Wetlands	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Required	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes	Yes	Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Major	Major
Cost savings/cost reduction	Major	Major	Major	Major
Cost avoidance	Major	Major	Major	Major
Increased revenues	None	Minor	Minor	None
Mission-driven performance improvements	Major	Major	Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	Major

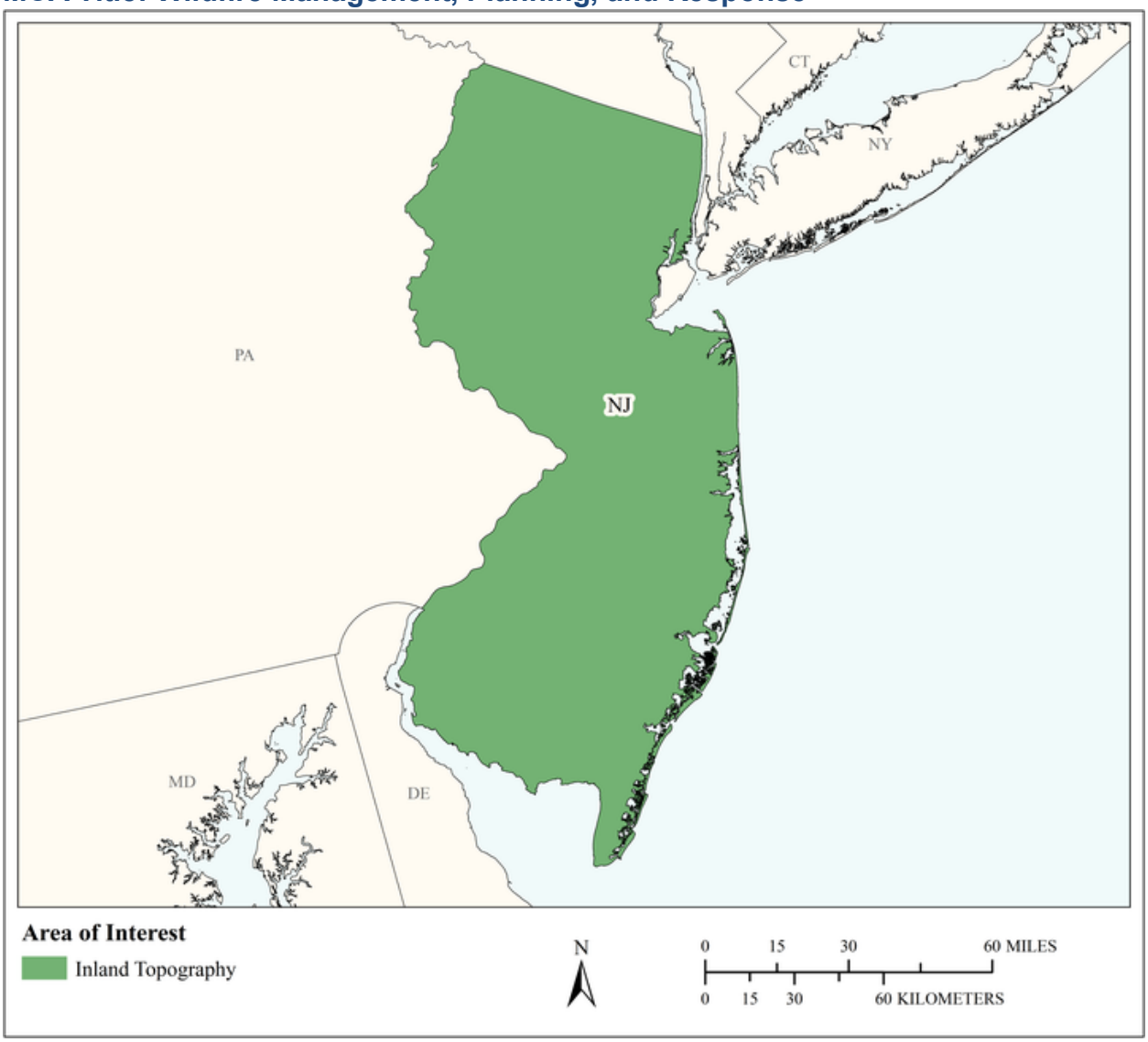
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Minor	Major	Major
Improved customer experience	Moderate	Moderate	Major	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Major	Moderate
Environmental	Moderate	Moderate	Major	Major
Public safety, including life and property	Major	Moderate	Major	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Increased revenues	Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$396,532									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Major			Major		
Environmental	Moderate			Major			Major			Major		
Public safety, including life and property	Moderate			Major			Minor			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		Yes
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Wildfire Management, Planning, and Response



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of forest fuel and fire susceptibility. Fire behavior modeling to support wildfire suppression activities. Wildland/urban interface building identification. Post fire analysis to determine landslide prone areas.
MCA Title	Wildfire Management, Planning, and Response
MCA ID	60300
Organization Type	State or U.S. Territorial government
Organization Name	State of New Jersey
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 17 - Wildfire Management, Planning, and Response
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

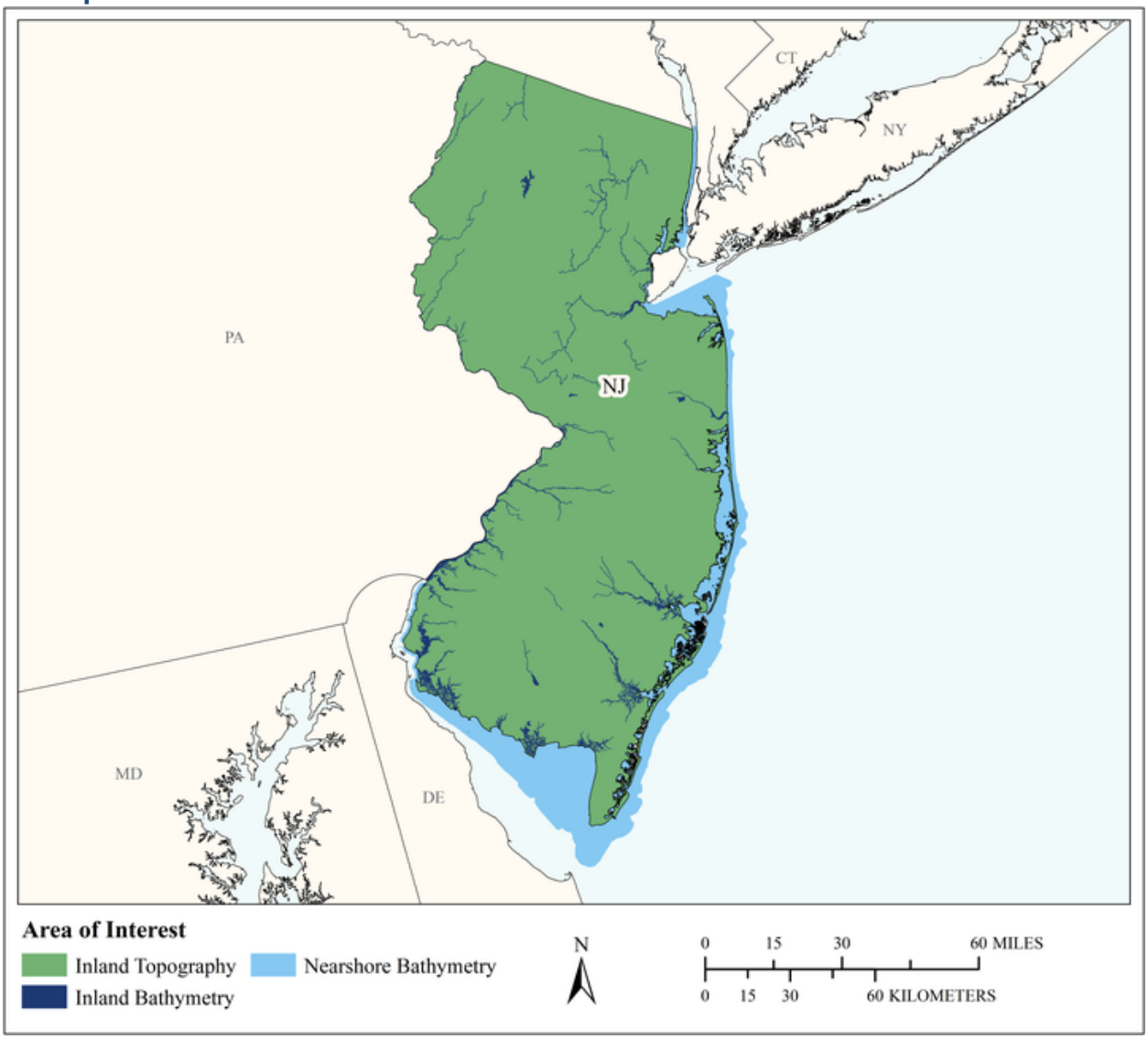
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$40,467									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Maintenance and Construction of Navigation Channels and Transportation Infrastructure



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Area split by varying quality level or update frequency	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements	New Jersey			

MCA Description	Response
Mission Critical Activity	Maintenance and construction of navigation channels including dredging, dredged material management, provision of aids to navigation, public outreach and education for shallow draft vessel (commercial and recreational) use. Maintenance of transportation infrastructure.
MCA Title	Maintenance and Construction of Navigation Channels and Transportation Infrastructure
MCA ID	21486
Organization Type	State or U.S. Territorial government
Organization Name	New Jersey DOT
Sub-Agency or Division	
Organization Mission	Development of Maritime Policy and Planning as well as maintenance of the State's portion of the NJ Marine Transportation System.
Program Name	State Channel Maintenance Program
Total Annual Program Budget	
Primary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Secondary Business Use	BU 22 - Infrastructure and Construction Management
Tertiary Business Use	BU 27 - Recreation

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Navigational channels, underwater objects that may impact navigation, confined disposal facilities, beaches, waterside infrastructure

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	(a) QL0 HD (b) QL2	QL0B	QL0B	
Update Frequency	2-3 years	2-3 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI	Need QL0 HD of coastal zone only (10 miles inland is of most concern to include navigable rivers); QL2 is OK farther inland.		Coastal areas only	
Acceptable Horizontal Error	Less than 20 cm	Less than 50 cm	Less than 50 cm	
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm	Less than 10 cm	
How far onshore needed			500 meters inland	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MLLW	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required		Required	Required
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level		Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Highly desirable	Required	
DTM	Required	Highly desirable	Required	
DEM	Required	Highly desirable	Required	
Raw point cloud data	Required	Highly desirable	Required	
Classified point cloud	Required	Highly desirable	Required	
Edited/cube XYZ		Highly desirable	Required	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Required	
Intensity imagery/sidescan imagery	Not required	Highly desirable	Highly desirable	
Ground control/ground truthing	Nice to have	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Nice to have	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Not required	Nice to have	Not required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Highly desirable	
Boundaries			Nice to have	
Routes			Required	
Offshore cadastral			Nice to have	
Lease areas			Required	
Fixed obstructions			Required	
Floating observation/navigation systems			Required	
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Nice to have	Nice to have	Nice to have	
Wetlands	Highly desirable	Required	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Highly desirable	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Highly desirable	Nice to have	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Statewide lidar for planning, self-collected for construction	Channel bathymetry, beach elevation best available for planning, self-collected/USACE historical data	Coastal bathymetry to screen for restoration sites, self-collected as well	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	
NCEI				
Open Topography	Yes			
NOAA nautical charts		Yes	Yes	
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	NJ Geographic information network, NJ GIS	NJ Geographic information network, NJ GIS		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Inland bathy data not available	Minor	

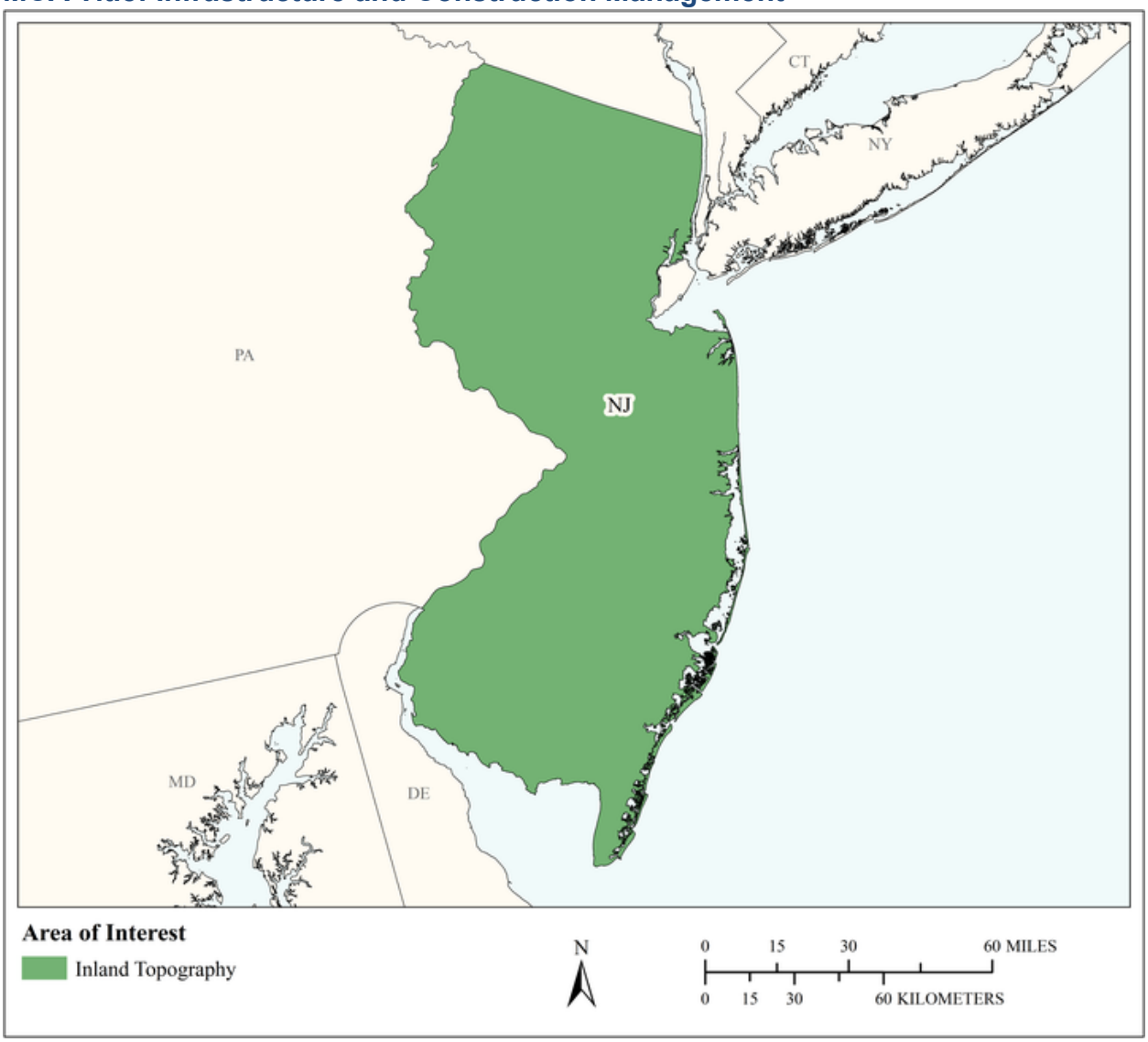
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost savings/cost reduction	Moderate	Inland bathy data not available	Minor	
Cost avoidance	Moderate	Inland bathy data not available	None	
Increased revenues	Moderate	Inland bathy data not available	None	
Mission-driven performance improvements	Moderate	Inland bathy data not available	None	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None	Inland bathy data not available	None	
Improved response or timeliness	None	Inland bathy data not available	Minor	
Improved customer experience	None	Inland bathy data not available	None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	Inland bathy data not available	None	
Environmental	None	Inland bathy data not available	None	
Public safety, including life and property	Major	Inland bathy data not available	Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Time savings description	Having available data reduces the need for field work.			Having available data reduces the need for field work.			Having available data reduces the need for field work.					
Cost savings/cost reduction	Minor	Annual dollars saved/realized	$571,000	Minor	Unable to provide		Moderate	Annual dollars saved/realized	$2,100,000			
Cost savings/cost reduction description	$4 million spent on data acquisition since 2012 = $571K per year.						$500,000 plus $600K for nautical surveys and $1m for 3800 cores.					
Cost avoidance	I don't know	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Increased revenues	None			None			None					
Mission-driven performance improvements	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide		None			Minor	Unable to provide				
Improved response or timeliness	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Improved customer experience	None			None			Minor	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			None			None					
Environmental	None			None			None					
Public safety, including life and property	None			None			Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Infrastructure and Construction Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Marine construction. Bridge design and construction. Engineering and construction of dams, levees, dikes, reservoirs, and coastal structures. Shipyard and port construction. Water, sewer, or power line planning and vegetation analysis. Pump, drain, and well placement. Stormwater modeling. Cut and fill analysis for earth-moving. Building site analysis. Road infrastructure. Infrastructure hardening or mitigation for climate change effects, e.g. sea level change.
MCA Title	Infrastructure and Construction Management
MCA ID	60301
Organization Type	State or U.S. Territorial government
Organization Name	State of New Jersey
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 28 - Telecommunications
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm			
Acceptable Vertical Error	Up to 10 cm			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			

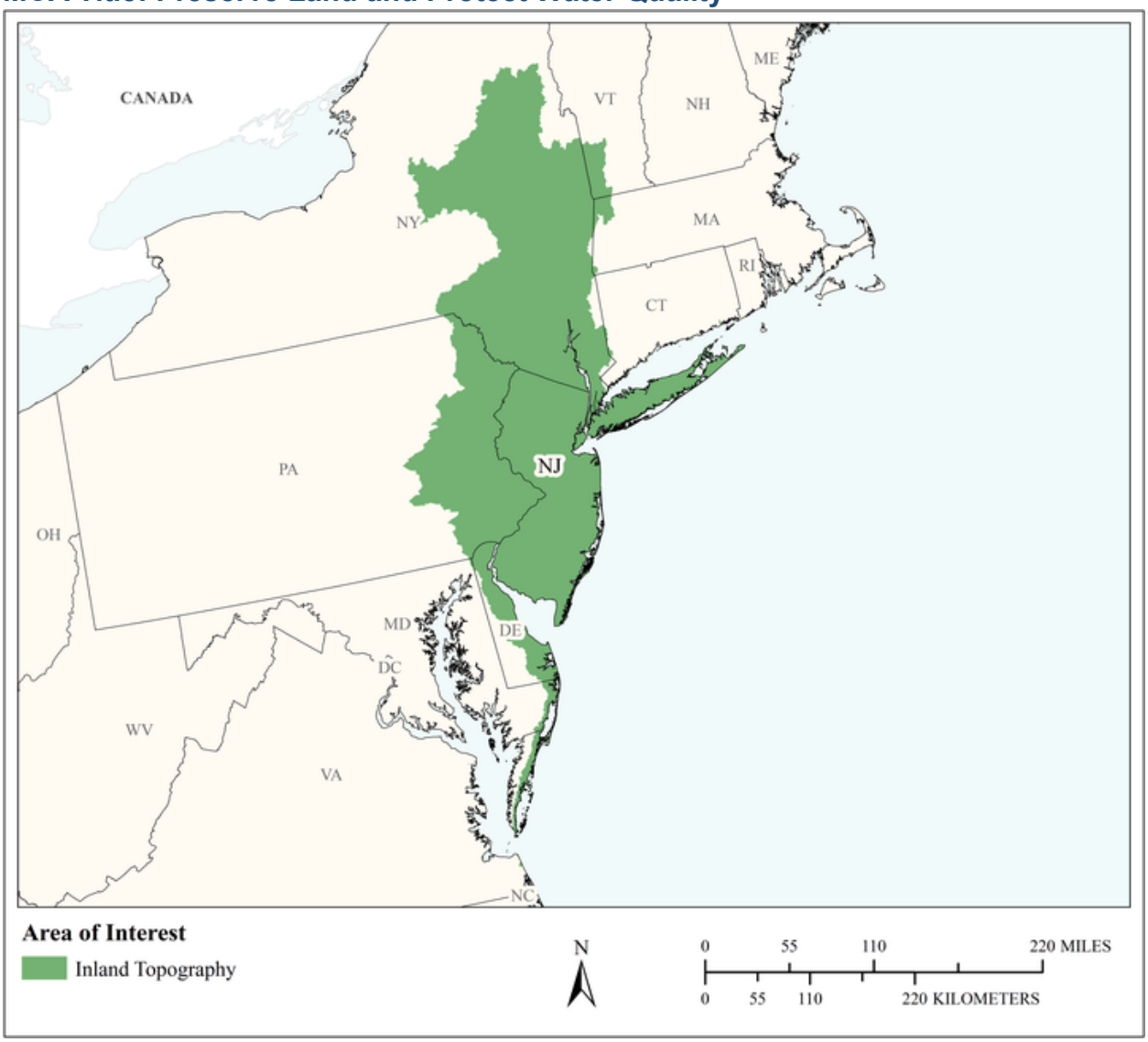
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Moderate			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$338,479									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$996,075									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Moderate											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Preserve Land and Protect Water Quality



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Preserve land and protect water quality
MCA Title	Preserve Land and Protect Water Quality
MCA ID	1154
Organization Type	Regional, County, City, or other local government
Organization Name	NJ Highlands Council
Sub-Agency or Division	
Organization Mission	Preserve Land and protect water quality
Program Name	Preserve land and protect water quality
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 01 - Water Supply and Quality
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Trees, roads, pools, depressions in earth

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Required			
Wetlands	Required			
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable			
Cultural resources	Required			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Lidar data obtained from 2006			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None			
Cost savings/cost reduction	None			
Cost avoidance	None			

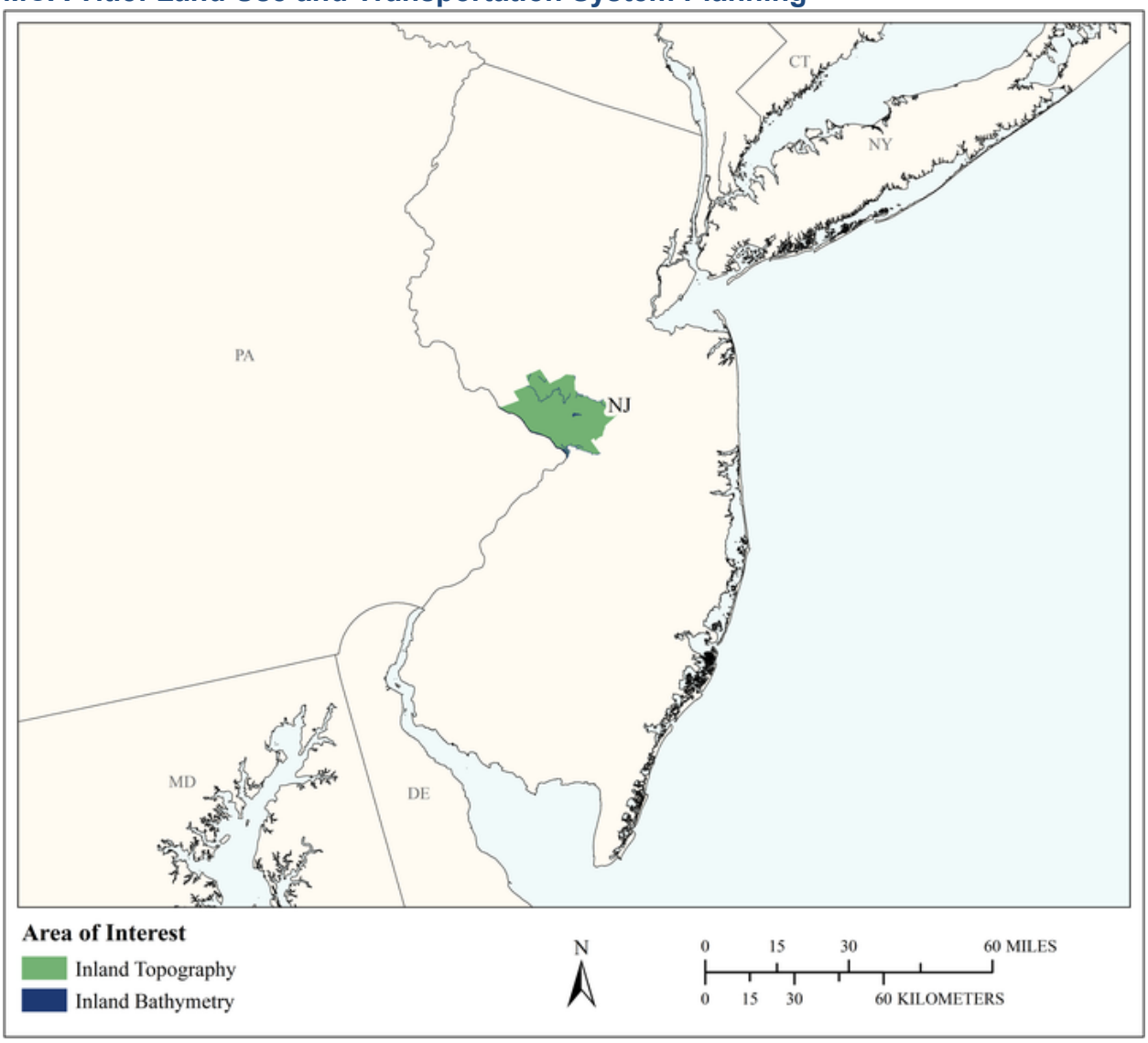
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	None			
Mission-driven performance improvements	None			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None			
Improved response or timeliness	None			
Improved customer experience	None			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Major			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide										
Cost savings/cost reduction	None											
Cost avoidance	Minor	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	None											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Land Use and Transportation System Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements	Mercer County, NJ	Mercer County, NJ		

MCA Description	Response
Mission Critical Activity	Land use and transportation system planning Highly detailed elevation data would be very helpful (more mobile than aerial lidar).
MCA Title	Land Use and Transportation System Planning
MCA ID	1393
Organization Type	Regional, County, City, or other local government
Organization Name	County of Mercer, NJ
Sub-Agency or Division	
Organization Mission	Promote the health and welfare of the residents of our territory, in cooperation with municipal (home rule) and state agencies.
Program Name	Storm water system management and enforcement
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Tertiary Business Use	BU 01 - Water Supply and Quality

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Curb break lines

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	Cross sections and/or transects meet needs		
Update Frequency	6-10 years	>10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 30 cm	Less than 50 cm		
Acceptable Vertical Error	Up to 10 cm	Less than 10 cm		
How far onshore needed				
How far down the beach profile needed	To MHW			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial	Yes		
Cross section/transect requirement	Cross sections required for stream corridors for flood analysis. If I could get better than QL2 for topography and impervious runoff analysis, I would appreciate it. QL2 is what I have.	Vertical accuracy as above. Transects every 500' would be nice (when we have nothing now).		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Nice to have			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have		
DTM	Highly desirable	Nice to have		
DEM	Required	Required		
Raw point cloud data	Required	Highly desirable		
Classified point cloud	Highly desirable	Highly desirable		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required	Highly desirable		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Nice to have		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Not required		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Highly desirable		
Bridges/culverts	Required	Nice to have		
Landmark features	Highly desirable	Not required		
Cultural resources	Highly desirable	Not required		
Coastal and riverine structures	Highly desirable	Not required		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Lidar QL2 April 2015, flown in conjunction with 12" pixel orthophoto	None, N/A		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	New Jersey Department of Environmental Protection, NJ Geographic Information Network			
Other	Yes			
Other description	MPO			
Data that meet my needs are not available		Yes		

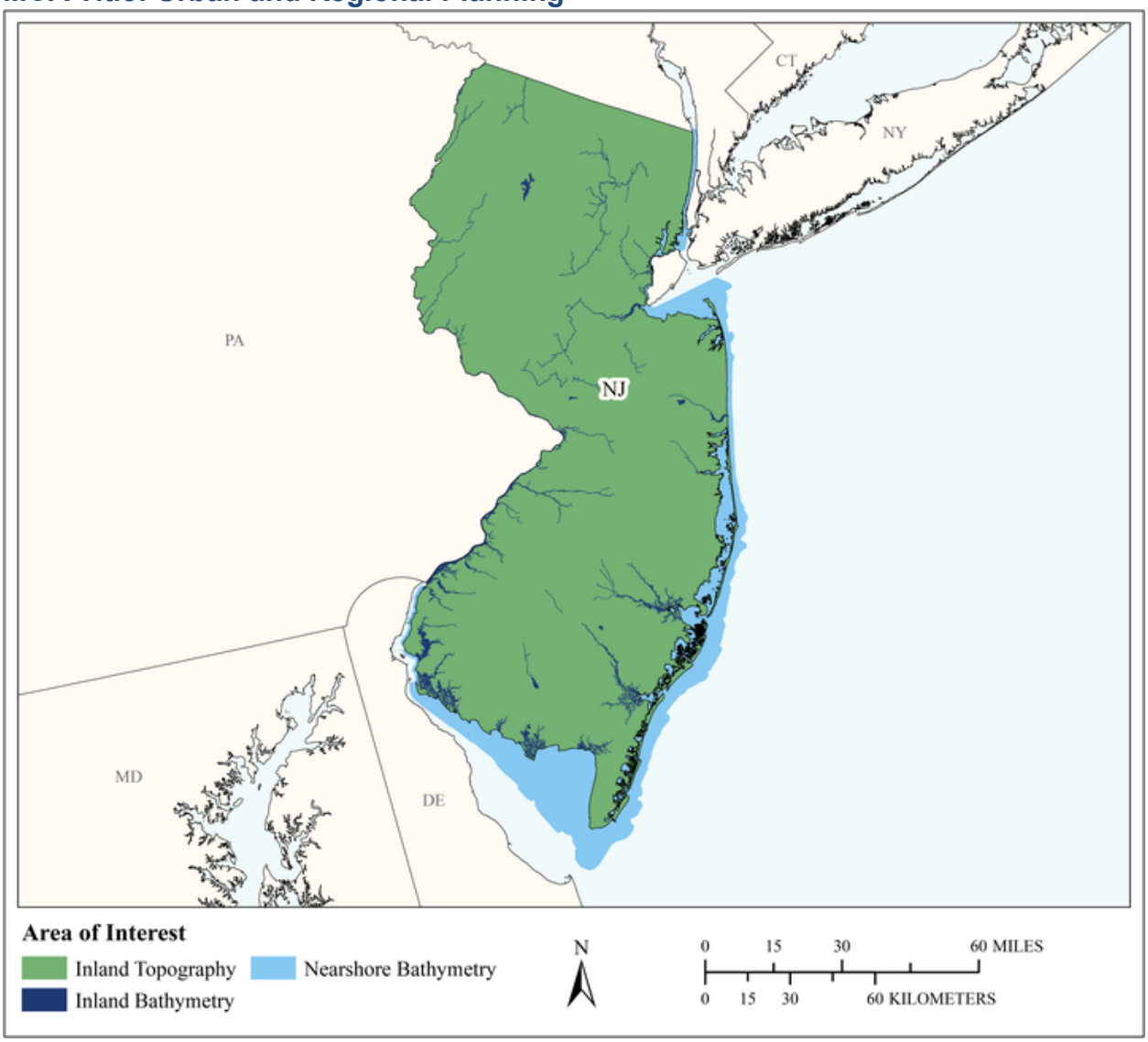
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available		
Cost savings/cost reduction	Minor	Inland bathy data not available		
Cost avoidance	Major	Inland bathy data not available		
Increased revenues	None	Inland bathy data not available		
Mission-driven performance improvements	Major	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available		
Improved response or timeliness	Major	Inland bathy data not available		
Improved customer experience	Minor	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Inland bathy data not available		
Environmental	Moderate	Inland bathy data not available		
Public safety, including life and property	Major	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$7,538	Moderate	Annual dollars saved/realized	$9,045						
Time savings description	Reduced need for field measurement and survey. Speed modeling and digital mapping.			Field inspections would be to survey to confirm digital analysis. Model flood plains and hazard areas.								
Cost savings/cost reduction	None			None								
Cost avoidance	Minor	Annual dollars saved/realized	$5,000	Minor	Unable to provide							
Cost avoidance description	Validation for what surveys we would still do. Field data post processing.											
Increased revenues	None			Major	Annual dollars saved/realized	$100,000						
Increased revenues description				This data would allow detailed analyses of flood risk.								
Mission-driven performance improvements	Minor	Annual percent improvement	7%	Moderate	Annual percent improvement	18%						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	None			Moderate	Unable to provide							
Value added to products or services description				The point of bathy data would be flood risk analysis county-wide.								
Improved response or timeliness	Minor	Annual dollars saved/realized	$5,427	Moderate	Annual dollars saved/realized	$1,508						
Improved response or timeliness description	Would require cost for analysis of new data. Validate drainage plans for site development applications.			Integrate flood data into web pre-development site analysis tool.								
Improved customer experience	Minor	Unable to provide		Moderate	Unable to provide							
Improved customer experience description	Confidence not measurable in hours or dollars.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor								
Education or outreach description	I would expect at least one conference presentation from the new data			Better communication about risks of extreme events								
Environmental	Minor			Minor								
Environmental description	Better flood control and site selection			More flood-prone areas preserved								
Public safety, including life and property	Moderate			Moderate								
Public safety, including life and property description	Data analysis may yield hazard mitigation projects			Would drive hazard mitigation projects								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Urban and Regional Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Land development and zoning. Municipal mapping of building footprints and elevations. Port resilience planning. Parks and transportation planning. Virtual city creation. Urban ecology planning.
MCA Title	Urban and Regional Planning
MCA ID	60302
Organization Type	State or U.S. Territorial government
Organization Name	State of New Jersey
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 21 - Aviation Navigation and Safety
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B	QL2B	
Update Frequency	4-5 years	6-10 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Required	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Required	Nice to have	Highly desirable	
Classified point cloud	Required	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Required	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Nice to have	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Minor	
Cost savings/cost reduction	Major	Minor	Minor	
Cost avoidance	Major	Minor	Minor	
Increased revenues	Minor	Minor	None	
Mission-driven performance improvements	Major	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Minor	

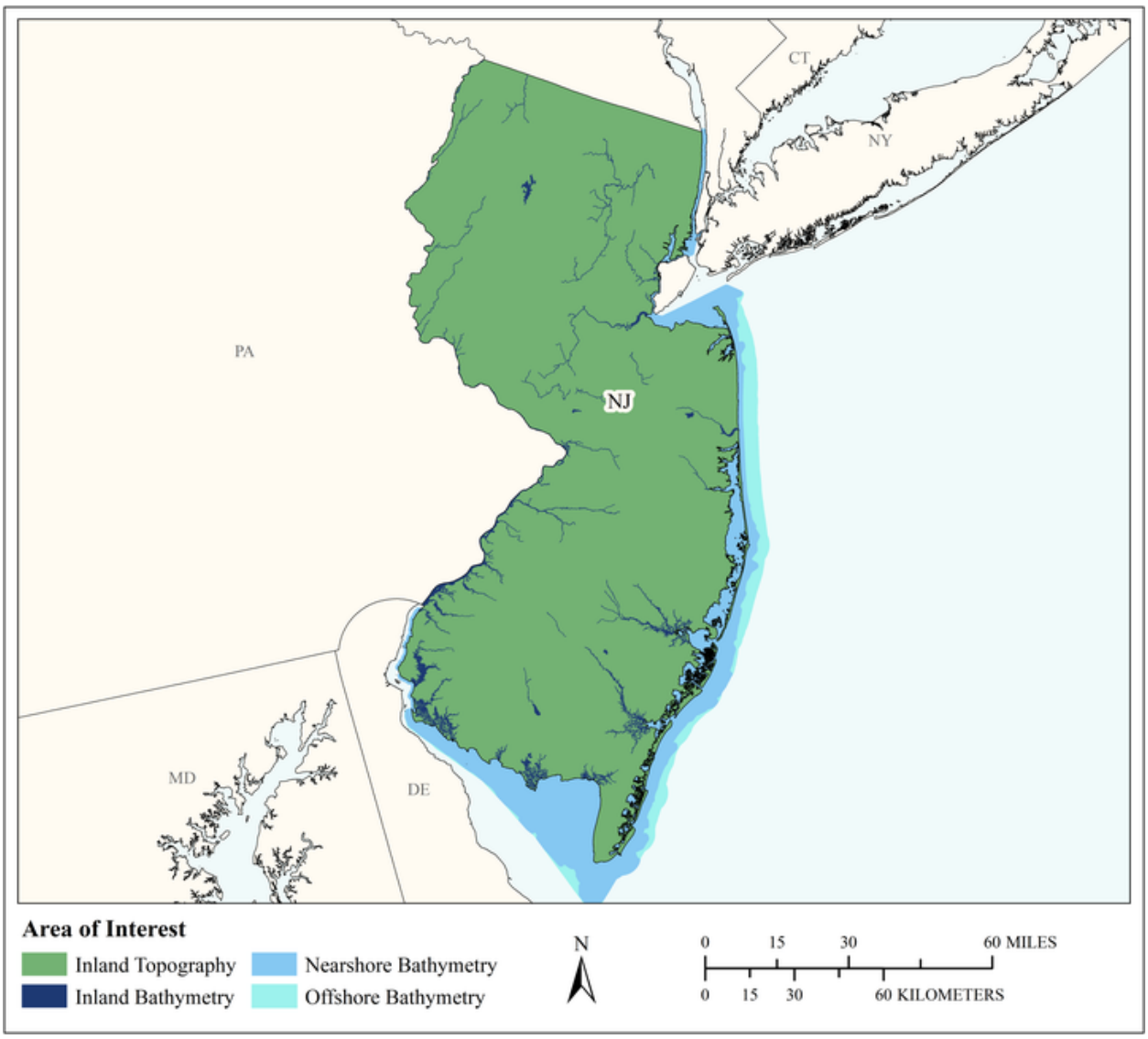
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	Minor	
Improved customer experience	Major	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	
Environmental	Major	Minor	Minor	
Public safety, including life and property	Major	Minor	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,026,525		Annual dollars saved/ realized	$82,536		Annual dollars saved/ realized	$184,365			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$233,963		Annual dollars saved/ realized	$104,416		Annual dollars saved/ realized	$194,498			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate					
Environmental	Major			Moderate			Moderate					
Public safety, including life and property	Major			Major			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	
Hillshades	Yes		Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Recreation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Beach monitoring. Planning and development of recreational facilities such as rafting, boating, swimming, diving, and fishing areas; ski slopes; and golf courses. Location- based products and services such as maps and guides. Tourism. Trail and vista site planning. Orienteering.
MCA Title	Recreation
MCA ID	60303
Organization Type	State or U.S. Territorial government
Organization Name	State of New Jersey
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 27 - Recreation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	I don't know
Update Frequency	4-5 years	4-5 years	4-5 years	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required	Highly desirable	I don't know	Not required	Not required
Entire AOI under same environmental conditions	Required	Not required	Highly desirable	I don't know	Not required	Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Nice to have	I don't know	Nice to have	Not required
DEM for entire AOI needs to be seamless	Required	Nice to have	Nice to have	I don't know	Nice to have	Not required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	I don't know
DTM	Nice to have	Highly desirable	Highly desirable	I don't know
DEM	Required	Required	Required	I don't know
Raw point cloud data	Nice to have	Nice to have	Not required	I don't know
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Nice to have	I don't know
Full waveform	Not required	Nice to have	Not required	I don't know
Bathymetric Attributed Grid (BAG)		Highly desirable	Nice to have	I don't know
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	I don't know
Tide Predictions			Nice to have	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	I don't know
Intensity imagery/sidescan imagery	Not required	Nice to have	Not required	I don't know
Ground control/ground truthing	Nice to have	Nice to have	Not required	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	I don't know
Nautical and/or navigation charts			Not required	I don't know
Acoustic imagery of the seafloor			Not required	I don't know
Aerial and/or satellite imagery	Required	Required	Not required	I don't know
Underwater videography			Not required	I don't know
Bottom texture			Nice to have	I don't know
Bottom type			Highly desirable	I don't know
Submerged features			Highly desirable	I don't know
Subbottom characteristics			Nice to have	I don't know
Geologic and seismic data	Not required	Highly desirable	Nice to have	I don't know
Water column properties - Physical			Nice to have	I don't know
Water column properties - Chemical			Nice to have	I don't know
Water column properties - Biological			Nice to have	I don't know
Currents			Nice to have	I don't know
Tide/wave heights			Nice to have	I don't know
Sea ice conditions			Not required	I don't know
Habitat distribution and classification			Highly desirable	I don't know
Boundaries			Not required	I don't know
Routes			Nice to have	I don't know
Offshore cadastral			Nice to have	I don't know
Lease areas			Nice to have	I don't know
Fixed obstructions			Highly desirable	I don't know
Floating observation/navigation systems			Highly desirable	I don't know
Shorelines – current, historic, change rates	Not required	Highly desirable	Highly desirable	
Land use/land cover	Nice to have	Highly desirable	Highly desirable	I don't know
Wetlands	Highly desirable	Highly desirable	Highly desirable	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	I don't know
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Not required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Minor	I don't know
Cost savings/cost reduction	Moderate	Minor	Minor	I don't know
Cost avoidance	Major	Minor	Minor	I don't know
Increased revenues	None	Minor	Minor	I don't know
Mission-driven performance improvements	Major	Minor	Minor	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor	Minor	I don't know

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	Minor	Minor	I don't know
Improved customer experience	Moderate	Minor	Minor	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	I don't know
Environmental	Major	Minor	Minor	I don't know
Public safety, including life and property	Major	Minor	Minor	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Increased revenues	None			Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,728		Annual dollars saved/ realized	$1,040		Annual dollars saved/ realized	$130,365			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Major			I don't know		
Environmental	Moderate			Major			Major			I don't know		
Public safety, including life and property	Moderate			Moderate			Moderate			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes		
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

New Mexico

At 121,700 square miles, New Mexico is the fifth largest state in the country in area, but with just 2,095,428 inhabitants, it ranks as 36th in population making it a largely rural state that is always maximizing its scant resources to manage its needs. The state has more than 10,000 feet in relief with a rich diversity of landforms, geologies, and ecosystems as well as some of the challenges that come with them such as large wildfires, forest mortality, habitat loss, flooding, drought, landslides, and subsidence. Being a border state, New Mexico has a rich cultural heritage. It has the highest percentage of Hispanic residents in the nation and the second highest percentage of Native American population. Each has their own traditional land use provisions and serve as major economic engines for the state which leave sizeable surface footprints such as agriculture and oil and gas production. For all of these issues, highly detailed mapping of its surface features – be it detailed, regularly acquired lidar with some supplemental bathymetry over its lakes – will aid greatly in meeting the needs of the state in managing them. Even though few lidar projects have been funded on the state or local level, this has been purely due to budgetary issues not because of need; the state's spatial data clearinghouse alone has logged some 120 terabytes of lidar data downloaded to state, regional, and local government and private entities since the 3DEP program began, but this represents only a third of the state's area.

Forest Resource and Wildland and Rural Lands Management

Approximately 12% of the state is directly managed by the U.S. Forest Service (USFS). In order to fulfill their goals in providing stewardship over their forest resources and wildlife, they have determined that Quality Level 1 (QL1) elevation data, especially over forest restoration sites, or QL2 elevation data at the minimum, needs to be acquired every 5-10 years to meet their goals. This objective will be dependent on whether a major landscape changing event occurs such as wildfire which would then require more immediate mapping acquisition. Another 44% of the state is managed by other federal, tribal, and state entities. Although they have many of the same management goals and issues as the USFS, they rarely have the budget to host their own lidar projects, nonetheless they too would benefit greatly from similar elevation data quality and delivery schedules. Even many of the private lands are rural lands with similar issues, so they are, at least indirectly, of concern to state and local entities which also lack the budgets to acquire appropriate data even though the need is very much there. Both detailed surface elevation and above ground data are needed to map such needs as wildfire risk, stand typing, canopy models, land cover, wildlife habitat, and flood risk.

Hydrology Mapping and Flood Risk Management

Though the state is largely arid, most of the state's population lies along the state's river corridors and are subject to flooding threat due to localized, episodic storms or the results of large wildfire events upstream. These river systems also supply the state's population with a majority of their water. In addition, much of the rivers' water is dedicated to agriculture use. Water that is not already allocated for use within the state is delivered to other states and countries through inter-state and international water compacts and treaties. There are a number of federal, state, and local organizations that actively manage and monitor the state's water resources. Historically, Federal Emergency Management Agency and the National Resources Conservation Service provided the elevation data needed for these activities. For flood risk mapping, regular acquisition of QL1 elevation data every 6-10 years is needed to keep flood risk maps current and to develop valid Base Level Engineering models as well as to analyze hydrologic flow nets, and to assess the current state of dams, dikes, and levees. Also, the state's Bureau of Geology and other engineering and environmental companies have used QL2 data in the past to model potential aquifers, monitor point source pollution for aquifers, and map sinkhole development. In addition, there are over 160 square miles of surface waters in reservoirs, mostly under the jurisdiction of the US Bureau of Reclamation and the U.S. Army Corps of Engineers, providing critical water storage and control structures. For these lakes,

inland bathymetry needs to be regularly acquired to determine the amount of sedimentation and the risk of dam failure.

Urban, Transportation Systems and Development Mapping

Although largely a rural state, almost 60% of its population is located within three designated Metropolitan Statistical Areas largely centered along the Rio Grande corridor. Similar to all urbanized areas in the country, these areas require regular highly detailed mapping of features such as buildings, transportation structures, and other new development. In addition, that are almost 60,000 completed wells and hundreds more are being approved each year due to oil and gas production in the mostly rural northwest and southeast quarters of the state, these areas are experiencing similar issues with the rapid development of roads and infrastructure and therefore have the same need for regular, detailed mapping of both surface elevation and above ground features. The user community is fairly large here from federal, state, regional, and local governments to many different private entities such as construction and engineering firms. At the minimum, QL2 data would be sufficient, but with stated needs of finding curbs and valve boxes, QL1 would be better and in some situations even QL0 data. As the urban situation is readily changing these areas should be covered as frequently as feasible. Some of these areas have already funded several lidar acquisitions over the last decade, and they acquire six-inch spatial resolution air photos on an every other yearly basis.

The State of New Mexico has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

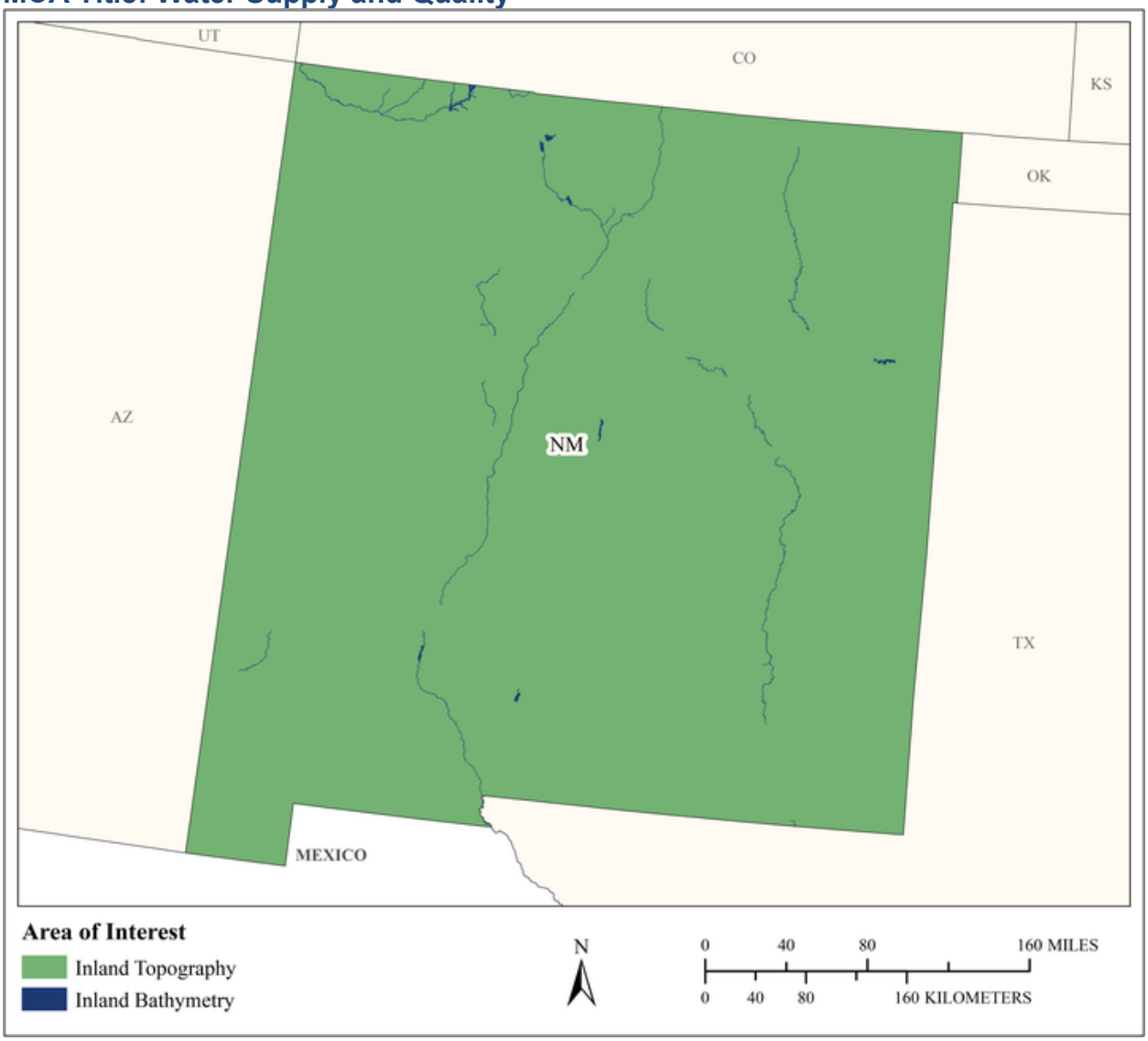
Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	State of New Mexico	60304	Water Supply and Quality	Inland Topo	QL2	4-5 years	$674,170	$180,579	Moderate	Major	Moderate
				Inland Bathy	QL1B	6-10 years	$2,916,517	$304,788	Moderate	Major	Moderate
BU 02 – Riverine Ecosystem Management	State of New Mexico	60305	Riverine Ecosystem Management	Inland Topo	QL1 HD	6-10 years	$186,109	$18,589	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$99,072	$6,985	Major	Major	Major
BU 04 – Forest Resource Management	NM USFS Region 3 (AZ, NM)	1456	Forest Management and Restoration	Inland Topo	QL1	Depends how much change to the vegetation has occurred on a landscape. Somewhere between 5 to 10 years	$63,437	$91,960	Minor	Moderate	Moderate
BU 05 – Rangeland Management	State of New Mexico	60306	Rangeland Management	Inland Topo	QL2	Annually	Unable to quantify	Unable to quantify	Minor	Major	I don't know
BU 06 – Natural Resource Management	University of New Mexico	22448	Eco-Habitat Mapping and Modeling	Inland Topo	QL1 HD	(a) Annually (b) 4-5 years	$4,769,115	$17,513,647	Moderate	Major	None
BU 07 – Wildlife and Habitat Management	State of New Mexico	60307	Wildlife and Habitat Management	Inland Topo	QL2	4-5 years	$28,963	$83,654	Moderate	Major	Moderate
				Inland Bathy	QL2B	4-5 years	$232,118	$140,302	Moderate	Moderate	Moderate
BU 08 – Agriculture	State of New Mexico	60308	Agriculture and Precision Farming	Inland Topo	QL2	2-3 years	$140,775	$111,601	Major	Major	Minor
BU 09 – Fisheries Management and Aquaculture	State of New Mexico	60309	Fisheries Management and Aquaculture	Inland Topo	QL2	2-3 years	$124,289	$269,967	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	6-10 years	$243,290	$110,731	Major	Major	Moderate
BU 10 – Geologic Assessment	NM Bureau of Geology and Mineral Resources - NM Tech	1438	Geologic Mapping and Analysis	Inland Topo	QL2	4-5 years	$25,666,436	$450,574	Moderate	Moderate	Major

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 11 – Geologic Resource Extraction	New Mexico Energy, Minerals & Natural Resources Dept. Mining & Minerals Division	1227	Permitting and Monitoring of Mining, Oil, and Gas Activities	Inland Topo	QL1	Annually	$29,701	$19,702	Major	Major	Major
BU 12 – Renewable Energy Resources	State of New Mexico	60310	Renewable Energy Resources	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	None
BU 13 – Oil and Gas Resources	State of New Mexico	60311	Oil and Gas Resources	Inland Topo	QL1	Annually	$53,368	Unable to quantify	Minor	Major	Major
BU 14 – Cultural Resource Management	State of New Mexico	60312	Cultural Resources Preservation and Management	Inland Topo	QL1	4-5 years	$22,286	$19,485	Minor	Minor	Minor
BU 15 – Flood Risk Management	Town of Taos	1089	Flood Risk Modeling and Mapping of Riverine Areas	Inland Topo	QL2	4-5 years	$15,618	$121,447	Major	Minor	Major
				Inland Bathy	Cross sections and/or transects meet needs	6-10 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 15 – Flood Risk Management	Earth Data Analysis Center - UNM	1364	Flood Risk Modeling, Mapping, and Mitigation	Inland Topo	QL1	6-10 years	Unable to quantify	$57,888	Major	Major	Major
				Inland Bathy	QL2B	6-10 years	Unable to quantify	Unable to quantify	Minor	Moderate	Moderate
BU 17 – Wildfire Management	State of NM Energy, Minerals and Natural Resources Department	1245	New Mexico Forest Management	Inland Topo	QL1	4-5 years	$653,285	Unable to quantify	I don't know	I don't know	I don't know
BU 18 – Homeland Security	State of New Mexico	60313	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management	Inland Topo	QL2	4-5 years	$3,586,927	$63,397	Major	Moderate	Major
BU 19 – Land Navigation	State of New Mexico	60314	Land Navigation and Safety	Inland Topo	QL0	2-3 years	$1,575,123	$127,199	Minor	Major	Major

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 21 – Aviation Navigation	State of New Mexico	60315	Aviation Navigation and Safety	Inland Topo	QL1 HD	Annually	$411,040	$511,937	Minor	Moderate	Moderate
BU 22 – Infrastructure Management	Bohannan Huston, Inc.	1400	Civil Engineering and Spatial Data Development	Inland Topo	QL2	6-10 years	$5,464,225	$16,080,115	I don't know	I don't know	I don't know
BU 26 – Education and Basic Research	State of New Mexico	60316	Education K12 and Beyond, Basic Research	Inland Topo	QL1 HD	2-3 years	$638,970	$1,527,324	Major	Major	Major
BU 27 – Recreation	State of New Mexico	60317	Recreation	Inland Topo	QL1	4-5 years	$27,900	Unable to quantify	Moderate	Moderate	Moderate
BU 28 – Telecom-munications	State of New Mexico	60318	Telecommunications	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

MCA Title: Water Supply and Quality



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Fate and transport of contaminants. Pollution risk mitigation. Runoff and sedimentation analyses. Point- or non-point source pollution modeling. Management of contaminants and marine debris - point, non-point, vessel, and atmospheric pollution; spills; trash.
MCA Title	Water Supply and Quality
MCA ID	60304
Organization Type	State or U.S. Territorial government
Organization Name	State of New Mexico
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B		
Update Frequency	4-5 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Required			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Highly desirable	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	Major	Minor		
Increased revenues	Minor	None		
Mission-driven performance improvements	Major	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		

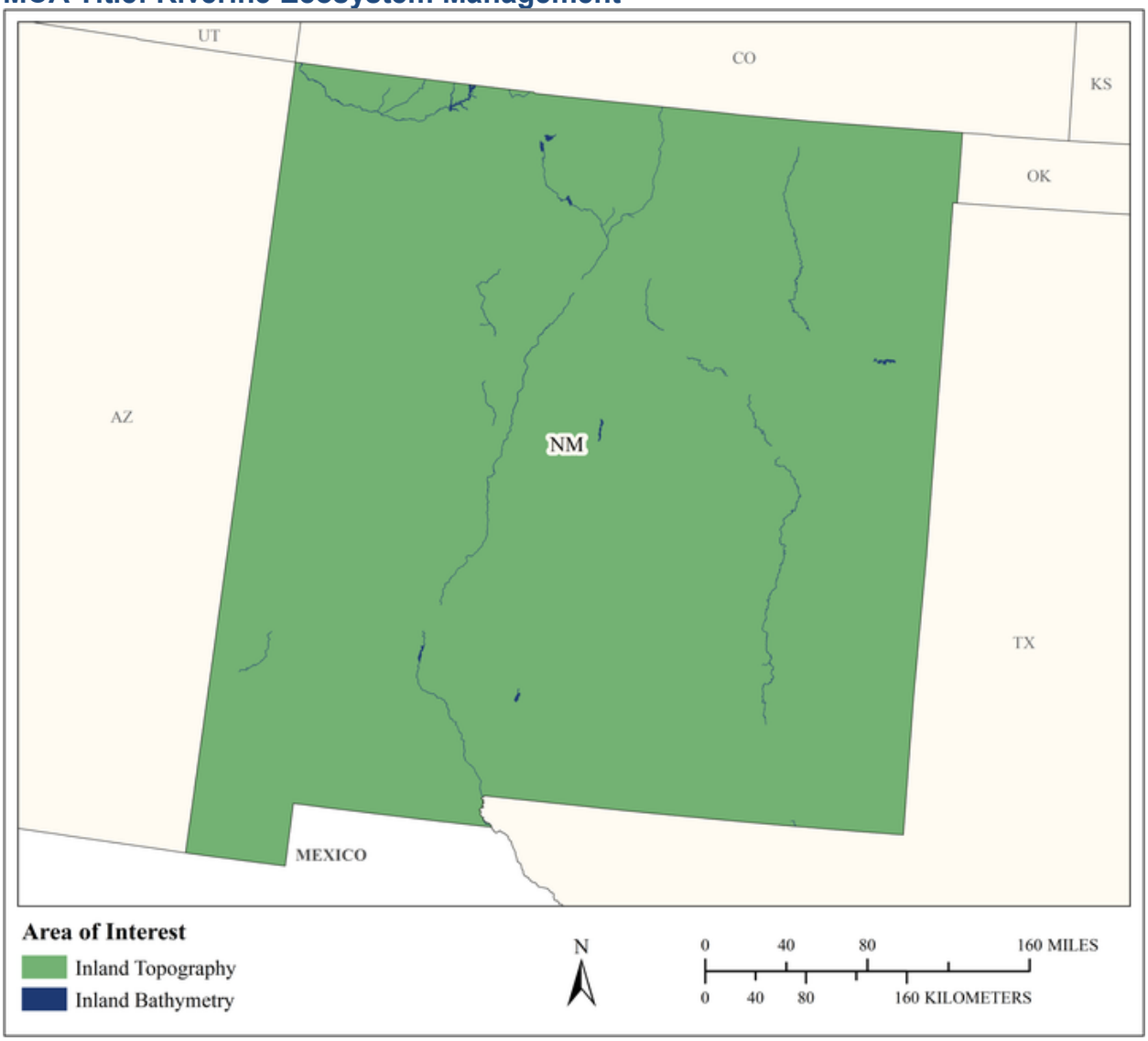
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor		
Improved customer experience	Major	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor		
Environmental	Major	Moderate		
Public safety, including life and property	Major	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$674,170		Annual dollars saved/ realized	$2,916,517						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide							
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$180,579		Annual dollars saved/ realized	$304,788						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate								
Environmental	Major			Major								
Public safety, including life and property	Moderate			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Riverine Ecosystem Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Stream channel analysis and mapping. Stream bank erosion analysis. Aquatic and terrestrial species habitat management. Environmental management.
MCA Title	Riverine Ecosystem Management
MCA ID	60305
Organization Type	State or U.S. Territorial government
Organization Name	State of New Mexico
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B		
Update Frequency	6-10 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Required			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Required	Highly desirable		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Highly desirable	Nice to have		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Moderate	Minor		
Cost avoidance	Moderate	None		
Increased revenues	None	None		
Mission-driven performance improvements	Major	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		

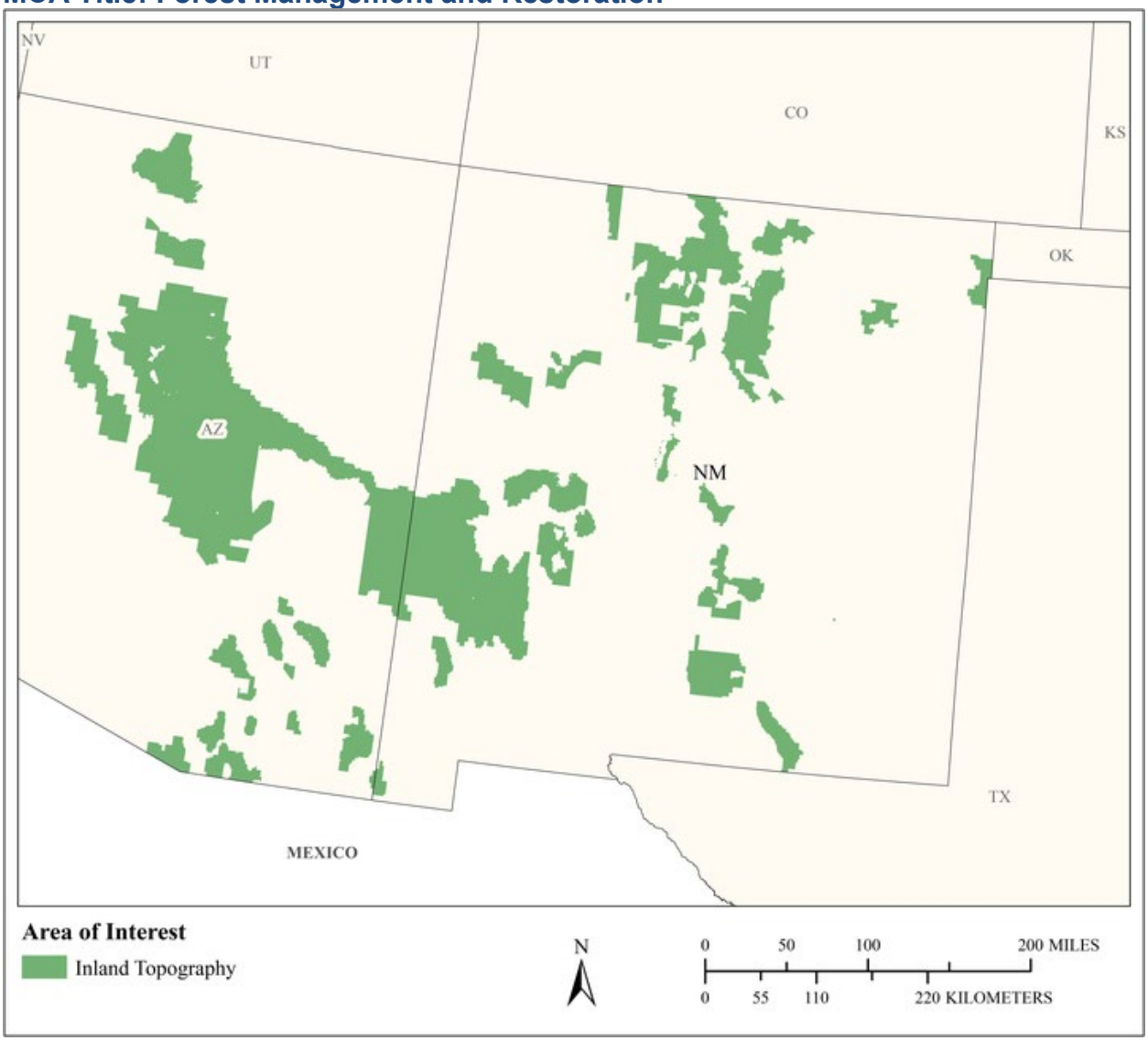
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Moderate		
Improved customer experience	Major	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate		
Environmental	Major	Major		
Public safety, including life and property	Major	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$186,109		Annual dollars saved/ realized	$99,072						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$18,589		Annual dollars saved/ realized	$6,985						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Major			Major								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Forest Management and Restoration



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Custom description			
Sub Area Requirements	Forest Service lands in New Mexico and Arizona			

MCA Description	Response
Mission Critical Activity	Characterization of forest vegetative structure in terms of height, size and density, standing inventory for planning and implementation of forest restoration treatments. Wildfire management.
MCA Title	Forest Management and Restoration
MCA ID	1456
Organization Type	Federal Agencies and Commissions
Organization Name	NM USFS Region 3 (AZ, NM)
Sub-Agency or Division	Southwestern Region
Organization Mission	To sustain the health, diversity, and productivity of the Nation's forests and grasslands to meet the needs of present and future generations
Program Name	Forest restoration
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	BU 17 - Wildfire Management, Planning, and Response
Tertiary Business Use	BU 07 - Wildlife and Habitat Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Individual trees so that we can accurately characterize vertical and horizontal distribution of vegetation and segmentation of the point cloud to identify individual tree crowns

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	Depends how much change to the vegetation has occurred on a landscape. Somewhere between 5 to 10 years			
Event type(s)				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI	QL1 data is necessary in areas and vegetation types where we have active forest restoration treatments or are planning them. Outside of these areas QL2 data should suffice.			
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Nice to have			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We have a mix of QL1 lidar collected for Forest Service specific acquisitions and QL2 data collected by USGS/FEMA/NRCS and local counties. Acquisitions are from 2012 to the present.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	NM RGIS, other states as well			

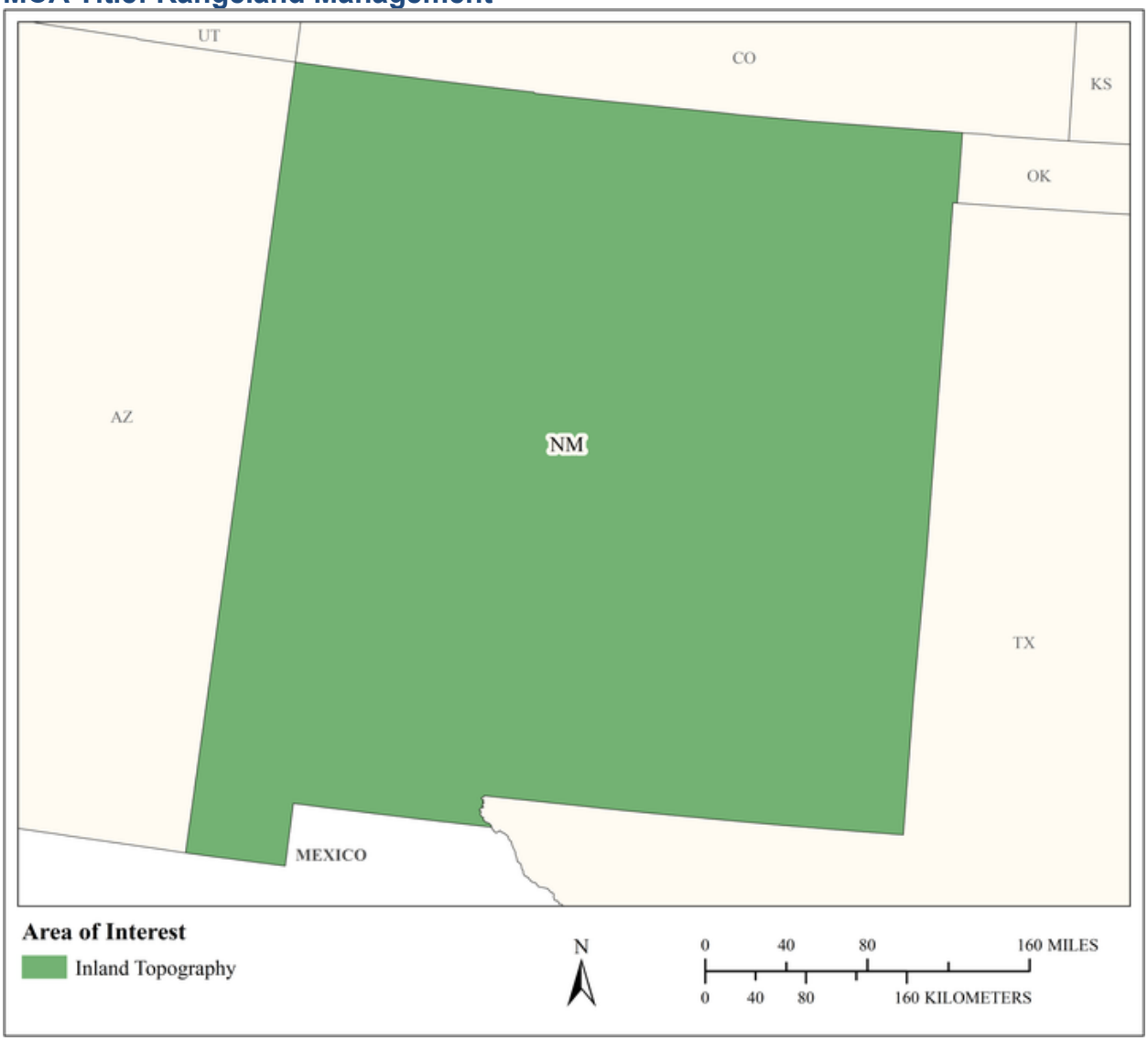
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other	Yes			
Other description	Get copies of data from federal and state partner agencies,			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Moderate			
Cost avoidance	Minor			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor			
Improved response or timeliness	Minor			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost savings/cost reduction description	If FS did not have to pay for QL1 lidar that would be a big savings with a large payoff.											
Cost avoidance	Moderate	Unable to provide										
Cost avoidance description	Restoration treatments supported by lidar could reduce impact of wildfires in the long term if applied over a large enough area.											
Increased revenues	Moderate	Unable to provide										
Increased revenues description	Forest restoration treatments typically do not generate much revenue since the products removed are mostly low value.											
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$63,437									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$91,960									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Moderate											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Rangeland Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Assessment of rangeland health. Mapping for soil erosion potential due to grazing.
MCA Title	Rangeland Management
MCA ID	60306
Organization Type	State or U.S. Territorial government
Organization Name	State of New Mexico
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 05 - Rangeland Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Highly desirable			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Not required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None			
Cost savings/cost reduction	None			
Cost avoidance	None			
Increased revenues	None			
Mission-driven performance improvements	None			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None			

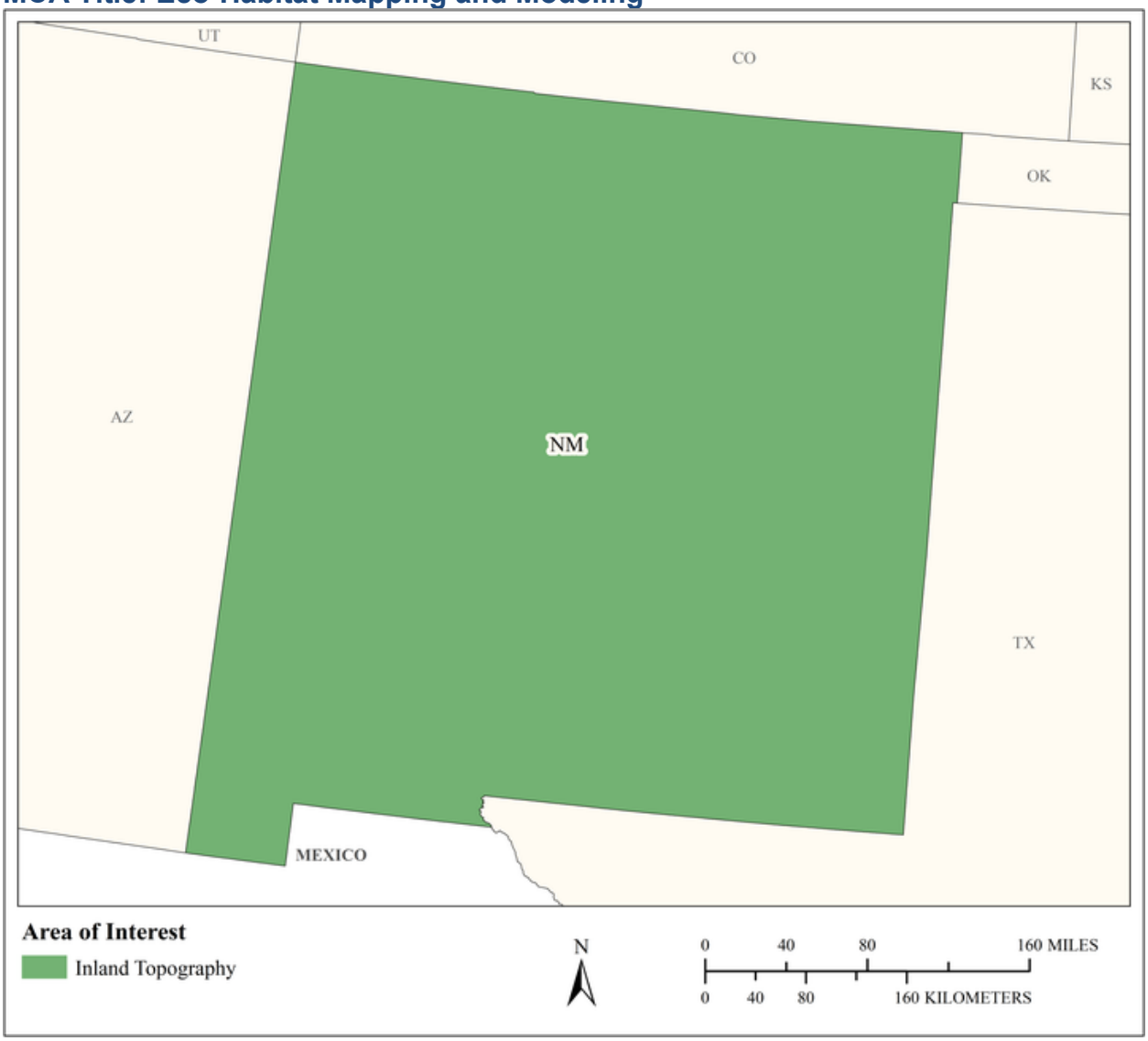
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	None			
Improved customer experience	None			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	None			
Public safety, including life and property	None			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	None											
Cost avoidance	Minor	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Eco-Habitat Mapping and Modeling



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Area split by varying quality level or update frequency			
Sub Area Requirements	New Mexico			

MCA Description	Response
Mission Critical Activity	Developing vegetation/habitat maps and species distribution models. Elevation and vegetation data are used to model critical habitats; tree canopy is an important component. The goal is to track endangered, threatened, and candidate fungi, animals, birds, and plants.
MCA Title	Eco-Habitat Mapping and Modeling
MCA ID	22448
Organization Type	Academic or Not-for-Profit
Organization Name	University of New Mexico
Sub-Agency or Division	
Organization Mission	We provide current scientific information, research, and education on the conservation of New Mexico biota and natural resources to government, business, land managers, scientists, and the public
Program Name	Natural Heritage New Mexico
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	BU 02 - Riverine Ecosystem Management
Tertiary Business Use	BU 07 - Wildlife and Habitat Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Trees and shrubs (grass bunches if possible)

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	(a) Annually (b) 4-5 years and certain events.			
Event type(s)	Tree die-off			
Quality Level and/or update frequency variability across AOI	Annually for riverine ecosystems; 2-5 years for upland depending on events such as tree die-off			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Horizontal Error	Up to 50 cm			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial			
Cross section/transect requirement	Stream/river cross section at 10 cm or less resolution 1-foot spacing			

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Best available, 10m DEM, available lidar, NAIP, satellite imagery			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	NM RGIS			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Moderate			
Cost avoidance	Major			
Increased revenues	Moderate			
Mission-driven performance improvements	Major			

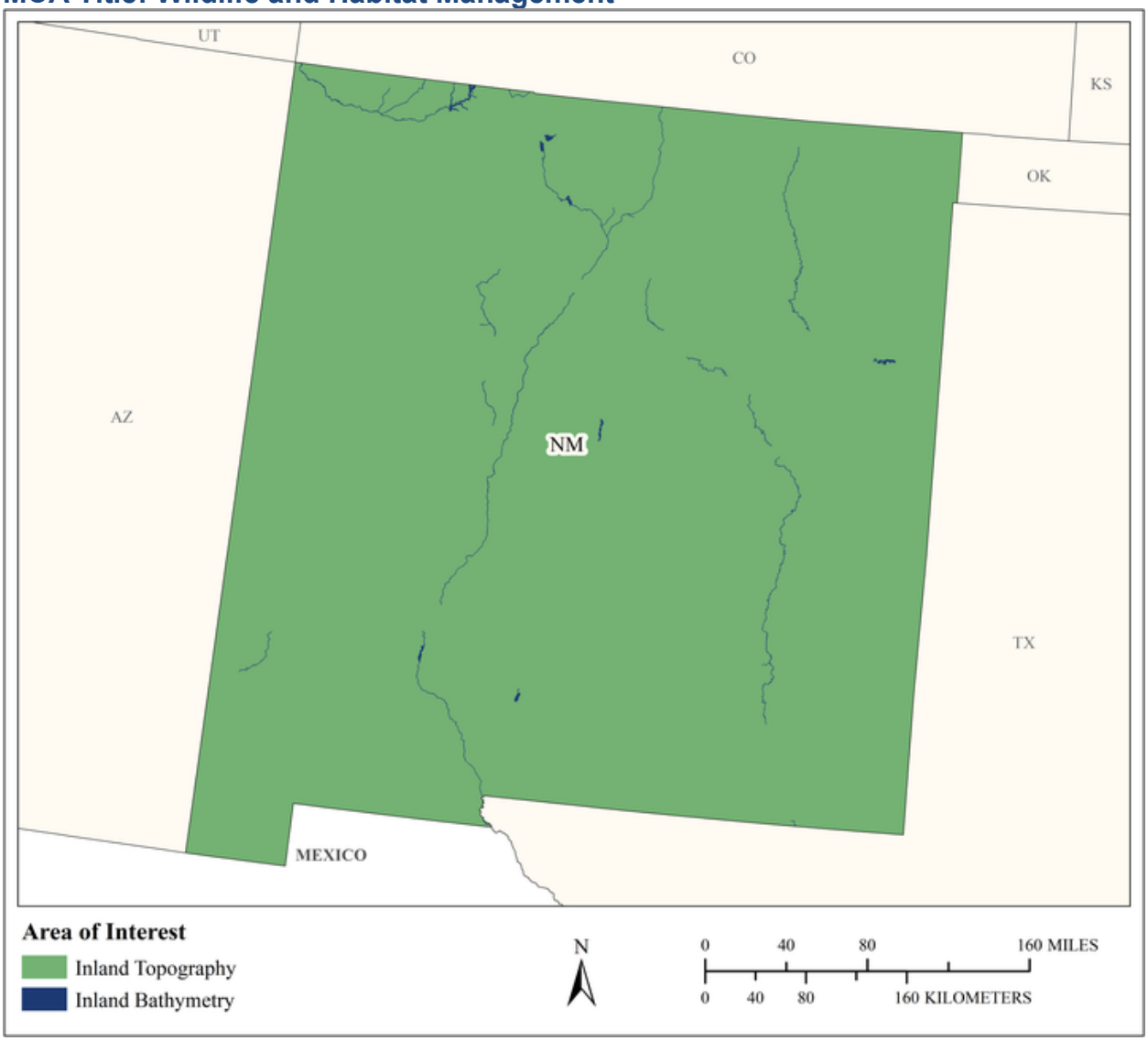
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Other operational benefits	Major	Unable to provide										
Other operational benefits description	A major element in our program is to map natural resources.											
Future annual operational benefits added during validation		Annual dollars saved/ realized	$4,769,115									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$17,513,647									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Major											
Public safety, including life and property	None											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Wildlife and Habitat Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation planning for wildlife refuges and marine sanctuaries. Conservation of critical habitats. Management of diverse migratory bird habitats, coral reef and coral communities, marine mammals, protected fish species, and trust resources.
MCA Title	Wildlife and Habitat Management
MCA ID	60307
Organization Type	State or U.S. Territorial government
Organization Name	State of New Mexico
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Highly desirable	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Nice to have		
Classified point cloud	Highly desirable	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Highly desirable		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Nice to have	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	Major	Minor		
Increased revenues	None	Minor		
Mission-driven performance improvements	Moderate	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate		

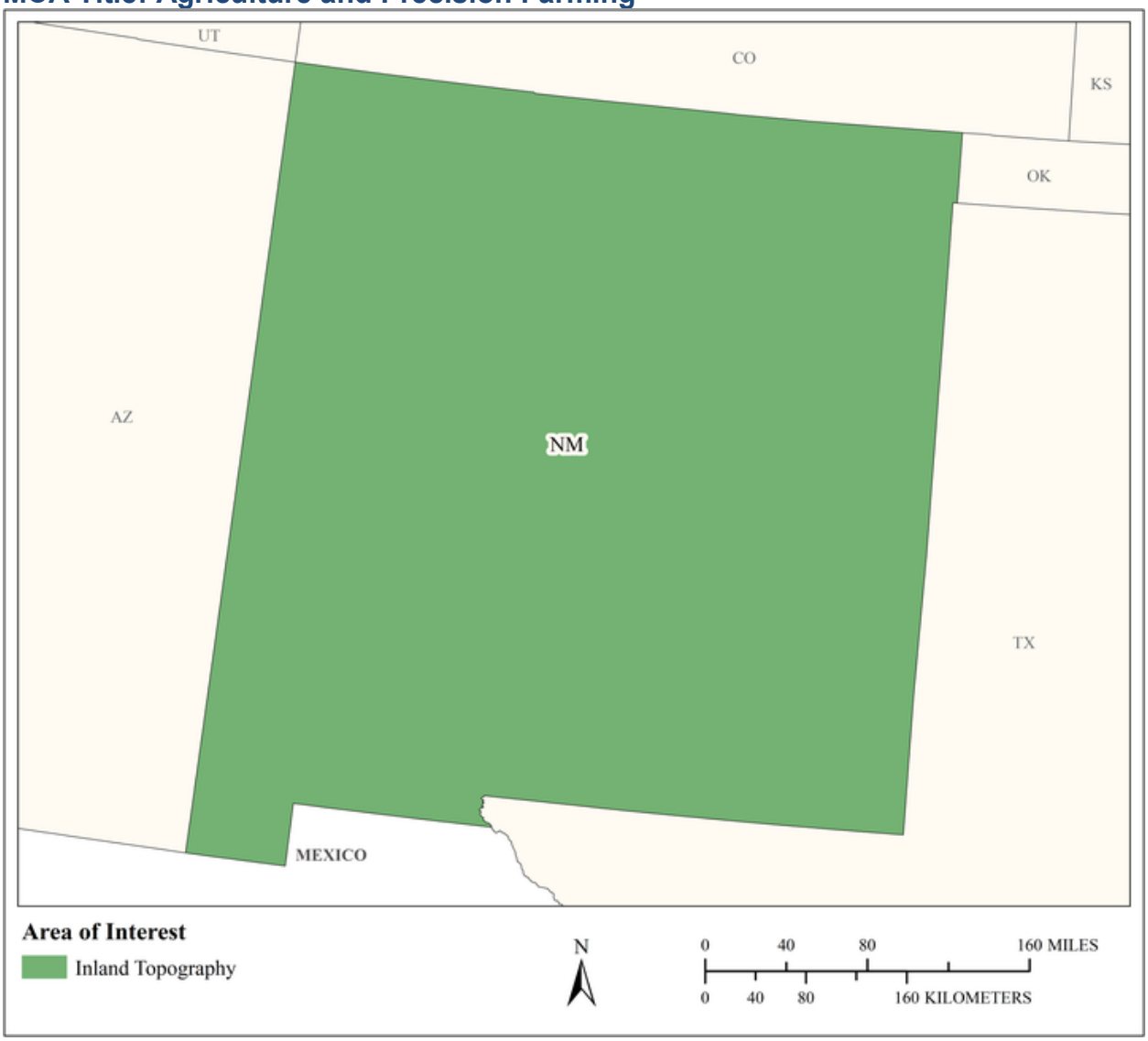
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Minor	Minor		
Improved customer experience	Minor	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Moderate		
Environmental	Moderate	Moderate		
Public safety, including life and property	Minor	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$28,963		Annual dollars saved/ realized	$232,118						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide							
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$83,654		Annual dollars saved/ realized	$140,302						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate								
Environmental	Major			Moderate								
Public safety, including life and property	Moderate			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Agriculture and Precision Farming



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Farm pond design. Irrigation system design. Detailed site analysis to support precision farming. Analysis of farm sedimentation and runoff. Calibration of fertilizer application, fertilizer management, and irrigation planning. Optimized terraforming.
MCA Title	Agriculture and Precision Farming
MCA ID	60308
Organization Type	State or U.S. Territorial government
Organization Name	State of New Mexico
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 08 - Agriculture and Precision Farming
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

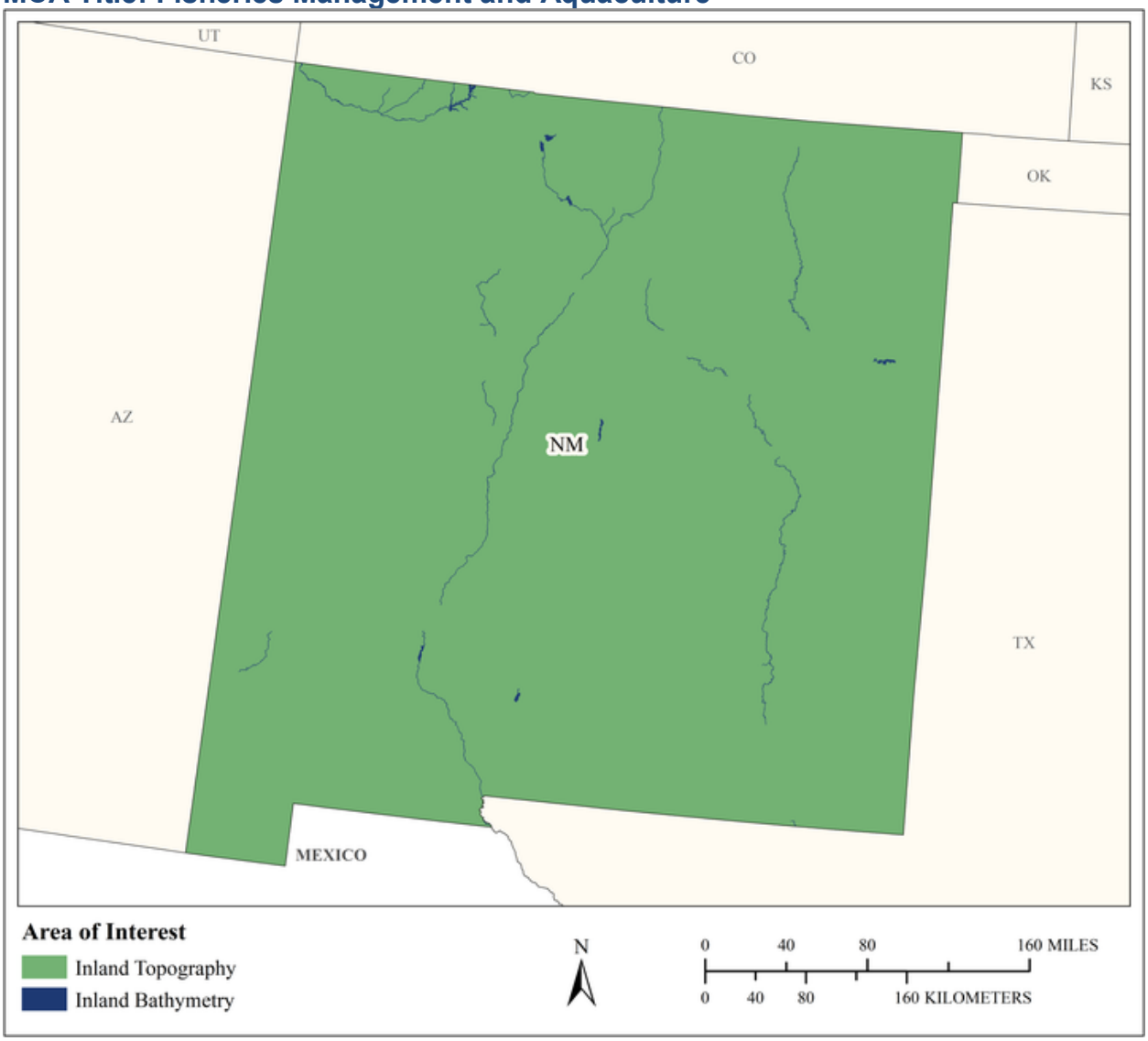
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$140,775									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$111,601									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Minor											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Fisheries Management and Aquaculture



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Management of fisheries. Sustainable aquaculture.
MCA Title	Fisheries Management and Aquaculture
MCA ID	60309
Organization Type	State or U.S. Territorial government
Organization Name	State of New Mexico
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B		
Update Frequency	2-3 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Required	
Entire AOI under same environmental conditions	Required	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Required	
DEM for entire AOI needs to be seamless	Required	Required			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Nice to have		
Classified point cloud	Highly desirable	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Nice to have		
Ground control/ground truthing	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required	Highly desirable		
Land use/land cover	Required	Highly desirable		
Wetlands	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Required	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Moderate		
Cost avoidance	Moderate	Moderate		
Increased revenues	Moderate	Moderate		
Mission-driven performance improvements	Major	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		

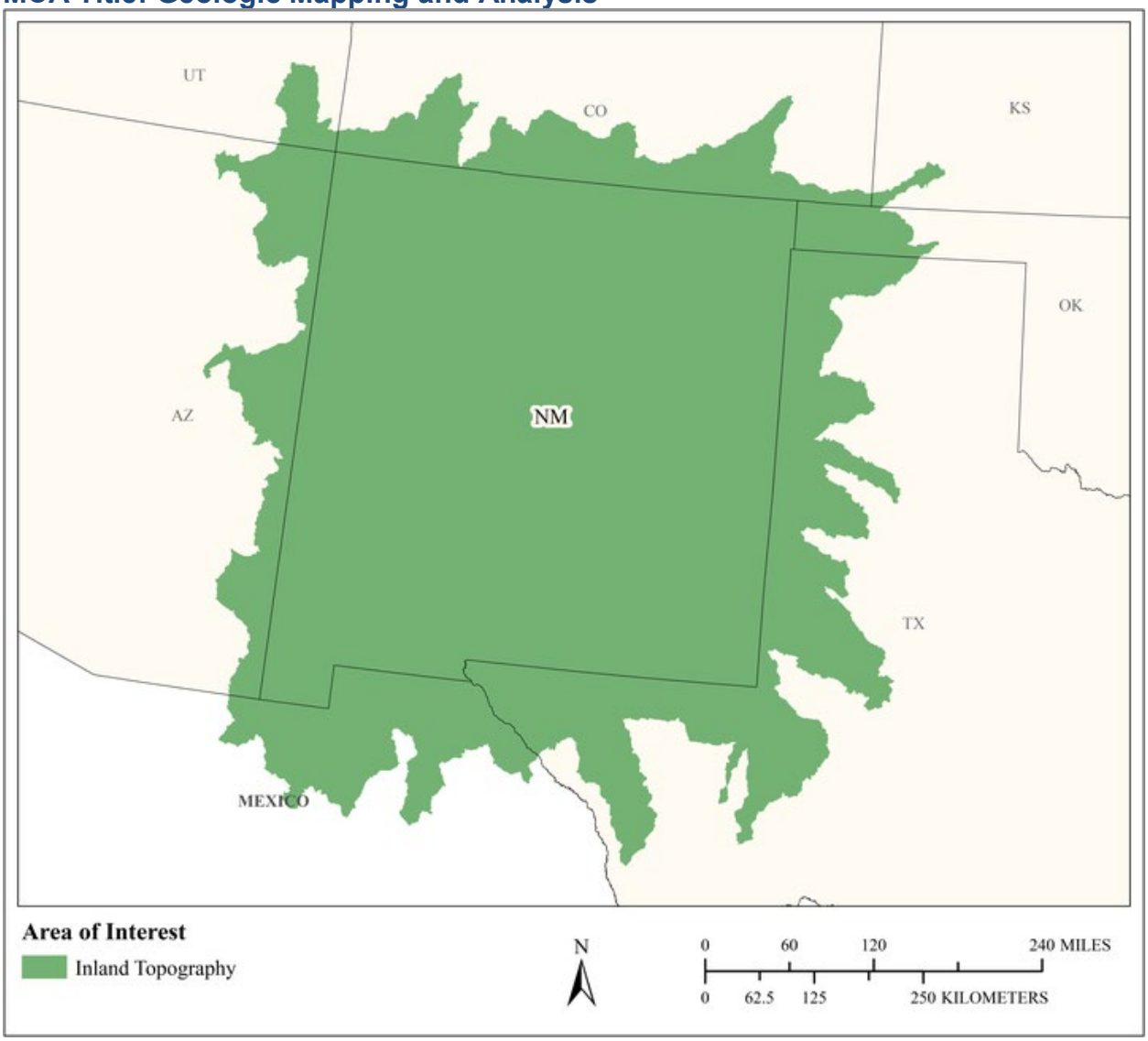
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major		
Improved customer experience	Moderate	Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor		
Environmental	Major	Moderate		
Public safety, including life and property	Moderate	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		None								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$124,289		Annual dollars saved/ realized	$243,290						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$269,967		Annual dollars saved/ realized	$110,731						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major								
Environmental	Moderate			Major								
Public safety, including life and property	Moderate			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic Mapping and Analysis



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more Hydrologic Units (HUC8s)			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Geologic mapping and analysis. Geologic mapping of formations and structures that represent the geologic history of the state. Geologic mapping helps us better define and describe aquifer bearing formations and structures that may partition groundwater resources. Mapping of geologic hazards such as sinkhole mapping, monitoring, and analysis. Identification of geomorphologic units. Landslide hazard mapping and assessment. Karst mapping, including springs and caves. Aquifer recharge.
MCA Title	Geologic Mapping and Analysis
MCA ID	1438
Organization Type	State or U.S. Territorial government
Organization Name	NM Bureau of Geology and Mineral Resources - NM Tech
Sub-Agency or Division	
Organization Mission	Conduct research and interact with State and Federal agencies and industry to facilitate prudent exploitation of the state's geological resources. Distribute accurate information to scientists, decision makers, and the New Mexico public regarding the state's geologic infrastructure, mineral and energy resources, and geohydrology (including water quantity and quality). Create accurate, up-to-date maps of the state's geology and resource potential. Provide timely information on potential geologic hazards, including earthquakes, volcanic events, soils-and subsidence-related problems, and flooding. Act as a repository for cores, well cuttings and a wide variety of geological data. Provide convenient physical and internet access for New Mexicans to such resources. Provide public education and outreach through college teaching and advising, a Mineral Museum, and teacher- and student-training programs. Our staff serve on a number of boards and commissions within the state and the region concerned with various geoscience-related issues.
Program Name	National Cooperative Geologic Mapping Program
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 11 - Geologic Resource Mining and Extraction
Tertiary Business Use	BU 13 - Oil and Gas Resources

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)

General Geographic Area and Size	
Description of smallest 3D features	Some hazards have minimal surficial expression. High resolution data greatly enhances our ability to identify subtle surficial features. For example, small expression sinkholes or small rockfall features.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years and certain events.			
Event type(s)	Volcanic eruptions, sinkholes, mining contamination of rivers, etc.			
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Not required			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Mixture of the 10m national elevation dataset, INSAR (nominally 4m) and locally QL2 Lidar.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	NM RGIS | New Mexico Resource Geographic Information System			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Minor			
Cost avoidance	Minor			

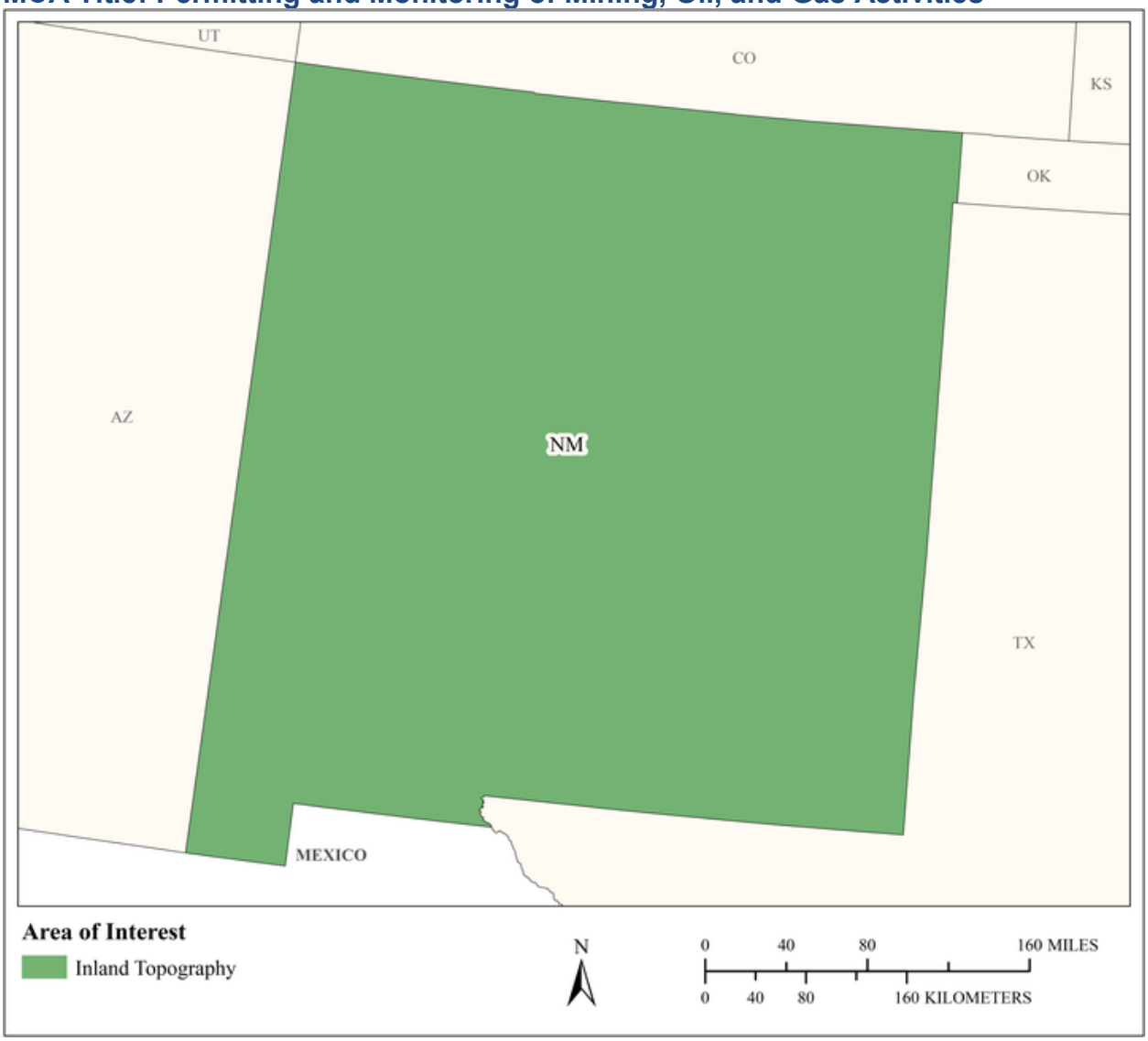
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Minor			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Other operational benefits	Major	Unable to provide										
Other operational benefits description	Fundamental data will improve our capabilities in core mission areas.											
Future annual operational benefits added during validation		Annual dollars saved/ realized	$25,666,436									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Other customer service benefits	Major	Unable to provide										
Other customer service benefits description	Better data results in much better analysis, i.e. geohazards.											
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$450,574									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Education or outreach description	Better elevation data enhances our geoscience analysis and the products we produce for the general public											
Environmental	Moderate											
Public safety, including life and property	Major											
Public safety, including life and property description	Geohazards in NM are still under appreciated, until disaster hits. We would greatly improve our understanding of the risks to the public with much better elevation data.											
Other	Many of our core mission areas would be enhanced through better elevation data and we would likely find new ways to use the data to the state's benefit.											
Other benefits	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Permitting and Monitoring of Mining, Oil, and Gas Activities



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Reclamation of post-mining activity; identify, inventory, safeguard and reclaim (pre-1977) abandoned mines that present a public safety hazard or environmental detriment; regulate, inspect and enforce reclamation and permit rules on all coal mines not on Native American reservations; regulate, inspect and enforce reclamation and permit rules on all hard rock or minerals mines (excluding aggregate, coal and potash mines).
MCA Title	Permitting and Monitoring of Mining, Oil, and Gas Activities
MCA ID	1227
Organization Type	State or U.S. Territorial government
Organization Name	New Mexico Energy, Minerals & Natural Resources Dept. Mining & Minerals Division
Sub-Agency or Division	
Organization Mission	The New Mexico Energy, Minerals & Natural Resources Departments Mining and Minerals Division's mission is to ensure the responsible utilization, conservation, reclamation and safeguarding of land and resources affected by mining.
Program Name	Mining and Minerals Division consists of four programs that all support the Division's Mission Critical Activity: Abandoned Mine Land Program, Coal Mine Reclamation Program, Mine Registration and Reporting Program, and Mining Act Reclamation Program. Note that the possible secondary and tertiary business uses are directly related to reclamation (revegetation, conservation of wildlife that use the reclamation habitat and wildlife friendly safeguarding construction, avoidance of cultural resources so as to not to disturb).
Total Annual Program Budget	
Primary Business Use	BU 11 - Geologic Resource Mining and Extraction
Secondary Business Use	BU 06 - Natural Resources Conservation
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Mine openings (adits, shafts, pits), patches of vegetation, rock waste and borrow piles, stream banks and drainage affected by waste piles and other mining disturbances, erosion features.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	Annually and certain events.			
Event type(s)	Event driven for active mining - can be done using drones			
Quality Level and/or update frequency variability across AOI	Reclamation, reveg/erosion monitoring, and flooding impacts progress needs more frequent data than baseline inventories			
Acceptable Horizontal Error	Up to 60 cm			
Acceptable Vertical Error	Up to 30 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	LiDAR flown for regions in NM. USGS 3DEP. Santa Fe County. 2014.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	NM Resource Geographic Information System (NM RGIS).			
Other	Yes			
Other description	Esri			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			

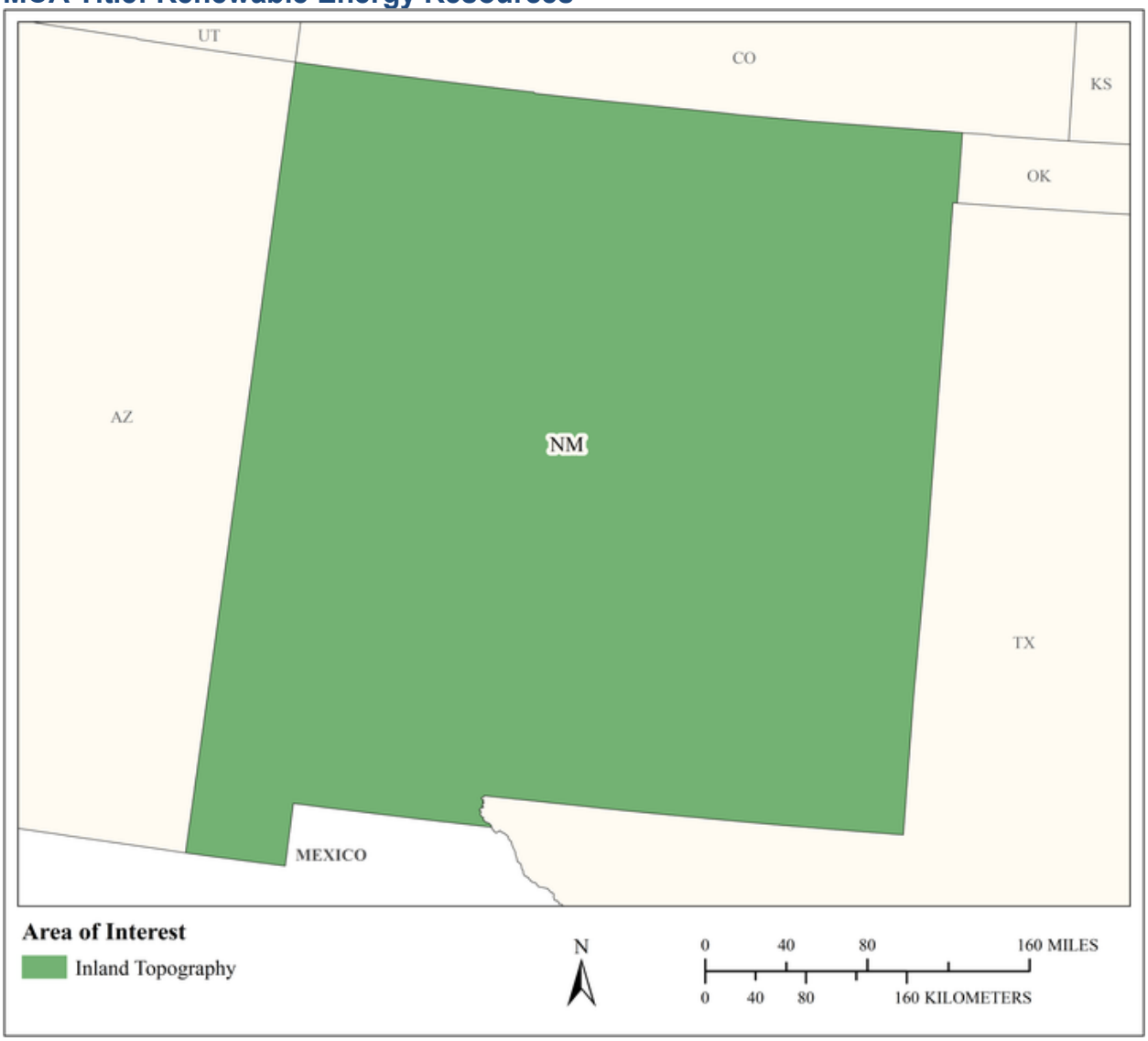
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost avoidance	I don't know			
Increased revenues	I don't know			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Time savings description	Still need field visits but will make visits more productive.											
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Cost avoidance description	Mines and abandoned mines can be hazardous to visit.											
Increased revenues	I don't know	Unable to provide										
Increased revenues description	Not applicable, we are state government.											
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$29,701									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved response or timeliness description	Mine / structure failure.											
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$19,702									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Education or outreach description	Explanation of our work, visibility analysis to show impacts											
Environmental	Major											
Environmental description	More efficient monitoring											
Public safety, including life and property	Major											
Public safety, including life and property description	Predict hazard zones											
Other	Communication											
Other benefits	Major											
Other description	Better tools for communicating with the public											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Renewable Energy Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Alternate energy development – solar, tidal, wind, wave, and ocean current. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Low head power potential for hydropower.
MCA Title	Renewable Energy Resources
MCA ID	60310
Organization Type	State or U.S. Territorial government
Organization Name	State of New Mexico
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Not required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Minor			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Minor			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	None											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Oil and Gas Resources

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Oil and gas exploration and production. Pipeline and route selection. Facility siting to mitigate geologic hazards. Construction planning. Environmental impact assessment and mitigation. Regulatory compliance.
MCA Title	Oil and Gas Resources
MCA ID	60311
Organization Type	State or U.S. Territorial government
Organization Name	State of New Mexico
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 13 - Oil and Gas Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to triple the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Nice to have			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Minor			
Cost avoidance	Minor			
Increased revenues	None			
Mission-driven performance improvements	Minor			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

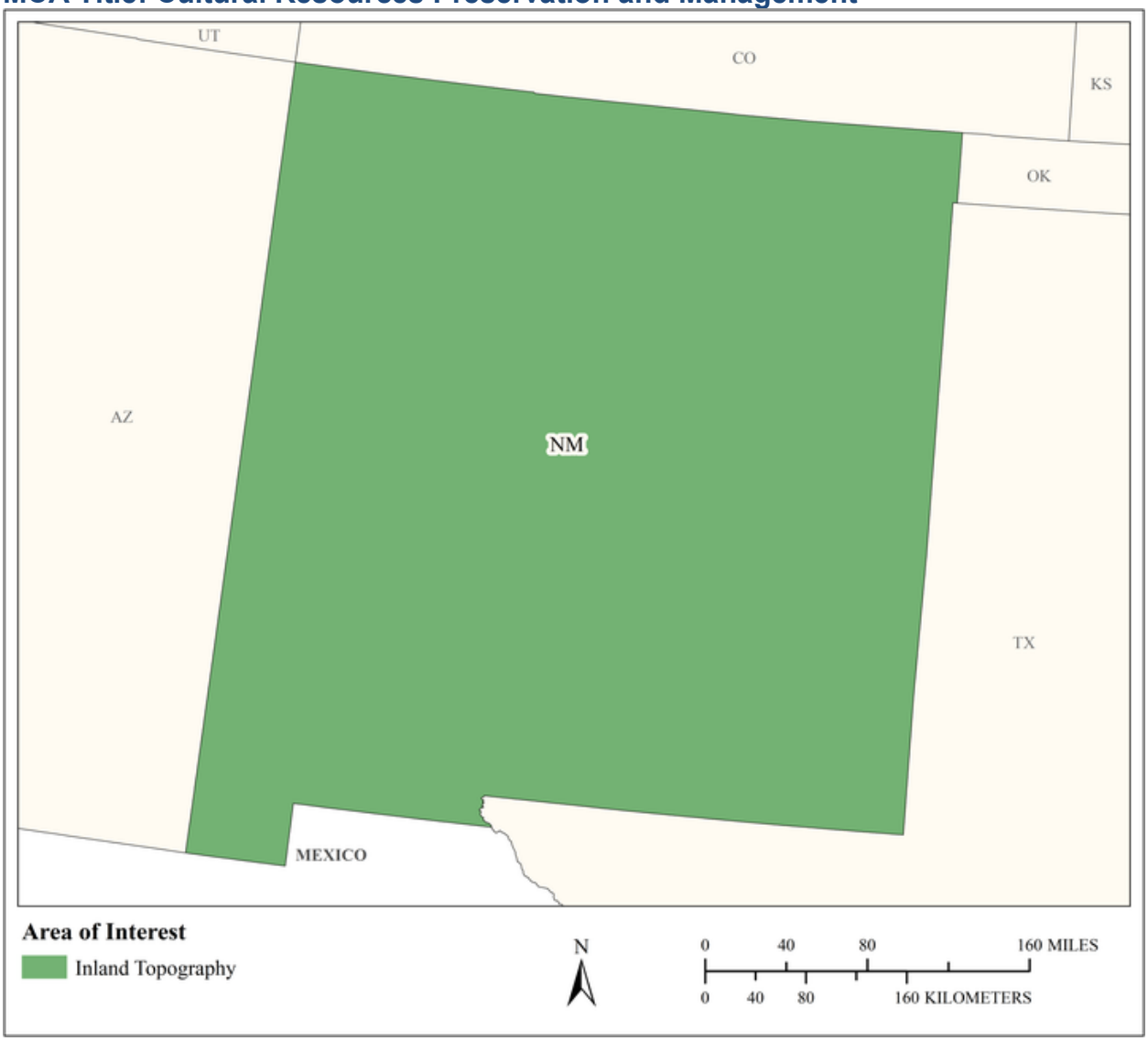
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$53,368									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Cultural Resources Preservation and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Discovery and analysis of underwater archaeological and historical cultural sites. Site protection and preservation planning. Discovery and analysis of Native American and other historical cultural sites and subsistence activities.
MCA Title	Cultural Resources Preservation and Management
MCA ID	60312
Organization Type	State or U.S. Territorial government
Organization Name	State of New Mexico
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Nice to have					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have					
DEM for entire AOI needs to be seamless	Nice to have					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Moderate			
Cost avoidance	Minor			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			

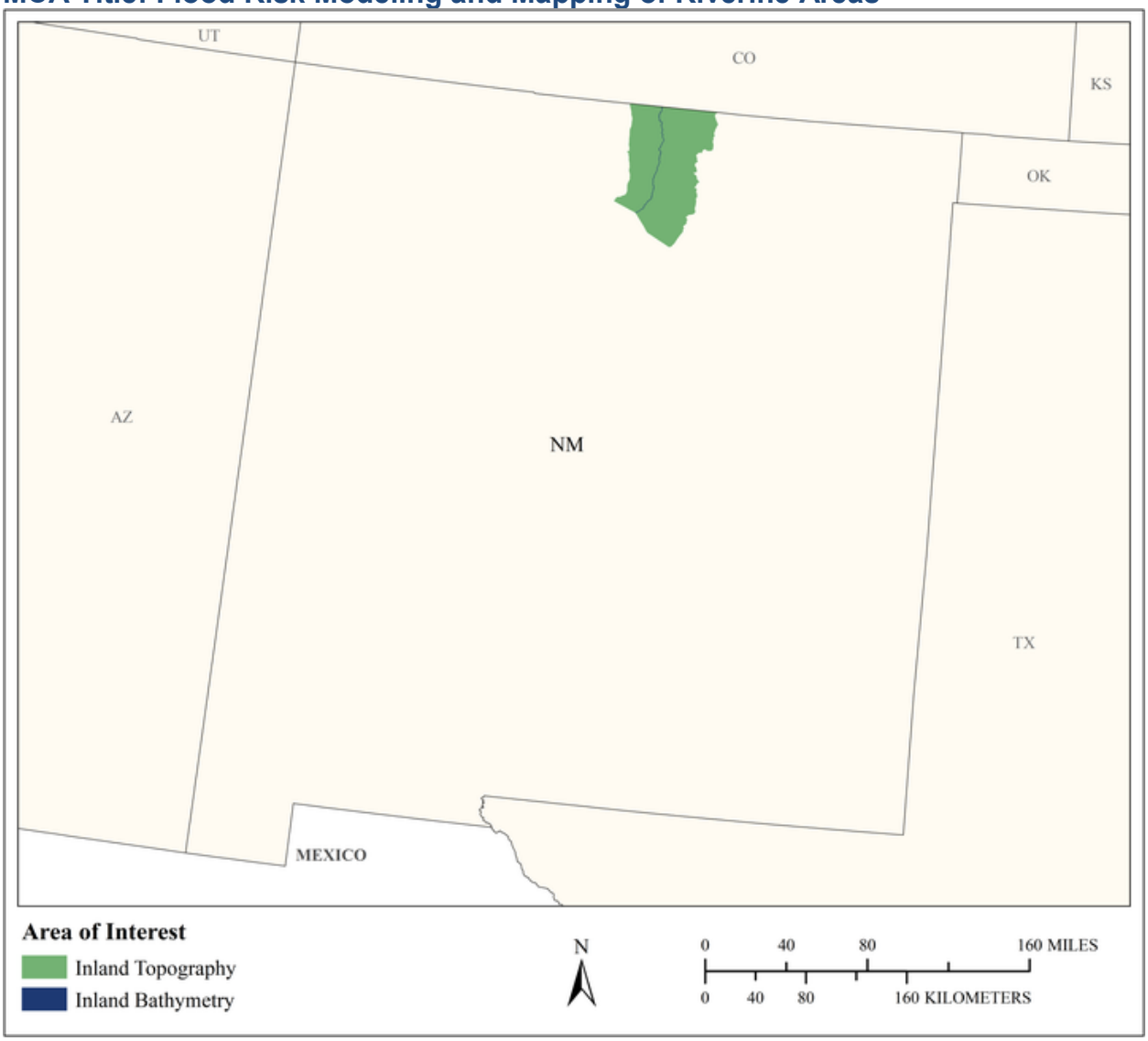
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Cost savings/cost reduction	Minor	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Moderate	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$22,286									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$19,485									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	Minor											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Flood Risk Modeling and Mapping of Riverine Areas



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements	Taos County, NM	Taos County, NM		

MCA Description	Response
Mission Critical Activity	Flood risk modeling and mapping of riverine areas. Elevation data can be used to model flood hazards. We expect to receive BLE data this Fall derived from a 2016 LiDAR acquisition. In addition we hope to get contours, building footprints, and other secondary products. Improved floodplain maps and data will, I hope, make the NFIP fit for purpose in Taos County. It will help us to educate the public, build confidence in the NFIP, protect people and their property through regulation of floodplain development, and make better informed decisions. The secondary products such as building footprints will help us with our land use planning and property appraisal and assessment. 3D data is invaluable to the work of local government and the implementation of federal government programs at the local level.
MCA Title	Flood Risk Modeling and Mapping of Riverine Areas
MCA ID	1089
Organization Type	Regional, County, City, or other local government
Organization Name	Town of Taos
Sub-Agency or Division	
Organization Mission	To provide goods and services that benefit our entire community and to represent and involve citizens in determining specific local public needs and how these local needs can be met.
Program Name	Administration of the Town of Taos Flood Damage Prevention Ordinance and implementation of the National Flood Insurance Program
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	For public works and street mapping, having details of signs, curbs, and roads would be very useful.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have

Inland Bathy Feature Size Requirements	Response
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	Cross sections and/or transects meet needs		
Update Frequency	4-5 years and certain events.	6-10 years		
Event type(s)	Wildfire, flooding, new land development, and avalanche.			
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	I don't know		
Acceptable Vertical Error	Up to 30 cm	I don't know		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial	Yes		

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross section/transect requirement	For the purpose of flood modelling, cross sections may be acceptable. Every 100 ft for the width of the floodplain would probably work.	I don't know, my idea is that bathymetry would help to create better floodplain maps. I'm not an engineer who creates the maps, so I really don't know. FEMA typically requires cross sections 1000 feet apart in open reaches, with additional cross section immediately upstream and downstream of hydraulic structures (culverts, bridges, weirs, etc.)		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Highly desirable		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Highly desirable	Highly desirable		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Highly desirable		
Ground control/ground truthing	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Nice to have		
Land use/land cover	Highly desirable	Nice to have		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Highly desirable		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL2 LiDAR acquired in Fall 2016 and processed in 2017 for the Upper Rio Grande Basin in New Mexico.	I'm not aware that bathymetry has been used in our floodplain maps.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	EDAC at UNM host and have made available to us a bare earth DEM, shaded relief, and minimally classified LiDAR data.			
Other		Yes		
Other description		Not currently doing so		

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor	None		
Cost savings/cost reduction	Major	None		
Cost avoidance	Major	None		
Increased revenues	None	None		
Mission-driven performance improvements	Major	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None		
Improved response or timeliness	Major	None		
Improved customer experience	Major	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	None		
Environmental	Moderate	None		
Public safety, including life and property	Major	None		
Other Current Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other	Major			
Other description	Professionals I work with such as P.E's can use LiDAR derived DEMs to submit LOMAs without the need for a survey, saving them and the citizen time and money.			

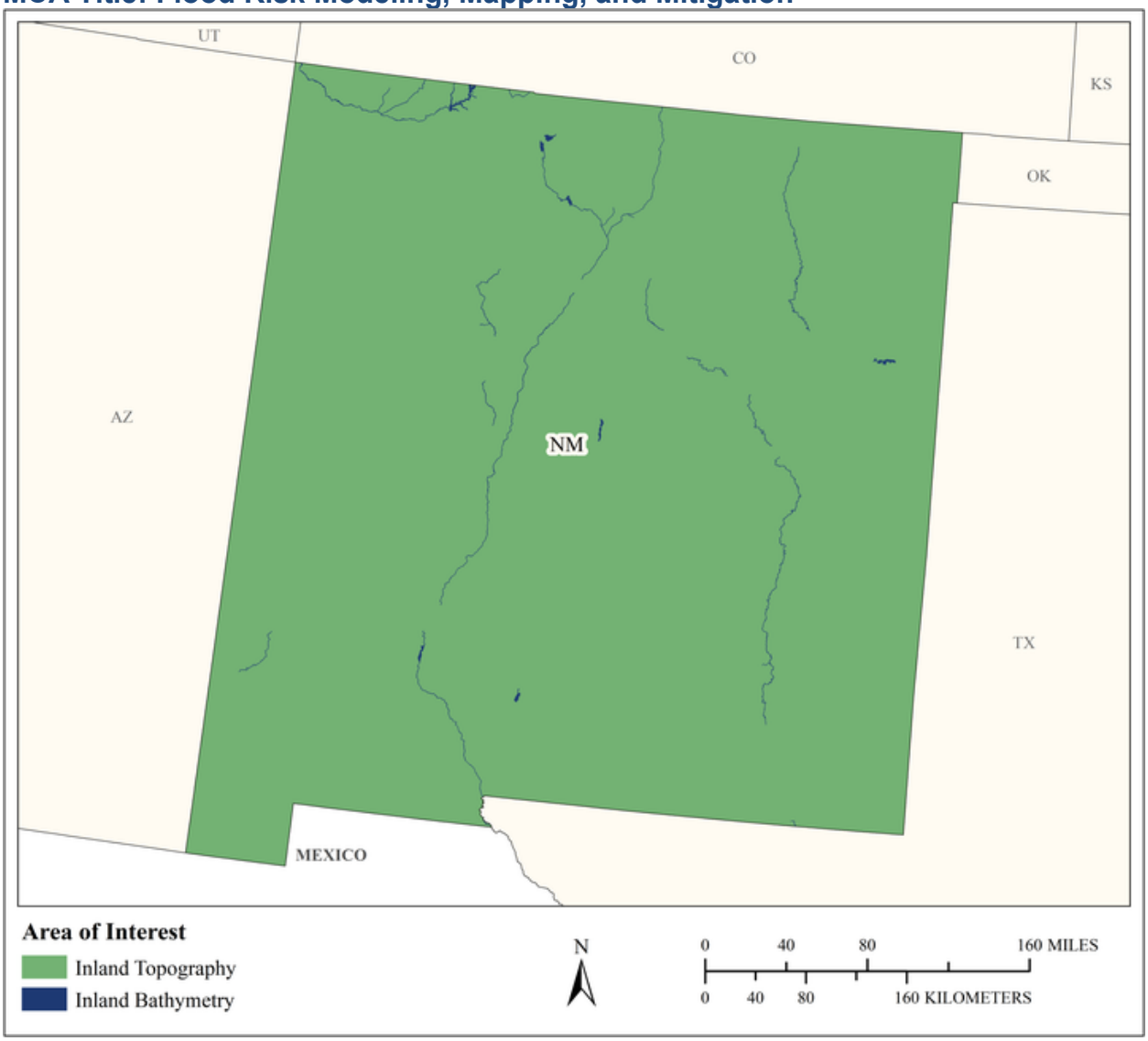
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$3,618	I don't know	Unable to provide							
Time savings description	For each floodplain development project having accurate elevation data can save me at least one site visit per project an average of 4 hours per project for 12 projects per year. 2 hours per floodplain project, 12 projects per year on average. Would save having to work with surveyors and engineers in approximate A zones or to produce the elevation certificate myself. 4 hours per project, 12 projects per year. For each project, with accurate mapping established this would save a lot of time explaining LOMAs to people.											
Cost savings/cost reduction	Moderate	Annual dollars saved/realized	$12,000	I don't know	Unable to provide							
Cost savings/cost reduction description	The approximate cost of flying and processing 50 square miles of LiDAR. But we would not do this annually.											
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide							
Cost avoidance description	Erroneous floodplain maps allow property owners to build in high risk areas that may result in loss of property and possibly life in the future.											
Increased revenues	None			I don't know	Unable to provide							
Mission-driven performance improvements	Major	Annual percent improvement	50%	I don't know	Unable to provide							
Mission-driven performance improvements description	Much of the floodplain we work with is unnumbered Zone A and very roughly digitized from old paper maps. LiDAR derived DEMs and floodplain maps will make the program much more realistic and effective. Better data leads to better maps leads to better regulatory decisions.											
Other operational benefits	Major	Unable to provide										
Other operational benefits description	Improved confidence in the NFIP by administators and the public.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide							
Value added to products or services description	The maps we have currently are a joke in many places, missing river channels, going up near vertical slopes. It is hard to justify our regulations in the context of bad mapping. Good maps help us to justify our regulations and regulatory decisions, they do not unduly burden those they should not and they do help to protect those that need it. Mapping products that show water depth for various events will be very useful for discussing floodplain damage prevention with the public.											
Improved response or timeliness	Major	Annual dollars saved/realized	$121,447	I don't know	Unable to provide							

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Improved response or timeliness description	Based on having to elevate customer properties less than they currently have to. 12 projects per year, $10,000 per project. Better maps, better decisions, more realistic regulation. 4 hours per project, 12 projects on average per year. Not having to deal with unnumbered A Zones.											
Improved customer experience	Major	Unable to provide		I don't know	Unable to provide							
Improved customer experience description	Data access is not really an issue currently. This is currently a major unquantifiable problem with NFIP maps in Taos County. Flood depth grids may help the public to understand flooding issues.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			I don't know								
Education or outreach description	Education is the first part of the flood damage prevention permitting process. Most customers are not familiar with the program and its requirements. Bad maps make it hard to justify the NFIP.											
Environmental	Minor			I don't know								
Environmental description	The environment is the lowest of the three priorities of the NFIP. People, property, river function.											
Public safety, including life and property	Major			I don't know								
Public safety, including life and property description	Better maps help to protect people who need protecting and do not over burden those who are less at risk.											
Other	Improved implementation of the NFIP											
Other benefits	Major											
Other description	Better maps, more public and administrator confidence, more reasonable decisions and regulation, better tools/maps for communicating risk, more reasonable insurance rates.											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Flood Risk Modeling, Mapping, and Mitigation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Highly desirable		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Flood risk modeling and mapping of drainage and lake areas. Dam/dike/levee safety analysis. Base Level Engineering (BLE) analysis. Landslide threat analysis. Wildfire threat analysis. Community coordination and emergency preparedness planning. EDAC is the state clearinghouse for spatial data and the state CTP for FEMA. Elevation data are needed for a myriad of uses to include addressing flooding, wildfire, landslides, post-disaster activities, and sinkholes, among others.
MCA Title	Flood Risk Modeling, Mapping, and Mitigation
MCA ID	1364
Organization Type	Academic or Not-for-Profit
Organization Name	Earth Data Analysis Center - UNM
Sub-Agency or Division	
Organization Mission	The main goal of EDAC is to provide a state center for geo-spatial data activities which includes being the state geo-spatial data clearinghouse. As part of these activities, my role as New Mexico's FEMA Region 6 Cooperating Technical Partner Program Manager is to analyze the state's disaster preparedness and resiliency needs, coordinate with various state, county and local emergency management entities and advise FEMA Region 6 as to these needs
Program Name	New Mexico's FEMA 6 Cooperating Technical Partners Program
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 17 - Wildfire Management, Planning, and Response
Tertiary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	200,000 sq mi - 2 million sq mi (e.g. large state, large multi-state region such as the Great Basin, standard Federal region, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Buildings down to 32 square meters and individual trees.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B		
Update Frequency	6-10 years and certain events.	6-10 years		
Event type(s)	Wildfire or flooding event			
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 10 cm	Up to 40 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Nice to have
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Required			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Highly desirable		
Raw point cloud data	Not required	Not required		
Classified point cloud	Required	Highly desirable		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Nice to have		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Nice to have	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Highly desirable		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Highly desirable		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Required	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			
Other	Required			
Other description	Lowest adjacent grade of buildings			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We are using all QL2 data available for the state with NAIP CIR photography and generating much of the above data that we can from this data.	We are mostly not using bathymetric data because of its general inaccessibility, but if it were to be more commonly available it could be useful to generate more accurate drainage patterns and BLE maps.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other	Yes			
Other description	As the state's geo-spatial data clearinghouse we use us - EDAC-UNM			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available		
Cost savings/cost reduction	Major	Inland bathy data not available		
Cost avoidance	Major	Inland bathy data not available		
Increased revenues	Major	Inland bathy data not available		
Mission-driven performance improvements	Major	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available		
Improved response or timeliness	Major	Inland bathy data not available		
Improved customer experience	Major	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Inland bathy data not available		
Environmental	Major	Inland bathy data not available		
Public safety, including life and property	Major	Inland bathy data not available		

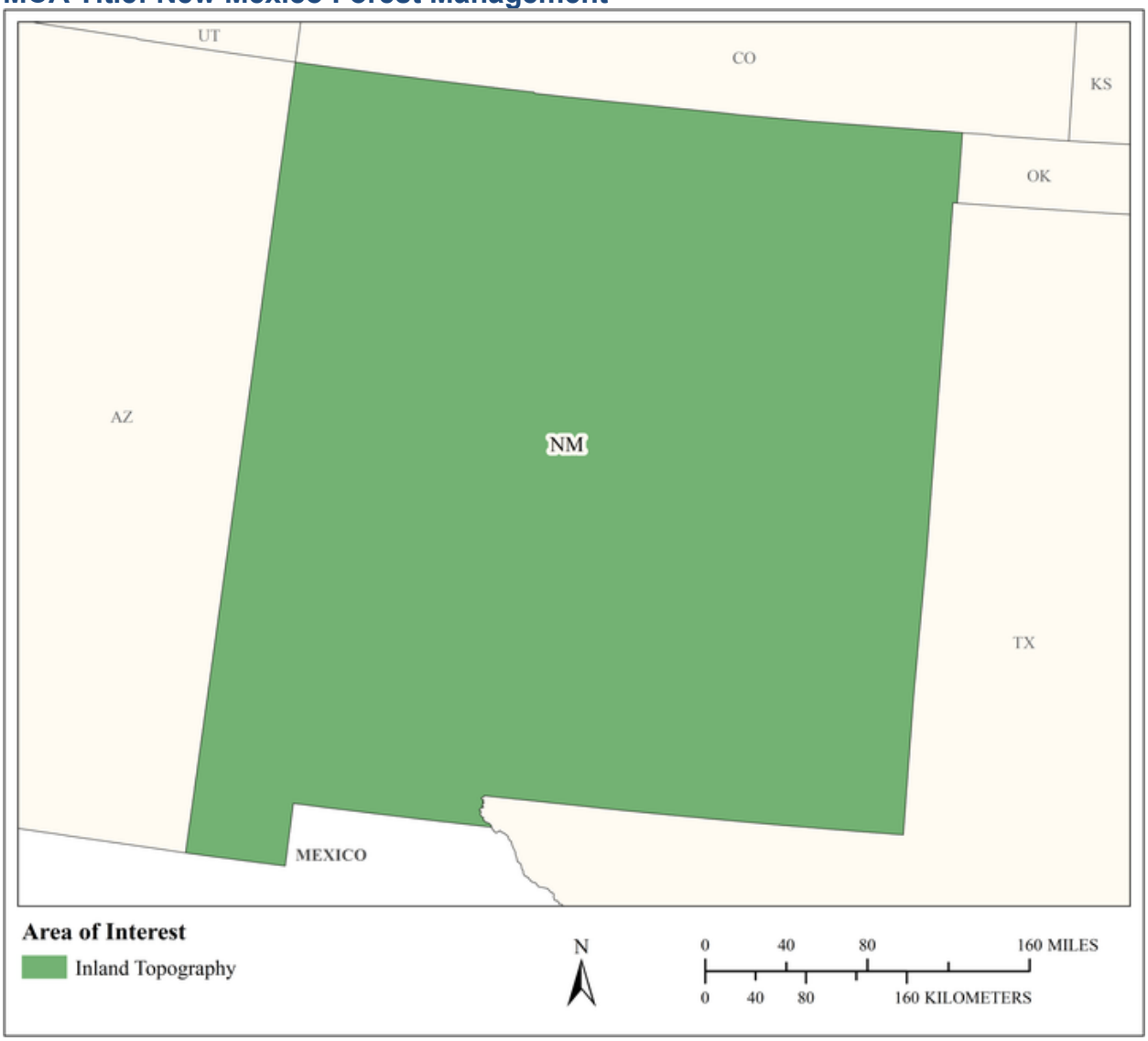
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Moderate	Unable to provide							
Time savings description				Provide better modeling of stream flow, erosion, and flood risk. Produce better BLE estimates in a quicker time. Reduce the number of places we would need to find data and centralize the processing on one data set.								
Cost savings/cost reduction	None			Minor	Unable to provide							
Cost savings/cost reduction description				Reduce the number of places we would need to find data and centralize the processing on one data set.								
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Cost avoidance description				Anything that improves the output modeling efforts will in the end will improve safety outcomes and even may avoid accidents. Reduce the number of places we would need to find data and centralize the processing on one data set.								
Increased revenues	Moderate	Unable to provide		Minor	Unable to provide							
Increased revenues description	We are developing new apps (public domain) for using the LiDAR data.			We may use the data to create new apps to process the data more efficiently.								
Mission-driven performance improvements	Major	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements description	The more detailed topographic and above ground data information improves everything else down the line.			Reduce the number of places we would need to find data and centralize the processing on one data set.								
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Annual dollars saved/realized	$57,888	Moderate	Unable to provide							
Value added to products or services description	Better flood hazard and emergency preparedness maps saves lives and dollars so the benefits are inestimable. Automated building footprint and elevation apps from this data saves off of manual digitizing.			Provide better modeling of stream flow, erosion, and flood risk. We may use the data to create new apps to process the data more efficiently.								
Improved response or timeliness	Major	Unable to provide		Minor	Unable to provide							
Improved response or timeliness description	Better detailed topographic and above ground data makes for faster, more accurate results for all reviews and product development. Better detailed topographic and above ground data creates a better user experience when coordinating with other entities and the public in general.			Improved mapping info always helps in providing the state, local and community entities a better picture of the issues that need to be dealt with. Provide better modeling of stream flow, erosion, and flood risk. Reduce the number of places we would need to find data and centralize the processing on one data set.								
Improved customer experience	Major	Unable to provide		Major	Unable to provide							

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved customer experience description	Better detailed topographic and above ground data makes for faster, more accurate results for all reviews and product development. We are developing a number of apps that can use the surface and above ground information found in these data to improve data and map output. Better detailed topographic and above ground data creates a better user experience when coordinating with other entities and the public in general.			
Societal Benefits	**Benefits**	**Benefits**	**Benefits**	**Benefits**
Education or outreach	Major	Minor		
Education or outreach description	As part of the university environment and the public face for FEMA in the state, these data sets provide uses that cannot be replicated any other way.	The data will be useful for the academic entities that use our services		
Environmental	Major	Moderate		
Environmental description	From accurate outlining of drainage systems to the amount and type of canopy cover or human disturbance, these data are irreplaceable.	This information will be definitely helpful in stream channel and riparian mapping and monitoring efforts.		
Public safety, including life and property	Major	Moderate		
Public safety, including life and property description	These data provide the baseline and potentially future change data that are required in most emergency management decisions.	Enhanced mapping products will ultimately lead to better protection and planning for public safety.		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: New Mexico Forest Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Forestry is responsible for fire suppression on 43 million acres of non-municipal, non-federal, and non-tribal land across the state. Forestry also assists New Mexico's communities by evaluating those lands and forests most at risk to wildfire, disease, and insect infestation by developing appropriate land management and restoration programs, and implementing mitigation projects. Forestry staff provides technical assistance to private landowners for developing sustainable forests that enhance quality of life by providing tree care training, distributing low-cost seedlings, developing Forest Stewardship plans, and delivering insect and disease identification assistance as well as forest health project funding.
MCA Title	New Mexico Forest Management
MCA ID	1245
Organization Type	State or U.S. Territorial government
Organization Name	State of NM Energy, Minerals and Natural Resources Department
Sub-Agency or Division	
Organization Mission	The New Mexico State Forestry Division (Forestry) retains lead responsibility for wildland fire management on non-federal, non-tribal, and non-municipal lands, maintaining fire suppression capacities and emphasizing public and firefighters' safety. Forestry promotes healthy, sustainable forests in New Mexico for the benefit of current and future generations.
Program Name	New Mexico State Forestry Division consists of multiple programs that support the Division's Mission Critical Activity: Fire Management, Fire Planning Task Force, Fire Prevention Programs, Returning Heroes Wildland Firefighter Program, Inmate Work Camp Program, Resource Management, Forest Legacy Program, Forest & Watershed Health Office, Land Conservation Tax Incentive Act Tax Credit Program, Conservation Seedling Program, Cooperative Forest Health Program, Endangered Plants Program, Urban and Community Forestry Program
Total Annual Program Budget	
Primary Business Use	BU 17 - Wildfire Management, Planning, and Response
Secondary Business Use	BU 04 - Forest Resources Management
Tertiary Business Use	BU 07 - Wildlife and Habitat Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)

General Geographic Area and Size	
Description of smallest 3D features	Tree health, understory, fuel potential. Individual tree.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Other	Required					
Other description	Classified Point Cloud data for entire AOI available for our own processing into DEM as-needed for unique project needs)					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to triple the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Not required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	National Elevation Dataset (1/3 arc second=10m and 1 arc second=30m) DEM's from LiDAR QL2 recently collected for first time across NM			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				

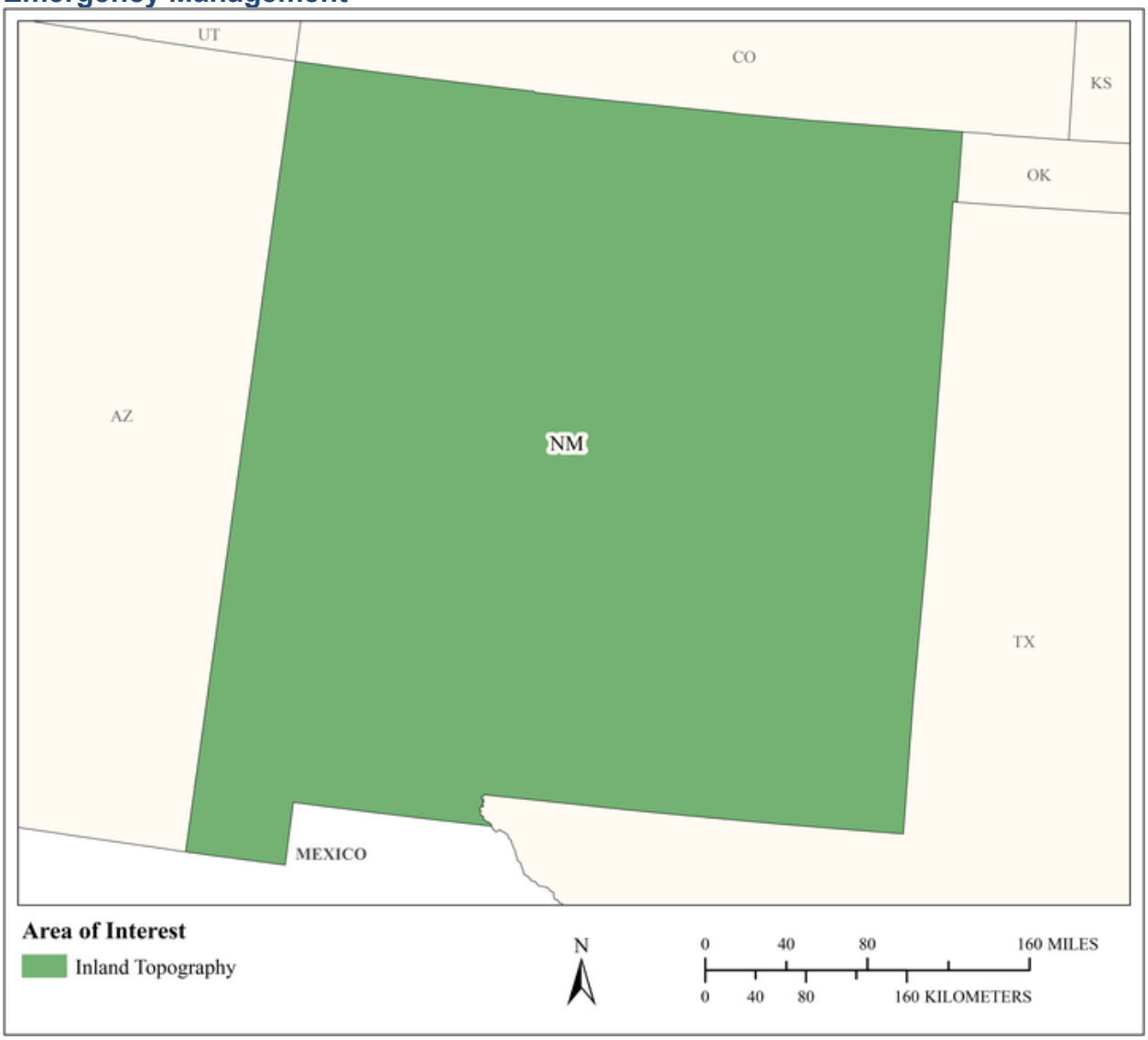
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State Repositories	Yes			
State repositories used	NM Resource Geographic Information System (http://rgis.unm.edu/)			
Other	Yes			
Other description	Copies in our own enterprise GIS (Esri) and file system storage of raw data; Esri Online			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	None			
Cost avoidance	Minor			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			
Improved response or timeliness	Moderate			
Improved customer experience	None			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Moderate			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide										
Cost savings/cost reduction	I don't know	Unable to provide										
Cost avoidance	I don't know	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	I don't know	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$653,285									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide										
Improved response or timeliness	I don't know	Unable to provide										
Improved customer experience	I don't know	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Homeland Security, Law Enforcement, Disaster Response, and Emergency Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Infrastructure and border protection. Coastal search and rescue. Population dynamics. Emergency fuel supply and movement. Line of sight analysis in urban areas. Disaster response. Flood risk analysis resulting from acts of terrorism.
MCA Title	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
MCA ID	60313
Organization Type	State or U.S. Territorial government
Organization Name	State of New Mexico
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

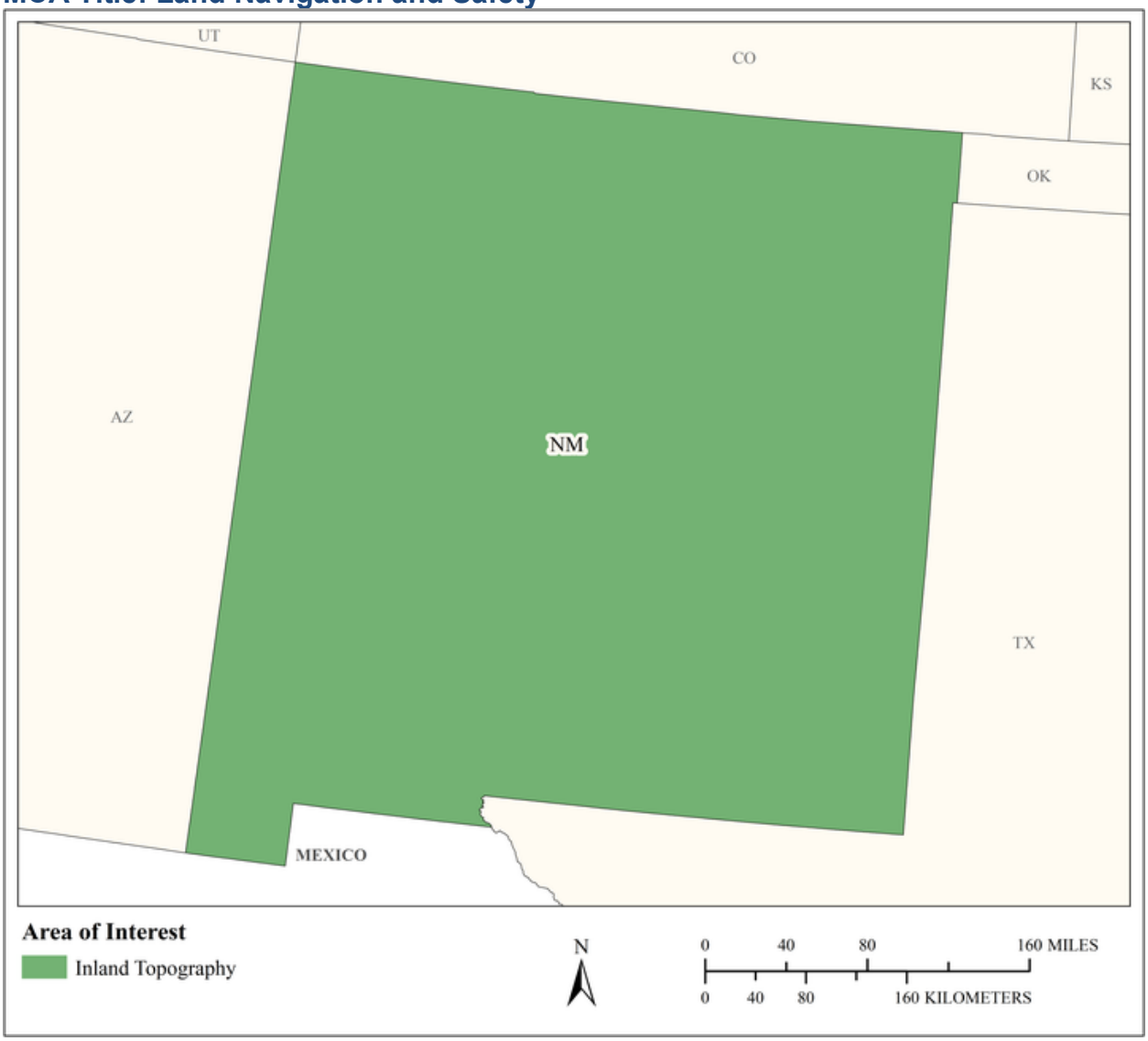
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Minor			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$3,586,927									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$63,397									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Moderate											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Land Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Road and railroad route selection and maintenance. Slope analysis for autonomous cars. GPS navigation visualization.
MCA Title	Land Navigation and Safety
MCA ID	60314
Organization Type	State or U.S. Territorial government
Organization Name	State of New Mexico
Sub-Agency or Division	New Mexico Department of Transportation
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 19 - Land Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

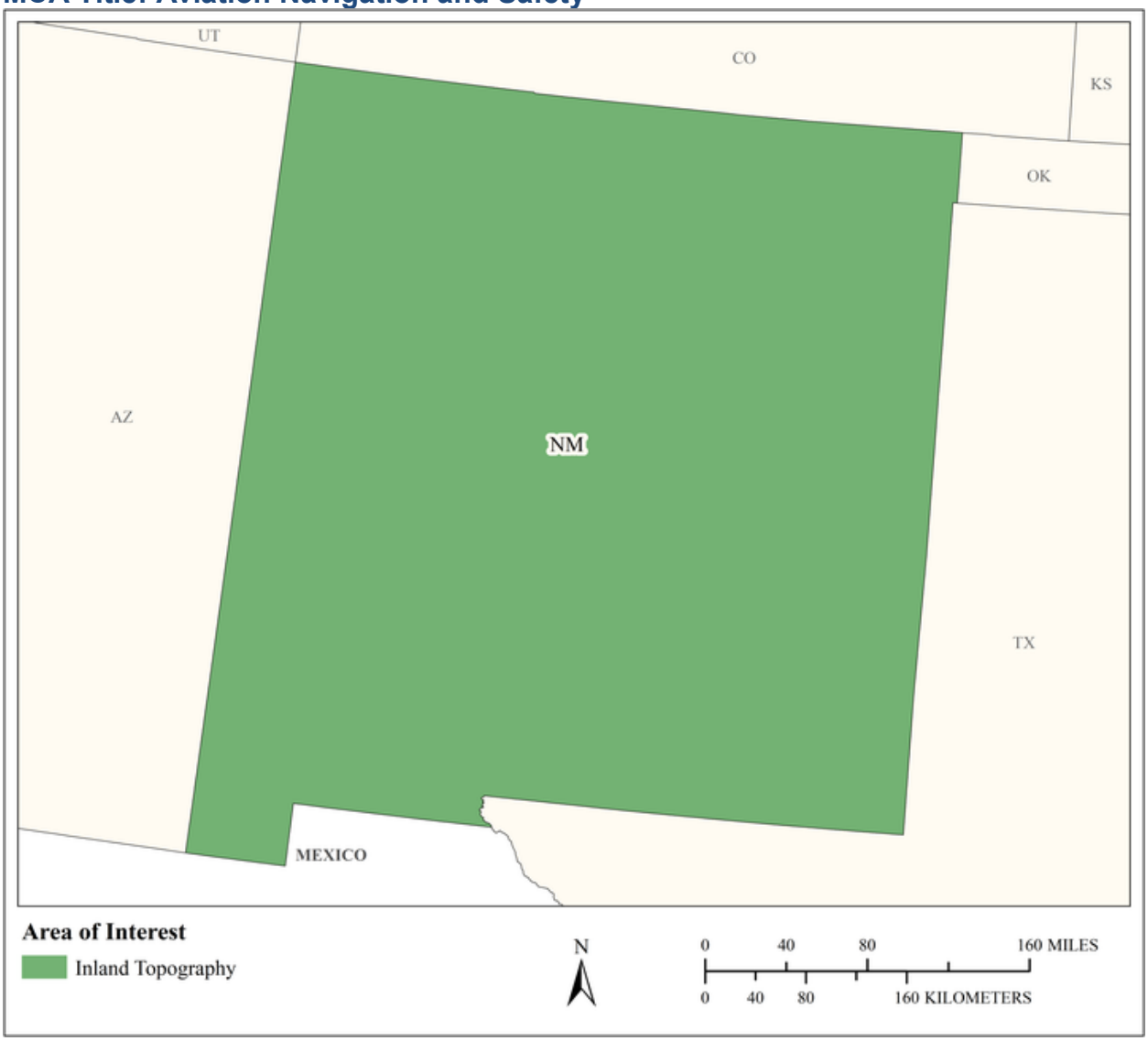
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Moderate			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Moderate	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,575,123									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$127,199									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Aviation Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of in-flight hazards and path obstructions. Aeronautical charting. Runway construction and repair.
MCA Title	Aviation Navigation and Safety
MCA ID	60315
Organization Type	State or U.S. Territorial government
Organization Name	State of New Mexico
Sub-Agency or Division	New Mexico Department of Transportation
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 21 - Aviation Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes			
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Major			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

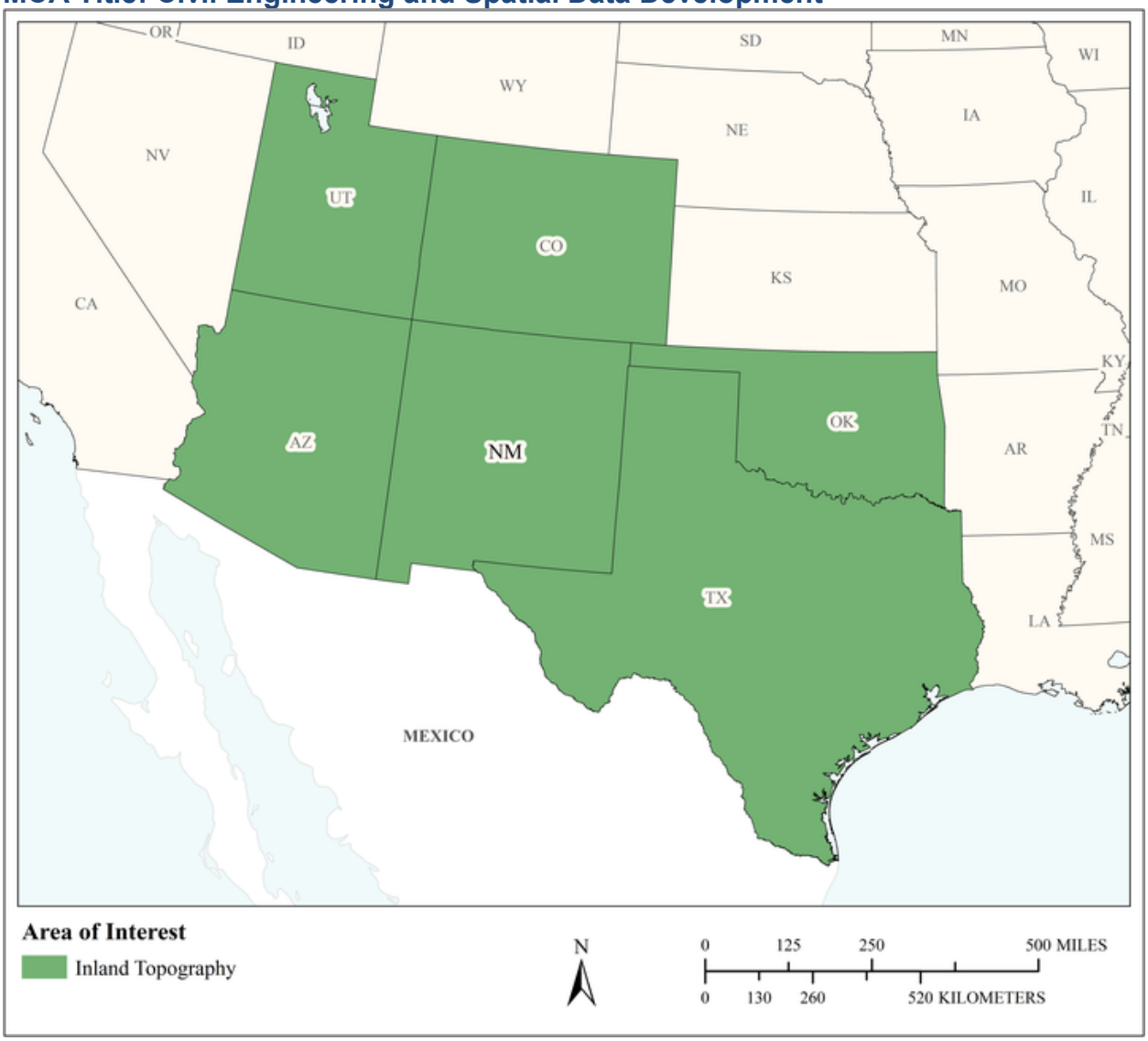
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$411,040									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$511,937									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Moderate											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Civil Engineering and Spatial Data Development



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Civil Engineering and Spatial Data Development. Elevation data are needed for hydraulic and hydrologic modeling for engineering projects including drainage master planning, and transportation infrastructure design and modeling, and building site analysis. We contract for imagery and lidar collection, then post process the data, and acquire photogrammetry data as well.
MCA Title	Civil Engineering and Spatial Data Development
MCA ID	1400
Organization Type	Private or Commercial
Organization Name	Bohannan Huston, Inc.
Sub-Agency or Division	
Organization Mission	To improve the quality of life for our customers, communities, and future generations by delivering solutions that enhance the natural and built environments.
Program Name	Hydraulic and hydrologic modeling including drainage master planning, Transportation infrastructure design and modeling, Building site analysis
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 23 - Urban and Regional Planning

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Road paint markings, valve boxes

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required					
Entire AOI under same environmental conditions	Not required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Other	Highly desirable					
Other description	No hydro flattening					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	None - would rather have access to original data collection in order to assess based on MCA requirment					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Not required			
Wetlands	Not required			
Estuaries				
Inland surface water features	Not required			
Bridges/culverts	Highly desirable			
Landmark features	Not required			
Cultural resources	Nice to have			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	- QL2 LiDAR - Site design, drainage master planning Photogrammetrically stereo collected surface information Mobile LiDAR for highway design, asset inventory with vertical accuracy in the hundredths of a foot - QL0			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				

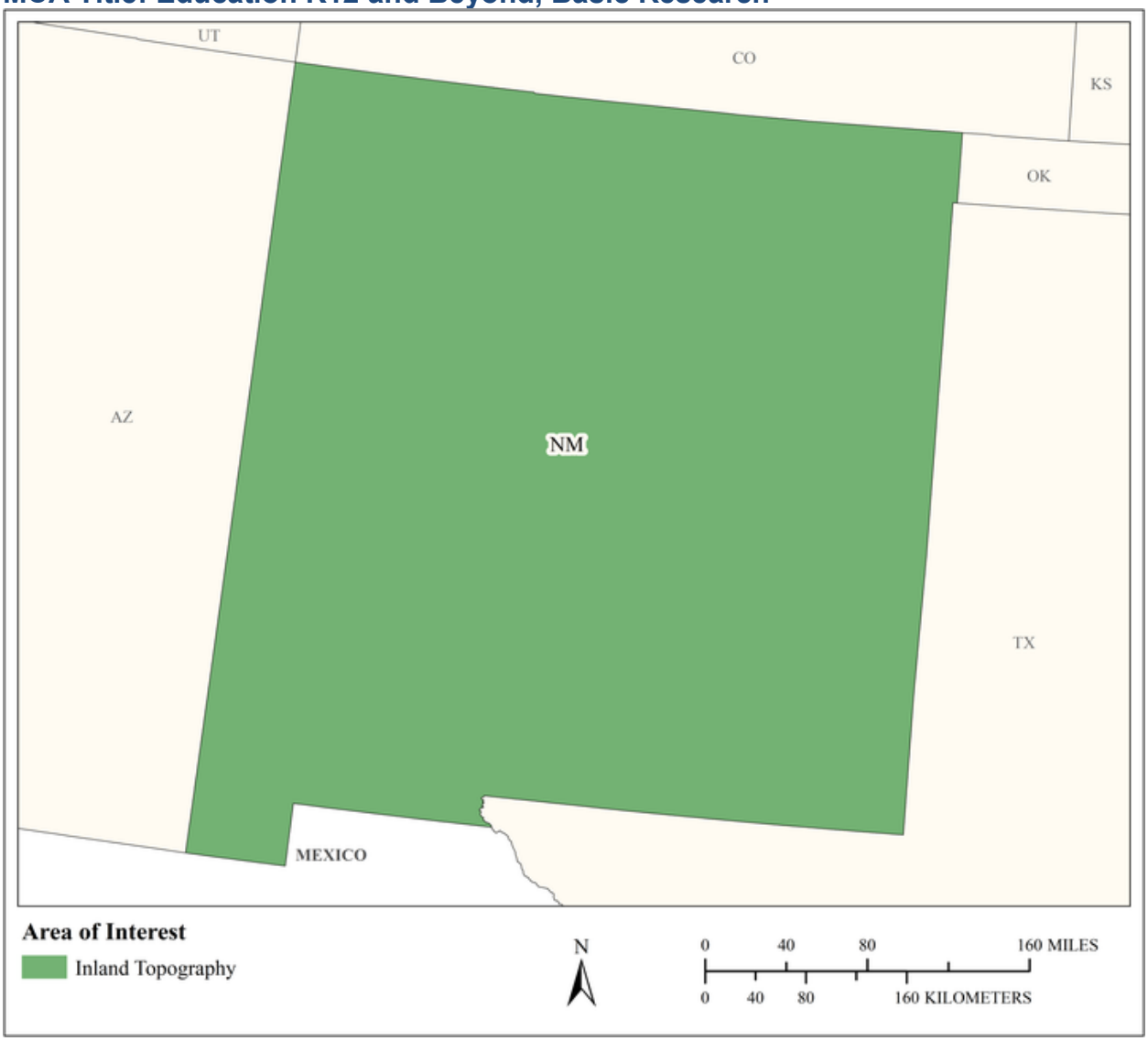
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	NM RGIS			
Other	Yes			
Other description	Develop in-house			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	I don't know			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know			
Improved response or timeliness	I don't know			
Improved customer experience	I don't know			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know			
Environmental	I don't know			
Public safety, including life and property	I don't know			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide										
Cost savings/cost reduction	I don't know	Unable to provide										
Cost avoidance	I don't know	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	I don't know	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$5,464,225									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide										
Improved response or timeliness	I don't know	Unable to provide										
Improved customer experience	I don't know	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$16,080,115									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Education K12 and Beyond, Basic Research



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Development of 3-D visualizations to help students understand the Earth they live on. Understanding of continental-scale climate change impacts. Ocean science. Ocean education. Scientific research. Data dissemination. Development of training simulators.
MCA Title	Education K12 and Beyond, Basic Research
MCA ID	60316
Organization Type	State or U.S. Territorial government
Organization Name	State of New Mexico
Sub-Agency or Division	New Mexico Public Education Department
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 26 - Education K12 and Beyond, Basic Research
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$638,970									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,527,324									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Recreation

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Planning and development of recreational facilities such as rafting, boating, swimming, diving, and fishing areas; ski slopes; and golf courses. Location- based products and services such as maps and guides. Tourism. Trail and vista site planning. Orienteering.
MCA Title	Recreation
MCA ID	60317
Organization Type	State or U.S. Territorial government
Organization Name	State of New Mexico
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 27 - Recreation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Nice to have			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Nice to have			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Nice to have			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Moderate			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$27,900									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Minor	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Moderate											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Telecommunications

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Telecommunication tower site selection. Design of radio and radar systems. Interference analysis. Path profiles. Undersea telecommunication route selection and deployment.
MCA Title	Telecommunications
MCA ID	60318
Organization Type	State or U.S. Territorial government
Organization Name	State of New Mexico
Sub-Agency or Division	New Mexico Department of Information Technology
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 28 - Telecommunications
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Highly desirable			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
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Aerial and/or satellite imagery	Required			
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Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
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Cultural resources	Required			
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Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
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Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

New York

Introduction and background

The State of New York includes roughly 54,555 square miles of land and water area that consists of a diverse topography of coastal lowlands and ports, the densely populated metropolis of New York City (NYC), glaciated lakes and valleys, the rolling hills of the Catskill Mountains, the rugged terrain of the Adirondack mountains, and a western boundary that borders on Canada and two of the nation's five Great Lakes. Additionally, New York has approximately 2,625 miles of coastline and is the only state that includes portions of the Atlantic Ocean and Great Lakes within its borders. The coastal counties of New York contain resort and recreational communities with beaches and tourism attracting a large spring through autumn population that drive a significant portion of the economies for those counties. The central, glaciated portion of New York contains the ever-popular Finger Lakes wine country, while the Adirondack Mountains in the northeast provide further recreation opportunities that attract vacationers. As already mentioned, the terrain of New York is varied, from coastal areas to the highest peak in the Adirondacks of Mount Marcy at 5,344 feet. Surface water drainage in New York serves as headwater streams for several major drainage basins that eventually reach the Gulf of St. Lawrence (via Lake Erie, Lake Ontario, or Niagara Falls), Long Island Sound, Port of New York and New Jersey, Atlantic Ocean, Chesapeake Bay, or Delaware Bay. According to NOAA (https://coast.noaa.gov/states/new-york.html), 81% of the population residing in New York lives in coastal areas, and the state's coastal areas are historically prone to severe storms, including tornadoes, hurricanes, and Nor'easters. As such, dependable topographic and bathymetric elevation data are vital for a state with such a diverse landscape, not to mention one that is home to NYC, the most populous city in the United States.

Current status of topographic elevation data for New York

Topographic lidar coverage in New York consists of a combination of more than 50 data collection efforts ranging from 2002 to 2019 with various project partners, funding sources, and data quality levels covering approximately 90% of the state's land area (Figure 1) with data and current project status available for access at: http://gis.ny.gov/elevation/. While most of these datasets are suitable for producing digital elevation models (DEMs) with a resolution of 2-meters or better, there are some areas with DEMs with 5-meter resolution. Of the 57 projects, two thirds were 8-years old or older in 2020. Since 2007, most of the lidar data collection projects have full point cloud (LAS extension type) files available for download, while projects completed prior to 2007 are XYZ, XYZI, or shapefile formats. When limited to only projects meeting 3DEP Quality Level 2 (QL2) accuracy specifications, a total of 17 projects cover approximately 60% of the state's land area. Except for one project flown in 2012, these QL2 projects were flown in 2014 or more recently.

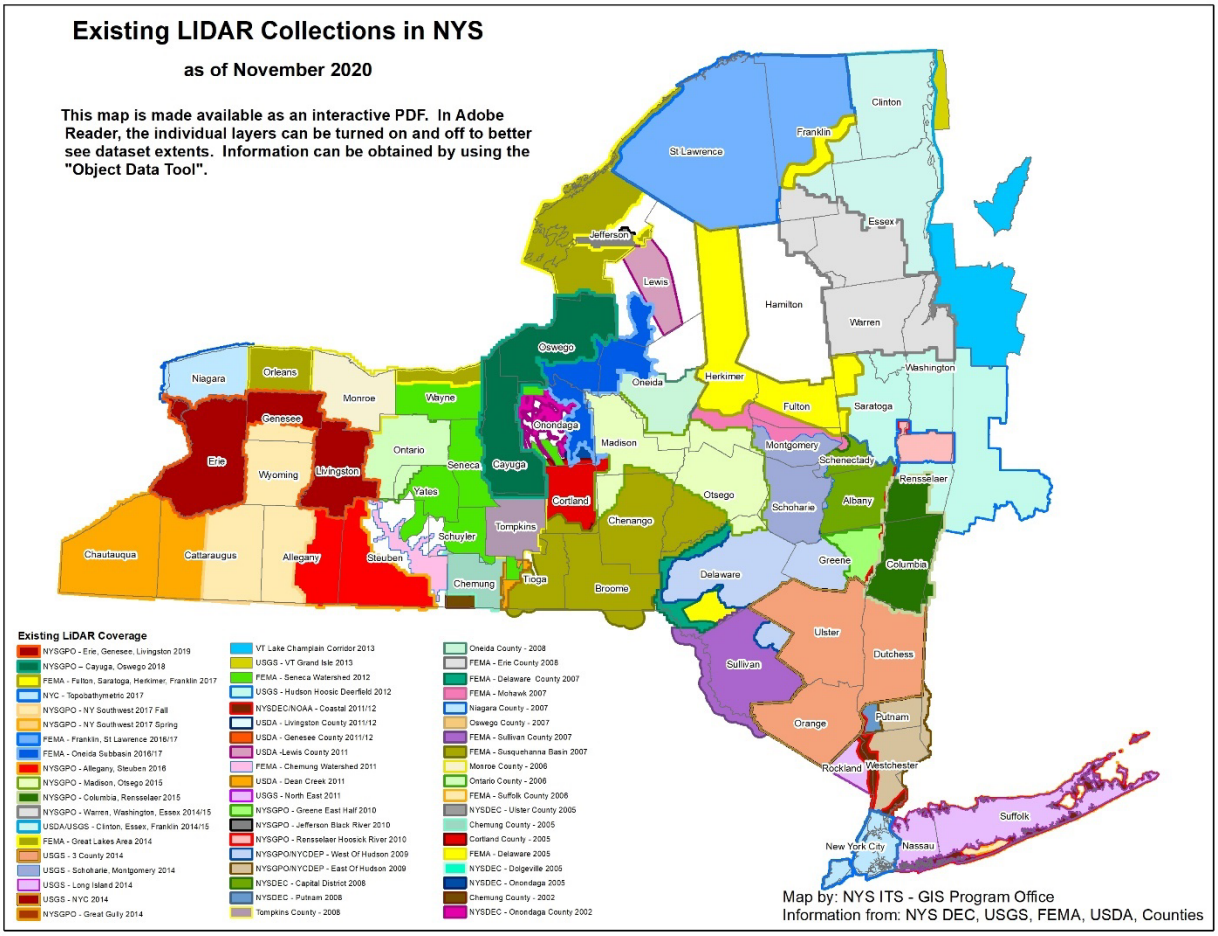


Figure 1. Existing elevation datasets for New York by funding organization and date of acquisition.

As of November 2020, several projects are currently in progress, with data soon to be delivered and made publicly available (Figure 2). These projects include the Central Finger Lakes data collection funded through a broad agency announcement (BAA), a large FEMA-funded project, and a Lake Ontario-Hudson River Region data collection funded through a BAA. From 2019 onward, elevation data collection in most of New York will be projects to replace existing lidar datasets, and this is true of two of the previously mentioned topographic lidar projects in progress (2019-2020), which, when combined with existing datasets, will increase QL2 coverage of the state to greater than 90%.

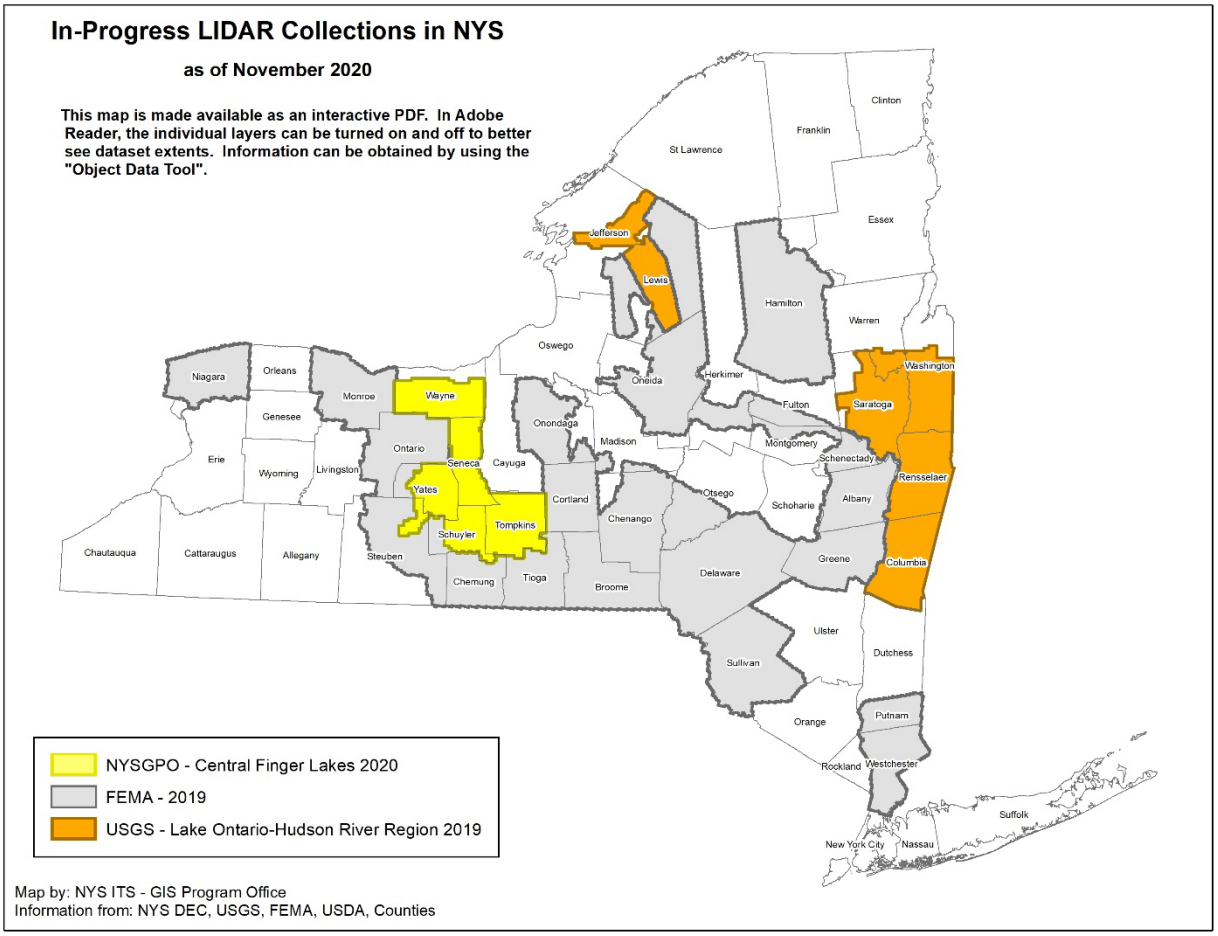


Figure 2. Regions of lidar collection by projects in 2019 and 2020

Elevation data update efforts have been completed at many levels of government with federal, state, county, and NYC efforts covering the largest area. Most of the lidar collections in New York were linked to FEMA flood risk mapping update efforts, whether completed by FEMA in partnership with USGS or by the state or a county in some form of a partnership with FEMA. USDA-NRCS also completed several lidar projects as well as supplying funding to help support projects run by the state. Since 2015, the state has completed six cooperative lidar projects with 3DEP funds accounting for about 30% of the total costs.

Based on tracking data requests, downloads through the state GIS website, and use of the state's web services, it is clear that elevation data are very widely used. Bare-earth DEMs, contours, and hillshade data and services are used for visualization and analysis. Lidar point cloud data are used for modeling above ground structures and analyses such as lines of sight and viewsheds. Usage is by all levels of government, academia, non-profits, private sector firms, and the general public.

New York is approaching the final transition from USGS quadrangle contour derived DEMs (typically 10-meter resolution) to lidar-derived DEMs of 2-meter or finer resolution as the statewide coverage. This represents a major temporal update as well as an increase in resolution. There is significant interest in maintaining the currency of the elevation dataset going forward, including in a recent update to the New York GIS strategic plan which is pending release at the time of this report. However, the need to increase the DEM resolution beyond 2-meter or 1-meter on a statewide basis is unclear. The private sector, mostly survey and engineering firms, is probably the critical audience for measuring the possible return on

government investment in sub-meter DEMs covering large areas. The question of how well profiles extracted from point clouds or high resolution DEMs compare to surveyed profiles for hydraulic modeling is key to increased use of the 3DEP products by engineering firms and agencies. Two parts of this question are: 1) Do the lidar or derived products provide sufficient detail for accurate flow modeling? and 2) Can one lidar collection also capture the stream bottom so a complete cross section can be extracted?

Current status of bathymetric elevation data for New York

While bathymetric data are not as well documented, major bathymetric data collection efforts include the 2011/2012 NYSDEC-NOAA Coastal 1 Meter DEM and 2017 NYC Topobathymetric data. The 2011/2012 NYSDEC-NOAA Coastal 1 Meter DEM project was developed by NOAA's Coastal Services Center and the New York State Department of Environmental Conservation to collect and deliver topographic elevation point data from lidar for areas of coastal New York (Figure 3). The data were collected for use in coastal management decision making, including applications related to projected sea level rise and the remapping of Coastal Erosion Hazard Areas. Two different versions of this dataset are available and include a tidal water raster DEM and a hydroflattened raster DEM.

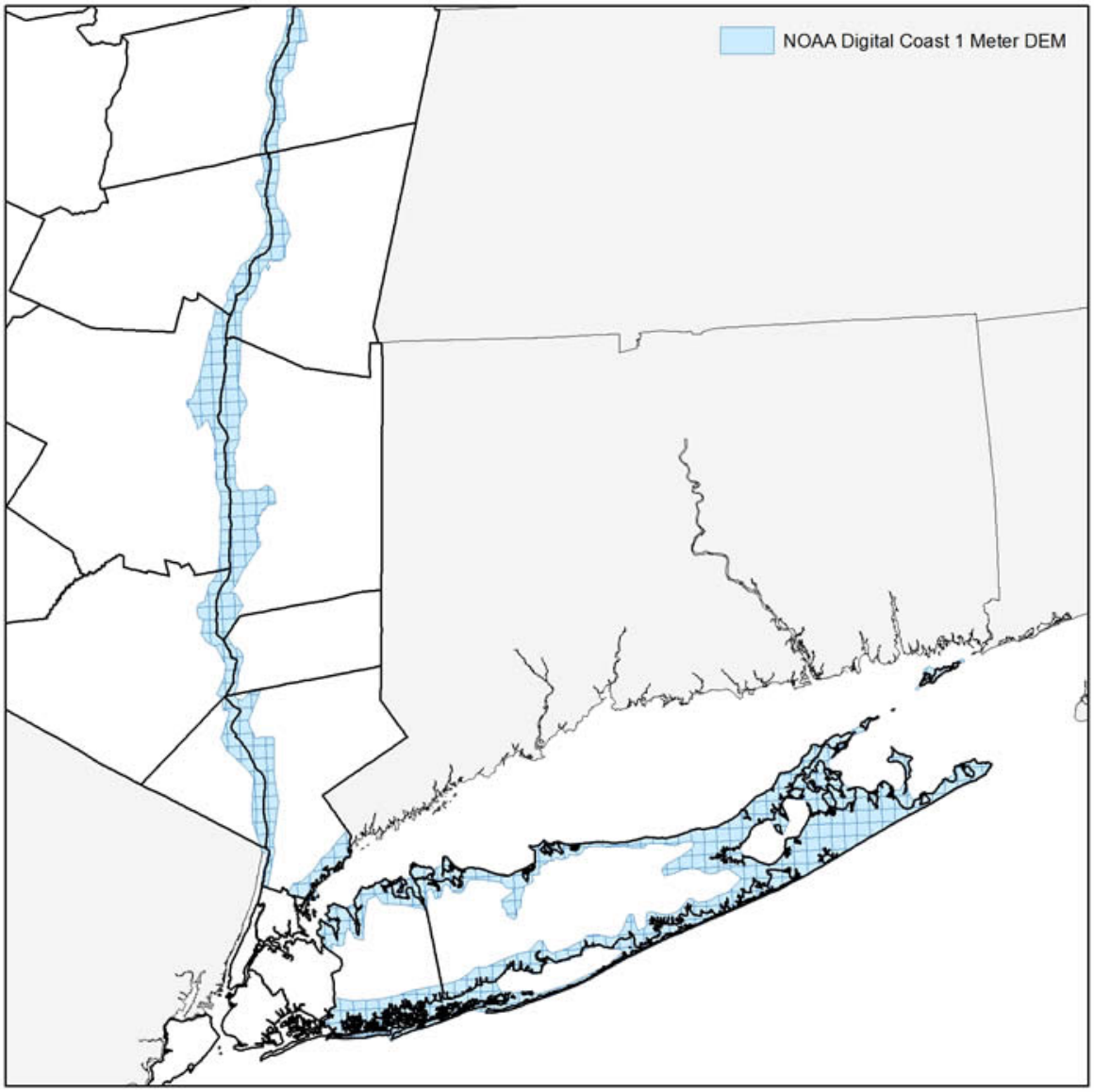


Figure 3. Bathymetric elevation data collection grid along Long Island and the Hudson River

The 2017 NYC Topobathymetric data project consists of 1-foot resolution topobathymetric DEMs and digital surface models (DSMs), as well as a classified point cloud (Figure 4). This project was developed and collected by the NYC Department of Information Technology and Telecommunications, Department of Parks and Recreation, and the Mayor's Office of Recovery and Resiliency as part of a federal Disaster Recovery Community Development Block Grant for disaster recovery and resiliency initiatives. Quantum Spatial collected these data for NYC between 05/03/17 and 07/26/17.

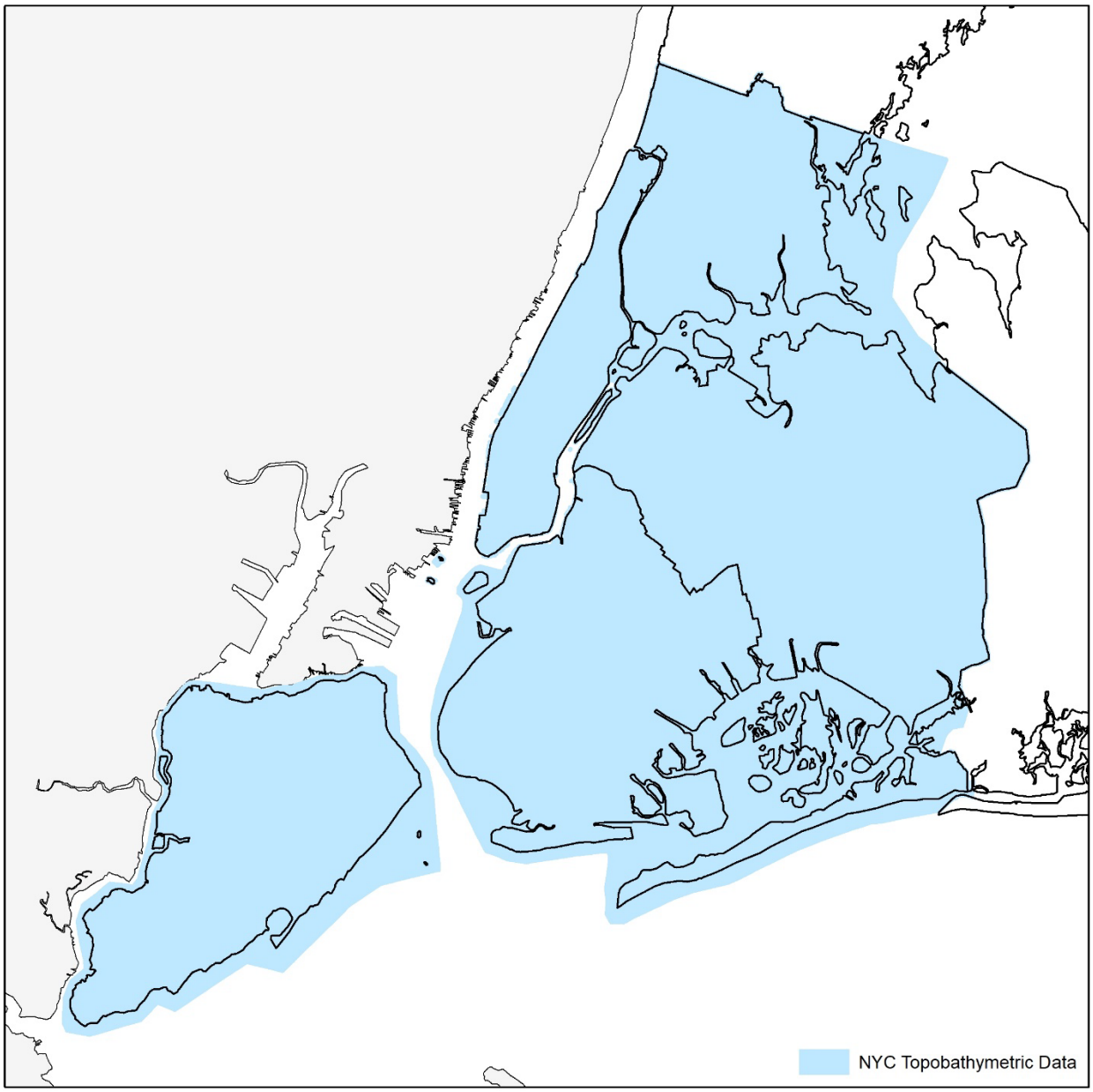


Figure 4. Area collected for high-resolution bathymetric data for New York City

New York still has many coastal nearshore and offshore bathymetric data gaps and areas that need updated and better-quality data, such as Niagara Falls or Lake Ontario with most current QL3 data collected in 2007 and 2011, respectively.

High-level summary of elevation data requirements

The New York State Office of Information Technology Services (ITS) has identified all of New York as in need of inland topographic lidar and nearshore bathymetry. Although this agency is primarily a data producer and provider, it is required to support spatial data related activities ongoing with the New York State Office of Emergency Management, which requires the provision of accurate and up-to-date elevation data to support emergency management activities across the entire state. Emergency management activities involve response to and recovery from incidents, emergencies, and disasters.

Ideally, New York's available topographic elevation data should be less than 10 years old at QL2 or higher, and coastal areas would have more frequent updates every 4-6 years. The New York State ITS also requires these data to support New York forest preserve trail planning and implementation.

Topographic lidar and nearshore bathymetry data are also important to NYC and city and county government agencies for municipal mapping of building footprints, virtual city creation, urban hydrology for surface water flow, capital planning, shoreline change detection, inland change detection, identification of staging locations for crisis events (public safety), elevation studies, flood risk management, mapping first floor elevation of buildings, public event viewsheds and resource siting, and three-dimensional (3D) building models. These data have been identified as a vital part of city and county geospatial data coordination activities.

Also, additional agencies have identified topographic lidar as part of their Mission Critical Activities. The New York State Geological Survey requires topographic lidar data to define the state's geologic framework, as the agency has been striving to create 3D databases that define the spatial relationships between rock and soil from the surface to depth. Examples of derivative uses of the data include farming, soil erosion, slope failures (landslides, bluff erosion, etc.), aggregate resources and mining, natural resource conservation, and groundwater protection. The New York State Department of Transportation requires elevation data for mapping and 3D modeling of the state's transportation system infrastructure. Hydrologic modeling and flood inundation mapping have been identified by local conservation districts as Mission Critical Activities for which updated lidar data are a requirement every 6-10 years. In addition, these data are important for land use and environmental planning pertaining to sea level rise in urbanized areas.

With New York having one of the largest ports in the country (the Port of New York and New Jersey) serving commercial shipping and fishing industries and an abundance of coastal- and marine- dependent tourism along its shores, nearshore and offshore bathymetric data are important for supporting the critical coastal areas of the state. In the New York Coastal Management Program and Final Environmental Impact Statement (https://www.dos.ny.gov/opd/programs/pdfs/NY_CMP.pdf), it is specified that the coastal areas of New York play an important role in furthering and achieving the state's energy goals, as they provide access to shipping corridors, proximity to energy consumers, availability of high volumes of water for cooling or direct production of energy, and strength and consistency of offshore wind resources relative to land-based wind resources. Bathymetric data can be used in efforts involving energy resource development, beach and habitat restoration projects, contaminant studies, and hurricane and storm-related preparedness studies in support of the New York Coastal Zone Management Program. For example, with the Port of New York and New Jersey being the busiest port on the eastern seaboard, concerns raised by the maritime commerce and navigation communities about the placement of offshore wind turbines could be addressed through the use of bathymetric data to support proper placement of these structures to suit the needs of involved stakeholders. In addition to supporting the siting of offshore renewable energy, updated and accurate offshore bathymetric data would be able to support other initiatives, such as efficient maritime transportation or the identification of offshore habitats, including those affected by fisheries or sand replenishment efforts.

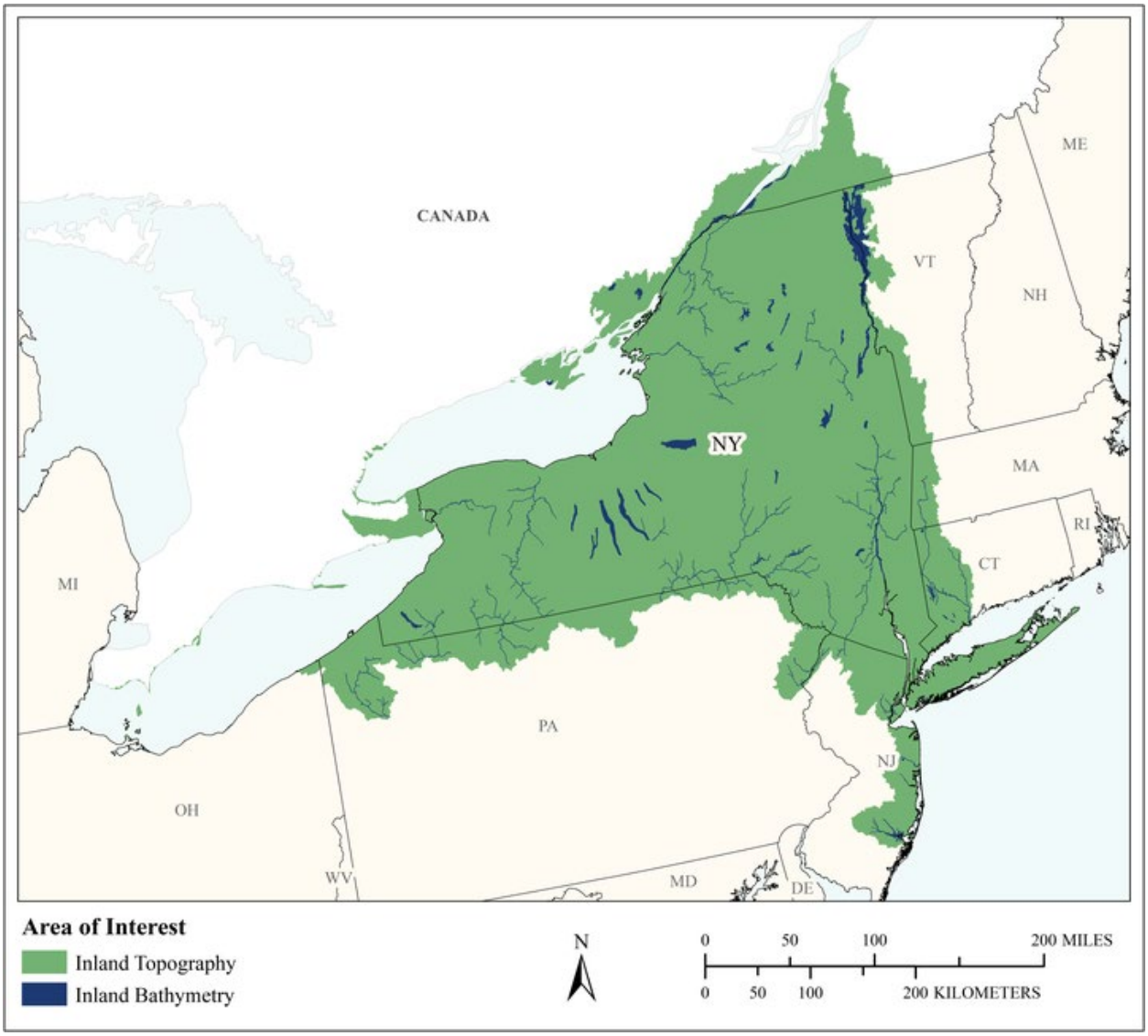
The State of New York has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 15 – Flood Risk Management	Chemung County Soil & Water Conservation District	1224	Hydrologic Modeling	Inland Topo	QL2	6-10 years	$397,940	Unable to quantify	Moderate	Major	Major
				Inland Bathy	QL1B	6-10 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 15 – Flood Risk Management	Tompkins County ITS	21564	Tompkins County GIS and Soil and Water Conservation Support	Inland Topo	QL0	2-3 years	$1,007,888	$113,072	None	Moderate	Major
				Inland Bathy	QL2B	6-10 years	$73,416	$43,416	None	Moderate	Major
BU 16 – Sea Level Rise and Subsidence	Westchester County GIS	1255	Land Use and Environmental Planning	Inland Topo	QL2	Has not been determined	$4,673	Unable to quantify	Moderate	Moderate	Moderate
BU 18 – Homeland Security	NY State Office of Information Technology Services	1177	Data Distribution and Emergency Management Data Support	Inland Topo	QL2	>10 years	$1,038,618	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	QL3B	6-10 years	$2,110	Unable to quantify	I don't know	I don't know	I don't know
BU 18 – Homeland Security	NYS Division of Homeland Security & Emergency Services - Office of Emergency Management	1178	New York State Emergency Management	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	Minor	Moderate	Major
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Minor	Minor	Moderate
				Nearshore Bathy	QL1B	Event driven	Unable to quantify	Unable to quantify	Minor	Minor	Moderate
BU 22 – Infrastructure Management	NYSDOT	1138	Mapping and 3D Modeling of Transportation System Infrastructure	Inland Topo	(a) QL0 HD (b) QL2	4-5 years	$160,000	$60,000	Minor	Moderate	Moderate
				Inland Bathy	Cross sections and/or transects meet needs	4-5 years	Unable to quantify	Unable to quantify	None	Minor	Minor
				Nearshore Bathy	QL2B	4-5 years	Unable to quantify	Unable to quantify	None	Minor	Minor
BU 23 – Urban and Regional Planning	City of New York	1140	Operational Data Support for City of New York Agencies	Inland Topo	QL1	Annually	$101,081,405	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
				Nearshore Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
BU 23 – Urban and Regional Planning	Suffolk County	1183	Suffolk County Enterprise GIS Services	Inland Topo	QL1	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 26 – Education and Basic Research	NY State Geologic Survey	21621	Geological Mapping	Inland Topo	QL1 HD	6-10 years	$31,331	Unable to quantify	Major	Moderate	Major
				Inland Bathy	QL1B	6-10 years	$252,412	Unable to quantify	Major	Minor	Minor
				Nearshore Bathy	QL3B	6-10 years	$603	Unable to quantify	Major	Minor	None
				Offshore Bathy	Order 1	6-10 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 27 – Recreation	New York State Office of Information Technology Services	1217	State Forest Preserve Trail Planning and Implementation	Inland Topo	QL1 HD	>10 years	$9,045	Unable to quantify	None	Moderate	Moderate

MCA Title: Hydrologic Modeling



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more Hydrologic Units (HUC8s)	One or more Hydrologic Units (HUC8s)		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Hydrologic Modeling. H& H modeling, flood mitigation, design of stormwater retention, wetlands attenuation, etc.
MCA Title	Hydrologic Modeling
MCA ID	1224
Organization Type	Regional, County, City, or other local government
Organization Name	Chemung County Soil & Water Conservation District
Sub-Agency or Division	
Organization Mission	Environmental Management in Chemung County
Program Name	Resource Management
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Could be patches of trees, or rock structure but mainly larger building sized targets.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Not required
5.1 – 10 acres	Not required
Greater than 10 acres	Not required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B		
Update Frequency	6-10 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need		
Acceptable Vertical Error	Up to 10 cm	Less than 10 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Highly desirable	Highly desirable		
DEM	Highly desirable	Highly desirable		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Required	Required		
Edited/cube XYZ		Not required		
Full waveform	Highly desirable	Highly desirable		
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required	Required		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Nice to have	Nice to have		
Wetlands	Nice to have	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Highly desirable		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL3 2003, 2005 flights	None		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	We own it in-house, Contracted both flights			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available		
Cost savings/cost reduction	Major	Inland bathy data not available		

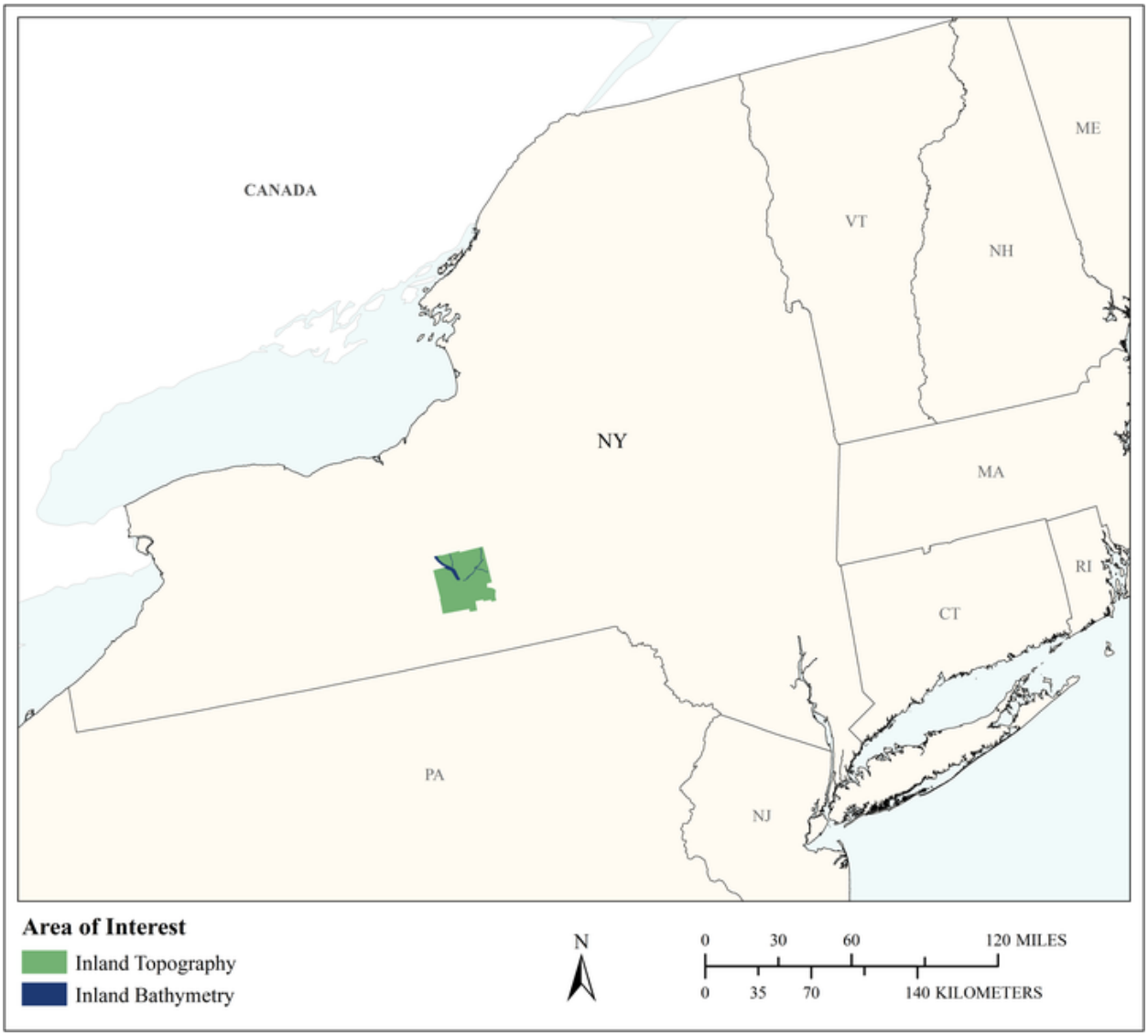
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost avoidance	Major	Inland bathy data not available		
Increased revenues	None	Inland bathy data not available		
Mission-driven performance improvements	Major	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available		
Improved response or timeliness	Major	Inland bathy data not available		
Improved customer experience	Major	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Inland bathy data not available		
Environmental	Major	Inland bathy data not available		
Public safety, including life and property	Major	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$172,940	I don't know	Unable to provide							
Time savings description	Better data is larger and take more time to process for modeling. This can be huge. Depends on how many projects per month. Generally saving 2 days' worth of field work with 2 people per project. Maybe 2-3 projects per month?. This can also be huge in time savings. Fewer field visits with good data available.											
Cost savings/cost reduction	Major	Annual dollars saved/realized	$225,000	I don't know	Unable to provide							
Cost savings/cost reduction description	We contacted to have our county flown before FEMA or the state or anyone else was willing to do it. We raised the money and took it out of County budgets.											
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide							
Increased revenues	Major	Unable to provide		I don't know	Unable to provide							
Increased revenues description	Saves time creating volume estimate for mining excavation.											
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements description	All of these are improved but hard to estimate savings/efficiency.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	Major	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness description	This could be potentially large.											
Improved customer experience	Moderate	Unable to provide		I don't know	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			I don't know								
Education or outreach description	We don't do a lot of education but it would make better.											
Environmental	Major			I don't know								
Environmental description	Could be great depending on how used.											
Public safety, including life and property	Major			I don't know								
Public safety, including life and property description	Could be great depending on how used.											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Tompkins County GIS and Soil and Water Conservation Support



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements	Tompkins County, NY	Tompkins County, NY		

MCA Description	Response
Mission Critical Activity	Flood Inundation Mapping, flood risk mitigation and emergency management and updating our flood insurance maps.
MCA Title	Tompkins County GIS and Soil and Water Conservation Support
MCA ID	21564
Organization Type	Regional, County, City, or other local government
Organization Name	Tompkins County ITS
Sub-Agency or Division	
Organization Mission	The Tompkins County ITS Department provides for the management of core, mandated technology services and infrastructure to facilitate cost-effective information processing and telecommunications solutions to meet program objectives, technical mandates, and public service requirements for Tompkins County departments. The mission of Tompkins County GIS is to serve the Tompkins County Community through the distribution of relevant GIS data and mapping resources to assist departments and municipal stakeholders on an ongoing basis. Tompkins County GIS also focuses on the production and distribution of meaningful datasets, paper maps and interactive mapping applications for local businesses and residents.
Program Name	Environmental Health & Emergency Response
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 22 - Infrastructure and Construction Management
Tertiary Business Use	BU 24 - Health and Human Services

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Sign, culvert, individual buildings

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have

Inland Bathy Feature Size Requirements	Response
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Required
Other	Required
Other description	Cayuga Lake, Dryden Lake

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL2B		
Update Frequency	2-3 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Up to 2 meters		
Acceptable Vertical Error	Up to 10 cm	Up to 50 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Required			Required	
Entire AOI under same environmental conditions	Required	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Required	Required		
Edited/cube XYZ		Not required		
Full waveform	Highly desirable	Highly desirable		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Point cloud, DEM and other products from LIDAR Collection in May 2008 1 meter RMSE horizontal, .085 meter RMSE vertical	1' Topo surveys currently completed on all stream/culvert projects		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	New York State GIS Clearinghouse, Cornell University Geospatial Information Repository			
Other	Yes	Yes		
Other description	Internal	Internal		

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Moderate		
Cost savings/cost reduction	Minor	Minor		
Cost avoidance	Major	Major		
Increased revenues	Moderate	Moderate		
Mission-driven performance improvements	Major	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		
Improved response or timeliness	Moderate	Moderate		
Improved customer experience	Major	Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor		
Environmental	Major	Major		
Public safety, including life and property	Major	Major		

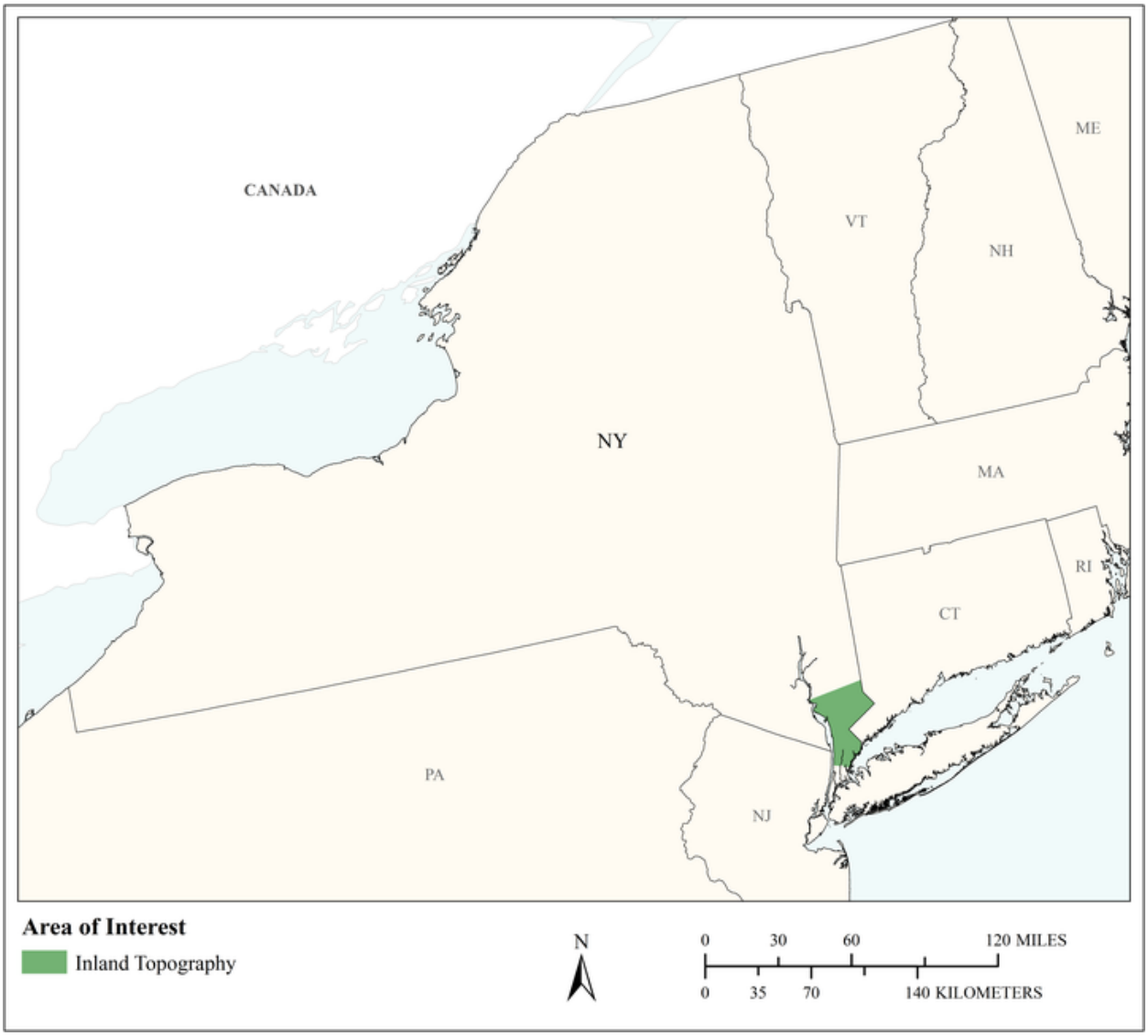
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$57,888	Major	Annual dollars saved/realized	$43,416						
Time savings description	Having this data in the same projection as our other data is a great benefit. We get a lot of request for the data from local engineering firms we save time by providing an application for them to download the data. Environmental group use data almost daily. Environmental Group can look at the data and scope out where they need to visit instead of doing an whole area. Various Departments and Engineer can use data for site planning and ground truthing.			TCSWCD staff view stream information for stream stabilization, culvert replacement projects. 1' Topo surveys currently completed on all stream/culvert projects. Having more data up front help with watershed/stream studies. TCSWCD work with data on daily basis for stream related projects. Data collection needed on all projects we design.								
Cost savings/cost reduction	Major	Annual dollars saved/realized	$150,000	Major	Annual dollars saved/realized	$30,000						
Cost savings/cost reduction description	It cost us that to acquire our own back in 2008.			Cost for staff time to survey and process data.								
Cost avoidance	Major	Annual dollars saved/realized	$800,000	Major	Unable to provide							
Cost avoidance description	Based on estimate of flooding damage due to flash flooding in 2015. Court cases involving crashes due to sloping issues. We paid a contractor to do this the last time.			Staff have to process all survey data. Data will help to direct options for stream projects -flood reduction. Help with landuse decisions, where to locate homes.								
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Moderate	Annual percent improvement	40%	Major	Annual percent improvement	43%						
Mission-driven performance improvements description	There have been many changes to the land due to flooding erosion a major problem new areas are flooding having update info is key. Would be really helpful for our Environmental Group to have updated data. Ability to disseminate updated 3D info would increase our effectiveness.			With streams can't see a lot from aerials and topos. Hard to make any decisions before survey/field visit. More accurate data helps with our work. Help to plan more effectively, plan projects faster with updated data that captures erosion, slopes.								
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$43,416	Major	Annual dollars saved/realized	$43,416						
Improved response or timeliness	Major	Annual dollars saved/realized	$40,522	Major	Unable to provide							
Improved response or timeliness description	Based on last flood event having updated data would help us to put maps on our site showing at risk areas.			Having data without all field work can save a lot of time. Help communicate risk to landowners and municipalities.								
Improved customer experience	Major	Annual dollars saved/realized	$27,135	I don't know	Unable to provide							
Other customer service benefits	Major	Annual dollars saved/realized	$2,000									
Other customer service benefits description	An estimate of income from data request from the old 2008 elevation data. 3D data requests from local engineering firms.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			None								

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Environmental	Moderate	Moderate		
Environmental description	Environmental Health group will use the data to assist in their day-to-day work on well and septic system design	TCSWCD works a lot with streams, wetlands, erosion and drainage issues. More accurate data especially of streams is highly needed/helpful		
Public safety, including life and property	Major	Major		
Public safety, including life and property description	Update flood models, Help with stream bank erosion, update wetland areas, conduct predictive modelling for areas in flood plain during major storms	Update flood models, stream erosion, help with education/outreach to landowners and municipalities		
Other	Planning and Case Management			
Other benefits	Moderate			
Other description	Line of sight and view shed analysis can help to reduce court cases against the County			

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness		Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Land Use and Environmental Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements	Westchester County, NY			

MCA Description	Response
Mission Critical Activity	Land Use and Environmental Planning, 3D rendering of built environment in urban areas (6 cities in county). Planimetric mapping done separately from imagery, also Land Use/Land Cover. Elevation data are needed for Sea Level Rise planning.
MCA Title	Land Use and Environmental Planning
MCA ID	1255
Organization Type	Regional, County, City, or other local government
Organization Name	Westchester County GIS
Sub-Agency or Division	
Organization Mission	Provide GIS/geospatial solutions to County and local governments
Program Name	Westchester County GIS
Total Annual Program Budget	
Primary Business Use	BU 16 - Sea Level Rise and Subsidence
Secondary Business Use	BU 23 - Urban and Regional Planning
Tertiary Business Use	BU 03 - Coastal Zone Management

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	95% of all 3D questions focus on modeling structures.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	Has not been determined			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	I don't know			
Acceptable Vertical Error	I don't know			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed	To MHW			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial			
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Nice to have					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have					
DEM for entire AOI needs to be seamless	Nice to have					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Highly desirable			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Nice to have			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Lidar data collected approximately 2009 co-op program with NYC Dept. of Environmental Protection and USGS.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes			
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	Local repository			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None			
Cost savings/cost reduction	None			

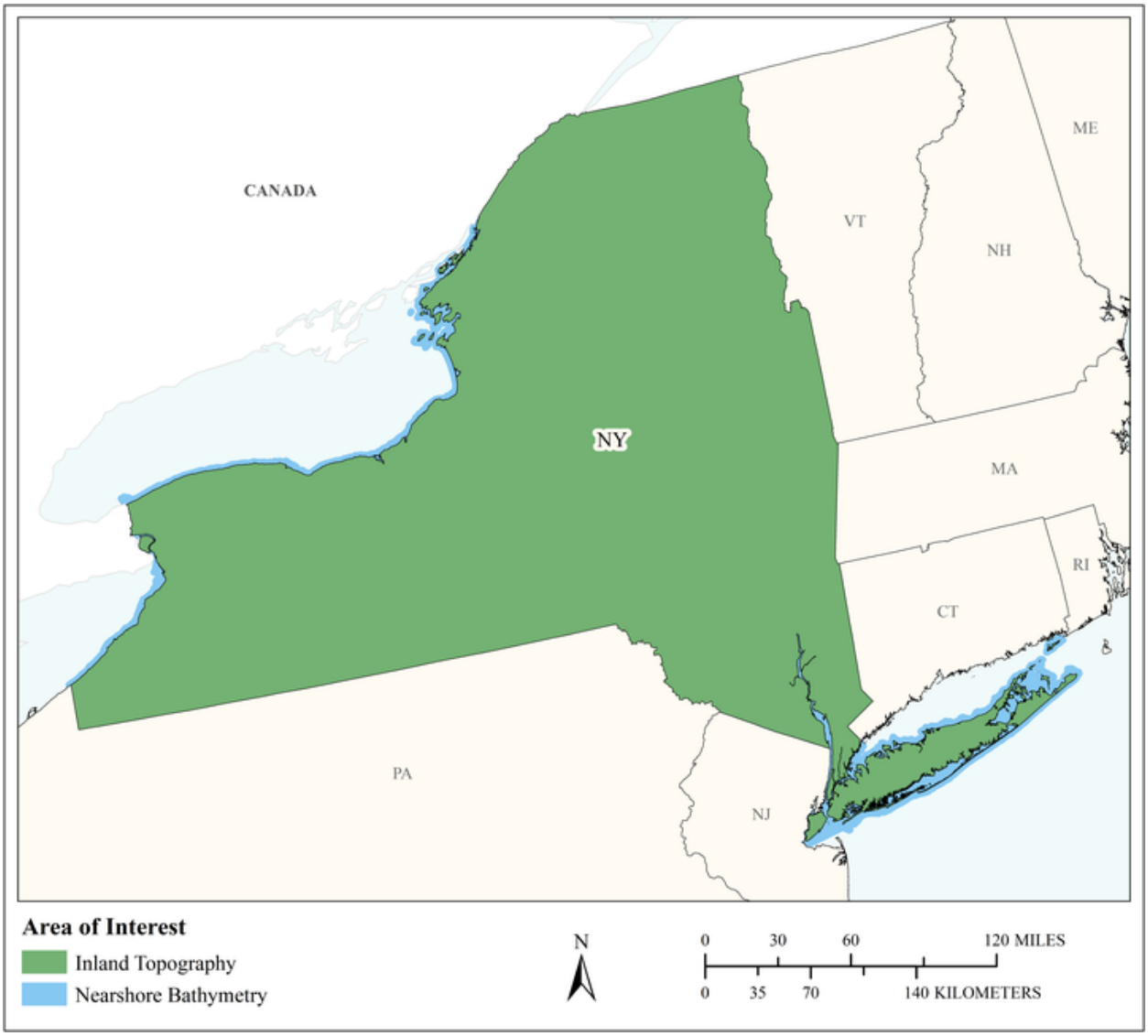
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Cost avoidance	None			
Increased revenues	None			
Mission-driven performance improvements	None			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None			
Improved response or timeliness	None			
Improved customer experience	None			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Moderate			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$4,673									
Time savings description	Estimate from making data available. Estimate.											
Cost savings/cost reduction	Major	Unable to provide										
Cost savings/cost reduction description	Obvious cost savings of cooperatively acquiring imagery vs. going solo.											
Cost avoidance	I don't know	Unable to provide										
Cost avoidance description	Have not handled data to this degree; no justification. Have not been involved to date. Has not been discussed/considered to date; no authority.											
Increased revenues	None											
Mission-driven performance improvements	Moderate	Unable to provide										
Mission-driven performance improvements description	Authority not established.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Improved customer experience description	Only assume we would be able to generate better/richer geospatial applications. No previous involvement; no reference point.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Moderate											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Data Distribution and Emergency Management Data Support



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Nice to have	
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	While our main role is as a GIS data producer and provider including for LIDAR and elevation data, we are required to support GIS activities at the State Office of Emergency Management. Thus, we need to provide accurate and up-to-date elevation data to support emergency management activities.
MCA Title	Data Distribution and Emergency Management Data Support
MCA ID	1177
Organization Type	State or U.S. Territorial government
Organization Name	NY State Office of Information Technology Services
Sub-Agency or Division	
Organization Mission	Statewide GIS Data Programs, such as orthoimagery, addresses, and LIDAR. We are part of the consolidated IT agency for NY State agencies.
Program Name	GIS Support of Emergency Management and Response activities.
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Anything large enough to significantly block line of sight, either for viewshed or for communication purposes. For example, a building or a row of trees.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2		QL3B	
Update Frequency	>10 years		6-10 years	
Event type(s)				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI	Coastal and riverine areas may need more frequent updates. Atlantic coast = 4 years, Great lakes and riverine areas depend on development: floodprone and developed = 6 years			
Acceptable Horizontal Error	Up to 1 meter		Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm		Up to 30 cm	
How far onshore needed			1 kilometer inland	
How far down the beach profile needed	Not applicable		Below MLLW	
Tide correction requirement			MLLW	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required		Highly desirable			Not required
Entire AOI under same environmental conditions	Nice to have		Highly desirable			Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable		Highly desirable			Nice to have
DEM for entire AOI needs to be seamless	Highly desirable		Highly desirable			Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to double the required TVU at the 95% confidence level			Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required		Highly desirable	
DTM	Required		Highly desirable	
DEM	Required		Required	
Raw point cloud data	Not required		Not required	
Classified point cloud	Required		Required	
Edited/cube XYZ			I don't know	
Full waveform	Nice to have		I don't know	
Bathymetric Attributed Grid (BAG)			Highly desirable	
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Nice to have		Nice to have	
Ground control/ground truthing	Required		Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required		Highly desirable	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Not required	
Submerged features			Nice to have	
Subbottom characteristics			Not required	
Geologic and seismic data	Not required		Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Not required	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Highly desirable	
Lease areas			Nice to have	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Highly desirable		Highly desirable	
Land use/land cover	Nice to have		Nice to have	
Wetlands	Highly desirable		Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Highly desirable		Not required	
Bridges/culverts	Highly desirable			
Landmark features	Not required		Not required	
Cultural resources	Not required		Not required	
Coastal and riverine structures	Highly desirable		Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Statewide, the source data for DEM's is about 60% QL2, 20% LIDAR of lesser quality, and the remainder from USGS 7.5-minute quads. Much of the LIDAR is older than 8-years old at this point.		Not using any	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			

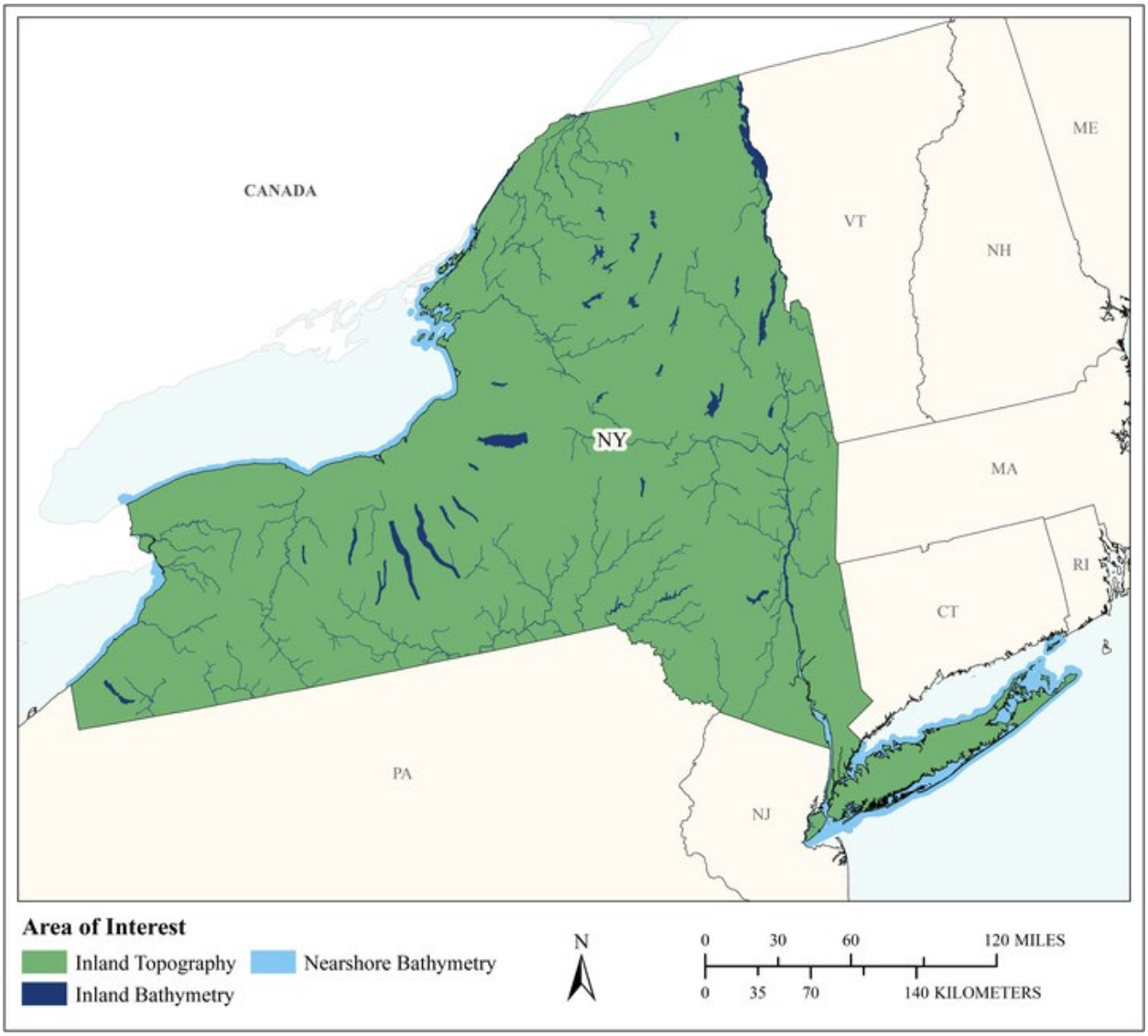
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
State repositories used	http://gis.ny.gov/elevation/ In addition to data collected in State projects, this includes copies of data from Federal and County collections.			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor		I don't know	
Cost savings/cost reduction	Minor		I don't know	
Cost avoidance	Moderate		I don't know	
Increased revenues	None		I don't know	
Mission-driven performance improvements	Minor		I don't know	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		I don't know	
Improved response or timeliness	Moderate		I don't know	
Improved customer experience	Minor		I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None		I don't know	
Environmental	Moderate		I don't know	
Public safety, including life and property	Moderate		I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$3,618				Minor	Annual dollars saved/realized	$2,110			
Time savings description	When State agencies use the same elevation data, collaboration is easier.											
Cost savings/cost reduction	Major	Annual dollars saved/realized	$1,000,000				None					
Cost savings/cost reduction description	If other agencies collect data and share, we don't have to collect for that area.											
Cost avoidance	Moderate	Annual dollars saved/realized	$35,000				Minor	Unable to provide				
Cost avoidance description	If we don't have to cover an area with our project, we don't have to complete the review steps. Our direct part is minor. We don't complete the process of mitigation, but supply the data used in the process.											
Increased revenues	None						None					
Mission-driven performance improvements	Major	Annual percent improvement	30%				Moderate	Unable to provide				
Mission-driven performance improvements description	Projects completed by other agencies allow our office to do other things. Our mission is to update the elevation data statewide, so good data from elsewhere helps.						Having more info on near-shore features will improve hazard modeling along shoreline.					
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	None						I don't know	Unable to provide				
Improved response or timeliness	Minor	Unable to provide					I don't know	Unable to provide				
Improved response or timeliness description	We don't issue the warnings, but supply data and some analysis to those who do.											
Improved customer experience	Moderate	Unable to provide					I don't know	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know						I don't know					
Environmental	I don't know						I don't know					
Public safety, including life and property	I don't know						I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes		Yes	
Hillshades	Yes			
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: New York State Emergency Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Respond to and recover from incidents, emergencies, and disasters.
MCA Title	New York State Emergency Management
MCA ID	1178
Organization Type	State or U.S. Territorial government
Organization Name	NYS Division of Homeland Security & Emergency Services - Office of Emergency Management
Sub-Agency or Division	
Organization Mission	Provides leadership, coordination, and support to prevent, protect against, prepare for, respond to, recover from, and mitigate man-made and natural disasters and other emergencies.
Program Name	State Emergency Operations Center
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Substation transformer

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Nice to have

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Nice to have
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL1B	
Update Frequency	4-5 years	4-5 years	Event driven only – Data need to coincide with a specific event.	
Event type(s)			Event driven only	
Quality Level and/or update frequency variability across AOI	Coastal areas more frequently			
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs		Partial	Partial	
Cross section/transect requirement		Tidal estuary		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Nice to have	Nice to have		Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Nice to have	Nice to have		Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Not required	Not required	
DTM	Required	Not required	Not required	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Nice to have	Nice to have	
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Not required	Not required	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	
Ground control/ground truthing	Highly desirable	Nice to have	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Highly desirable	Highly desirable	Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Highly desirable	
Tide/wave heights			Required	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Nice to have	
Boundaries			Highly desirable	
Routes			Required	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Required	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Nice to have	Nice to have	Highly desirable	
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Data used are primarily 1 - 2 meter DEMs from LIDAR collected for FEMA DFIRMs. Dates vary.	State collected	Data has been use to support surge and wave estimates	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	Data collected by NYS ITS GIS Program Office in coordination with USGS.	Compiled primarily for inland fishery management purposes		

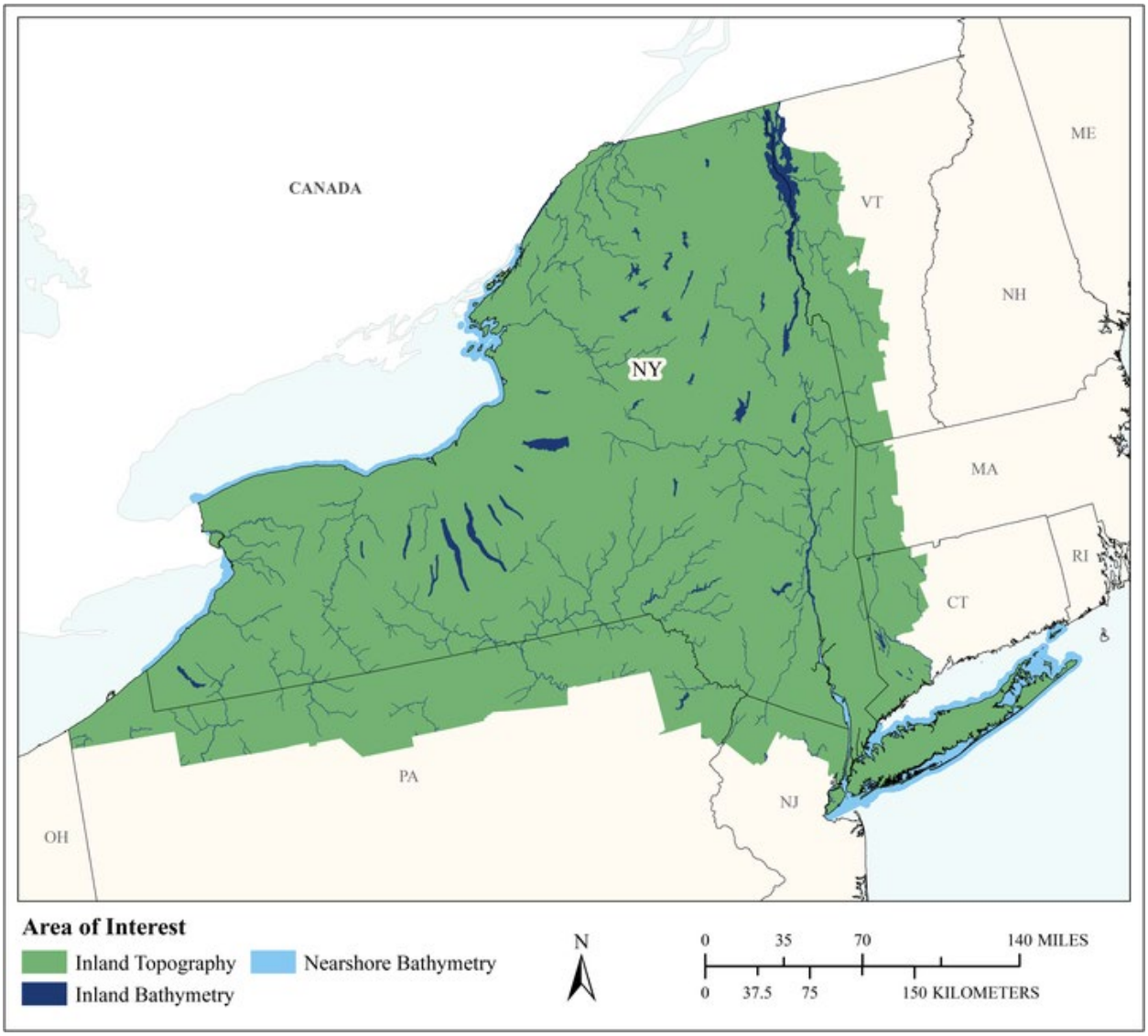
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Moderate	
Cost savings/cost reduction	Major	Minor	I don't know	
Cost avoidance	Major	Minor	Minor	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	Moderate	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Minor	
Improved response or timeliness	Major	Moderate	Moderate	
Improved customer experience	Moderate	Minor	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	Minor	
Environmental	Minor	Moderate	Minor	
Public safety, including life and property	Major	Moderate	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Increased revenues	Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Other operational benefits	Moderate	Unable to provide		Minor	Unable to provide							
Other operational benefits description												
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Other customer service benefits				Minor	Unable to provide							
Other customer service benefits description												
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			Minor					
Environmental	Moderate			Minor			Minor					
Public safety, including life and property	Major			Moderate			Moderate					
Public safety, including life and property description	Data facilitates improved situational awareness and in turn better emergency response			Dam break modeling where detailed engineering analysis is not available								
Other												
Other benefits				Minor								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Mapping and 3D Modeling of Transportation System Infrastructure



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Area split by varying quality level or update frequency	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements	New York and adjoining counties	New York and adjoining counties		

MCA Description	Response
Mission Critical Activity	Mapping and 3D modeling of Transportation System Infrastructure
MCA Title	Mapping and 3D Modeling of Transportation System Infrastructure
MCA ID	1138
Organization Type	State or U.S. Territorial government
Organization Name	NYSDOT
Sub-Agency or Division	
Organization Mission	It is the mission of the New York State Department of Transportation to ensure our customers - those who live, work and travel in New York State -- have a safe, efficient, balanced and environmentally sound transportation system.
Program Name	Roadway Design
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 16 - Sea Level Rise and Subsidence
Tertiary Business Use	BU 19 - Land Navigation and Safety

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Road lines, pavement striping, signs, curbs, underwater obstructions that are large enough to sink a boat

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	(a) QL0 HD (b) QL2	Cross sections and/or transects meet needs	QL2B	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI	Quality Level and update frequency applies only to NY state and its corresponding counties. For the surrounding states, we will take what we can get because it is used very infrequently. Requirements vary based on individual project needs. Could be anywhere in the state.			
Acceptable Horizontal Error	Less than 20 cm	Less than 50 cm	Less than 50 cm	
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm	Up to 40 cm	
How far onshore needed			To Mean Lower Low Water (MLLW)	
How far down the beach profile needed	To MHW		To MLLW	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs		Yes	Partial	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross section/transect requirement		Data is provided by survey unit based on top of bank and bottom of bank as well as changes in terrain. Not aware if there is a target sampling density. Cross sections are only required for a small portion of our AOI. Typically 1,000 to 1,500 feet upstream and downstream of individual bridges.	Vertical accuracies and sampling densities vary by project. There is not a standard.	

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required	Not required		Not required	Not required
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Nice to have		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Nice to have		Highly desirable	Not required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Not required	Not required	
DTM	Highly desirable	Nice to have	Not required	
DEM	Required	Nice to have	Nice to have	
Raw point cloud data	Highly desirable	Nice to have	Nice to have	
Classified point cloud	Required	Nice to have	Nice to have	
Edited/cube XYZ		Not required	Not required	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Not required	Not required	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Not required	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Required	Nice to have	Not required	
Ground control/ground truthing	Required	Nice to have	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Nice to have	Nice to have	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Not required	
Submerged features			Nice to have	
Subbottom characteristics			Not required	
Geologic and seismic data	Not required	Not required	Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Not required	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required	Nice to have	Not required	
Land use/land cover	Highly desirable	Not required	Not required	
Wetlands	Highly desirable	Nice to have	Not required	
Estuaries			Not required	
Inland surface water features	Highly desirable	Nice to have	Not required	
Bridges/culverts	Required	Nice to have		
Landmark features	Not required	Not required	Not required	
Cultural resources	Not required	Not required	Not required	
Coastal and riverine structures	Highly desirable	Nice to have	Nice to have	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We use a mix of data from the following sources: NY Counties, USGS, USDA, FEMA, NYSDEC, NYSDEP, and NYSGPO. It is typically QL2 data, but some are not up to QL2 standards	Currently not using inland bathymetry and have not contracted for the data due to limitations in turbid water conditions	Not currently using any bathymetry data other than surveyed transects or cross sections	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes			
NCEI		Yes		
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State repositories used	The New York State GIS Clearinghouse			
Other	Yes	Yes	Yes	
Other description	Contract for our own flights	Survey from individual projects	Survey Data	
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available	None	
Cost savings/cost reduction	Major	Inland bathy data not available	None	
Cost avoidance	Major	Inland bathy data not available	None	
Increased revenues	None	Inland bathy data not available	None	
Mission-driven performance improvements	Major	Inland bathy data not available	None	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available	None	
Improved response or timeliness	Major	Inland bathy data not available	None	
Improved customer experience	Major	Inland bathy data not available	None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Inland bathy data not available	None	
Environmental	Major	Inland bathy data not available	None	
Public safety, including life and property	Major	Inland bathy data not available	None	

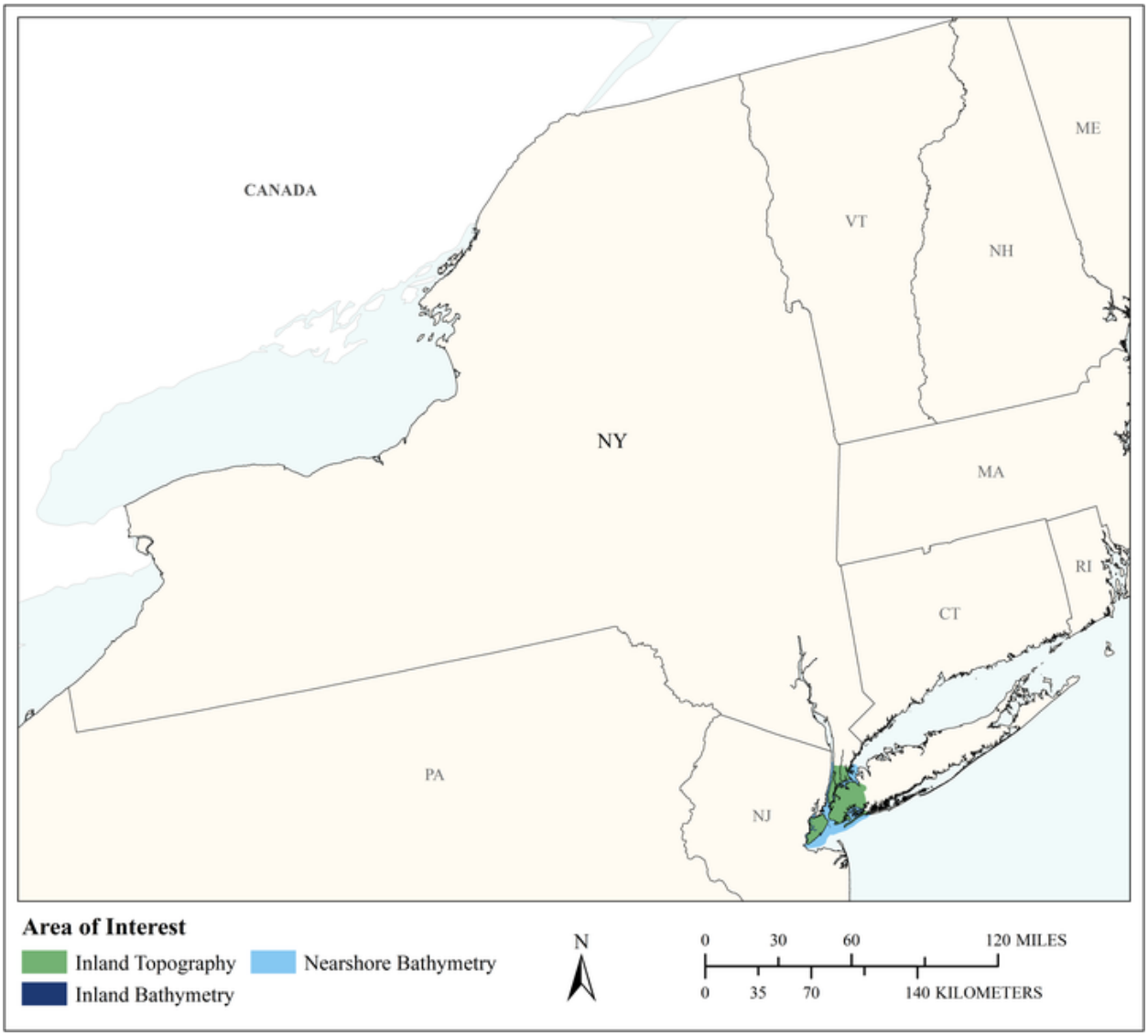
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Time savings description	Estimated for 20 projects at 3 hrs/day. Converted to dollars below. Estimated for 20 projects at 2 hrs/day. Converted to dollars below. Estimated for 20 projects at 1 day/project 7.5 hrs/day. Converted to dollars below. Estimated for 20 projects at 3 days/project. 7.5 hrs/day. Converted to dollars below.											
Cost savings/cost reduction	Major	Annual dollars saved/realized	$60,000	Moderate	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction description	VERY rough estimate based on 2017 AB LiDAR costs w/ increase.			Survey cost of hydraulic cross sections is not known or hard to estimate.								
Cost avoidance	Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Increased revenues	None			None			None					
Mission-driven performance improvements	Moderate	Annual percent improvement	17%	I don't know	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements description	Would allow quick modeling to make decisions faster. Would provide accurate data on demand to provide flexibility and allow rapid response. Would allow us to create 3D models without concern for flight seasons.											
Other operational benefits	Moderate	Annual dollars saved/realized	$100,000				Minor	Unable to provide				
Other operational benefits description	VERY rough estimate based on the numbers above computed with hours for a grade 20 salary.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Improved response or timeliness	Major	Annual dollars saved/realized	$60,000	I don't know	Unable to provide		Minor	Unable to provide				
Improved response or timeliness description	VERY rough estimate for two incidents/year at a savings of approximately 25,000 each. VERY rough estimate.											
Improved customer experience	Minor	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			None			None					
Education or outreach description	Possible use for public presentations											
Environmental	Moderate			Minor			Minor					
Environmental description	Help with wetland delineation and detection of encroachment on wetlands. Help with drainage or flooding studies.			Improved capabilities for hydrologic modelling			May make environmental analysis easier					
Public safety, including life and property	Moderate			Minor			Minor					
Public safety, including life and property description				Reduce the amount of cost associated with collecting data to evaluate the threat of flooding at choke points such as bridges and culverts			May help improve hydrologic modelling					

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other				
Other benefits		Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes	Yes	
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Operational Data Support for City of New York Agencies



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Respondent provided own shapefile, KML, or geodatabase	Respondent provided own shapefile, KML, or geodatabase	Respondent provided own shapefile, KML, or geodatabase	
Sub Area Requirements	New York City, NY	New York City, NY	New York City, NY	

MCA Description	Response
Mission Critical Activity	Municipal mapping of building footprints, virtual city creation. Elevation data are needed for urban hydrology for surface water flow, capital planning, shoreline change detection, inland change detection, Identify staging locations for crisis events (public safety), elevation studies, flood risk management, building first floor elevations, public event viewsheds and resource siting, 3D building models. Elevation data support many city government agencies. Elevation data are a vital part of the city's geospatial data coordination activities.
MCA Title	Operational Data Support for City of New York Agencies
MCA ID	1140
Organization Type	Regional, County, City, or other local government
Organization Name	City of New York
Sub-Agency or Division	
Organization Mission	The Department of Information Technology and Telecommunications (DoITT) is the City's technology and telecommunications leader and information technology (IT) utility, providing innovative and efficient infrastructure and services for New York City's residents, businesses, employees, and visitors. DoITT is responsible for modernizing, unlocking, and innovating to improve IT infrastructure and service delivery in New York City government: implementing state-of-the-art information technology solutions to improve services; making government more transparent and accountable; and employing cutting-edge tools, methods, and partnerships to empower New Yorkers. DoITT maintains the foundational IT systems that touch every aspect of City life. From public safety to human services, and from education to economic development, DoITT's impact spans the full spectrum of government operations and services to the public.
Program Name	Our agency manages contracting for elevation data capture projects and then makes that data and derived products available to other city agencies and the public.
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 22 - Infrastructure and Construction Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)

General Geographic Area and Size	
Description of smallest 3D features	Individual trees and canopy are important for urban forestry uses by the NYC Dept. of Parks and Recreation. Street furniture/sidewalk features would be of interest to NYC Dept. of Transportation, Dept. of Design and Construction.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Highly desirable
51 - 100 ft	Not required
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Not required
5.1 – 10 acres	Not required
Greater than 10 acres	Not required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL1B	
Update Frequency	Annually	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 30 cm	Less than 50 cm	Less than 50 cm	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed			To Mean Higher High Water (MHHW)	
How far down the beach profile needed	Below MLLW		Continuous data capture: near offshore plus inland for NYC	
Tide correction requirement			MLLW	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Required

Hydrologic Processing Required	Response
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Required	Required		Required	Required
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required		Required	Required
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Required	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Required	Required	Required	
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Not required	Not required	
Full waveform	Not required	Required	Required	
Bathymetric Attributed Grid (BAG)		Not required	Not required	
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Not required	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Required	Required	Required	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Not required	
Geologic and seismic data	Not required	Not required	Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Not required	
Routes			Nice to have	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Required	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Required	Required	Required	
Wetlands	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Nice to have	Required	Highly desirable	
Cultural resources	Nice to have	Required	Highly desirable	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy

Current dataset used	2017 QL1 topobathy Current DEM source metadata: https://github.com/CityOfNewYork/nyc-geo-metadata/blob/master/Metadata/Metadata_DigitalElevationModel.md Description: A bare-earth, hydro-flattened, digital-elevation surface model derived from 2010 Light Detection and Ranging (LiDAR) data. Surface models are raster representations derived by interpolating the LiDAR point data to produce a seamless gridded elevation data set. A Digital Elevation Model (DEM) is a surface model generated from the LiDAR returns that correspond to the ground with all buildings, trees and other above ground features removed. The cell values represent the elevation of the ground relative to sea level. The DEM was generated by interpolating the LiDAR ground points to create a 1 foot resolution seamless surface. Cell values correspond to the ground elevation value (feet) above sea level. A proprietary approach to surface model generation	Very little inland bathy in the 2017 QL1 topobathy	2017 QL1 topobathy	

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
	was developed that reduced spurious elevation values in areas where there were no LiDAR returns, primarily beneath buildings and over water. This was combined with a detailed manual QA/QC process, with emphasis on accurate representation of docks and bare-earth within 2000ft of the water bodies surrounding each of the five boroughs.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes	Yes	Yes	
Other description	NYC Opendata	NYC has none. Don't know where city agencies get it.	Unknown	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	I don't know	I don't know	
Cost savings/cost reduction	Major	I don't know	I don't know	
Cost avoidance	I don't know	I don't know	I don't know	

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	Major	I don't know	I don't know	
Mission-driven performance improvements	Moderate	I don't know	I don't know	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	I don't know	I don't know	
Improved response or timeliness	Major	I don't know	I don't know	
Improved customer experience	Major	I don't know	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	I don't know	I don't know	
Environmental	Major	I don't know	I don't know	
Public safety, including life and property	Major	I don't know	I don't know	

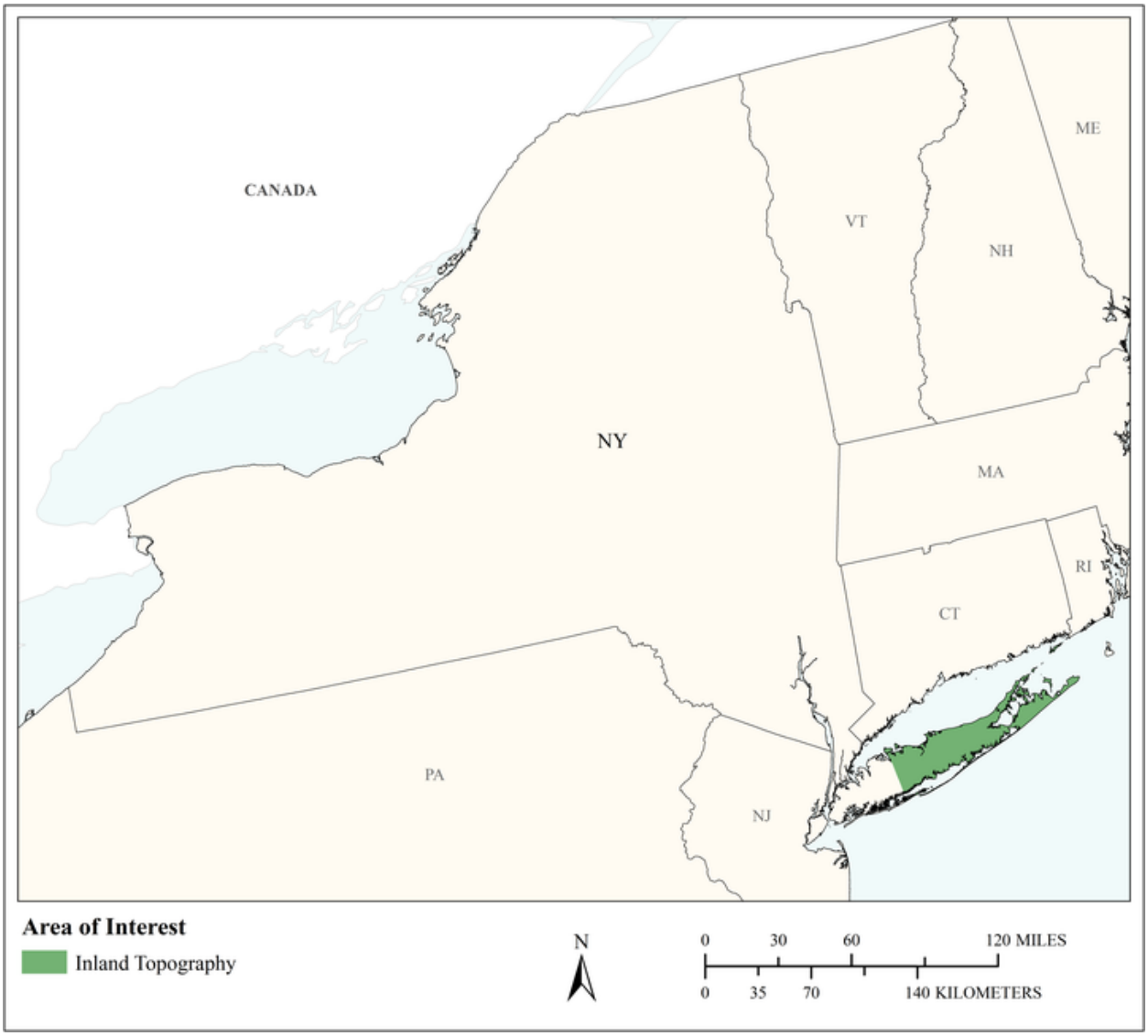
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$51,255	Major	Unable to provide		Moderate	Unable to provide				
Time savings description	Researching building constructions/demolitions. Only starting to receive benefits here because LiDAR data is a new resource. Urban landscape change analysis applications. Better estimation of changes helps work force deployment.			Anticipated answer, don't have the data from the current capture yet.			Anticipated answer, don't have the data from the current capture yet.					
Cost savings/cost reduction	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost savings/cost reduction description	Tax assessor using change detection – will be major revenues. Data products are new to city agencies, have not been fully operationalized yet.			Anticipated answer, don't have the data from the current capture yet.			Anticipated answer, don't have the data from the current capture yet.					
Cost avoidance	Moderate	Annual dollars saved/realized	$100,000,000	I don't know	Unable to provide		Major	Unable to provide				
Cost avoidance description	Savings anticipated through improved flood zone mapping for hurricanes and storm surges. Data products are new to city agencies, have not been fully operationalized yet.			Anticipated answer, don't have the data from the current capture yet.			Anticipated answer, don't have the data from the current capture yet.					
Increased revenues	Major	Annual dollars saved/realized	$1,000,000	Moderate	Unable to provide		Moderate	Unable to provide				
Increased revenues description	Updated tax assessment revenue increases. Data products are new to city agencies, have not been fully operationalized yet.			Anticipated answer, don't have the data from the current capture yet.			Anticipated answer, don't have the data from the current capture yet.					
Mission-driven performance improvements	Major	Annual percent improvement	50%	Minor	Unable to provide		Moderate	Unable to provide				
Mission-driven performance improvements description	3D data provides another ground truth source that improves other mapping products.			Anticipated answer, don't have the data from the current capture yet.			Anticipated answer, don't have the data from the current capture yet.					
Other operational benefits	Major	Annual dollars saved/realized	$30,150									
Other operational benefits description	Improved mapping accuracy.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Value added to products or services description	Difficult to estimate, many city agencies will use elevation data products in different ways.			Anticipated answer, don't have the data from the current capture yet.			Anticipated answer, don't have the data from the current capture yet.					
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness description	Anticipated answer, data products are new to city agencies, have not been fully operationalized yet.			Anticipated answer, don't have the data from the current capture yet.			Anticipated answer, don't have the data from the current capture yet.					
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved customer experience description	Data products are new to city agencies, have not been fully operationalized yet. Data availability will need to change to better accommodate 3D data. Will need to wait and see. Customers already expect 100% accuracy, so don't know if an improved accuracy will be noticed immediately.			Anticipated answer, don't have the data from the current capture yet.			Anticipated answer, don't have the data from the current capture yet.					

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Societal Benefits	**Benefits**	**Benefits**	**Benefits**	**Benefits**
Education or outreach	Moderate	Moderate	Moderate	
Education or outreach description	Anticipated answer, data products are new to city agencies, have not been fully operationalized yet.	Anticipated answer, don't have the data from the current capture yet.	Anticipated answer, don't have the data from the current capture yet.	
Environmental	Moderate	Moderate	Moderate	
Environmental description	Anticipated answer, data products are new to city agencies, have not been fully operationalized yet.	Anticipated answer, don't have the data from the current capture yet.	Anticipated answer, don't have the data from the current capture yet.	
Public safety, including life and property	Moderate	Moderate	Moderate	
Public safety, including life and property description	Anticipated answer, data products are new to city agencies, have not been fully operationalized yet.	Anticipated answer, don't have the data from the current capture yet.	Anticipated answer, don't have the data from the current capture yet.	

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes	Yes	Yes	
Curvature maps				
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes	Yes	Yes	
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Suffolk County Enterprise GIS Services



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements	Suffolk County, NY			

MCA Description	Response
Mission Critical Activity	Support GIS Enterprise Platform
MCA Title	Suffolk County Enterprise GIS Services
MCA ID	1183
Organization Type	Regional, County, City, or other local government
Organization Name	Suffolk County
Sub-Agency or Division	
Organization Mission	Provide GIS support.
Program Name	Suffolk County GIS Viewer
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 30 - Maritime and Land Boundary Management
Tertiary Business Use	BU 15 - Flood Risk Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Structures

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	DEM			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	Qwn			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Moderate			

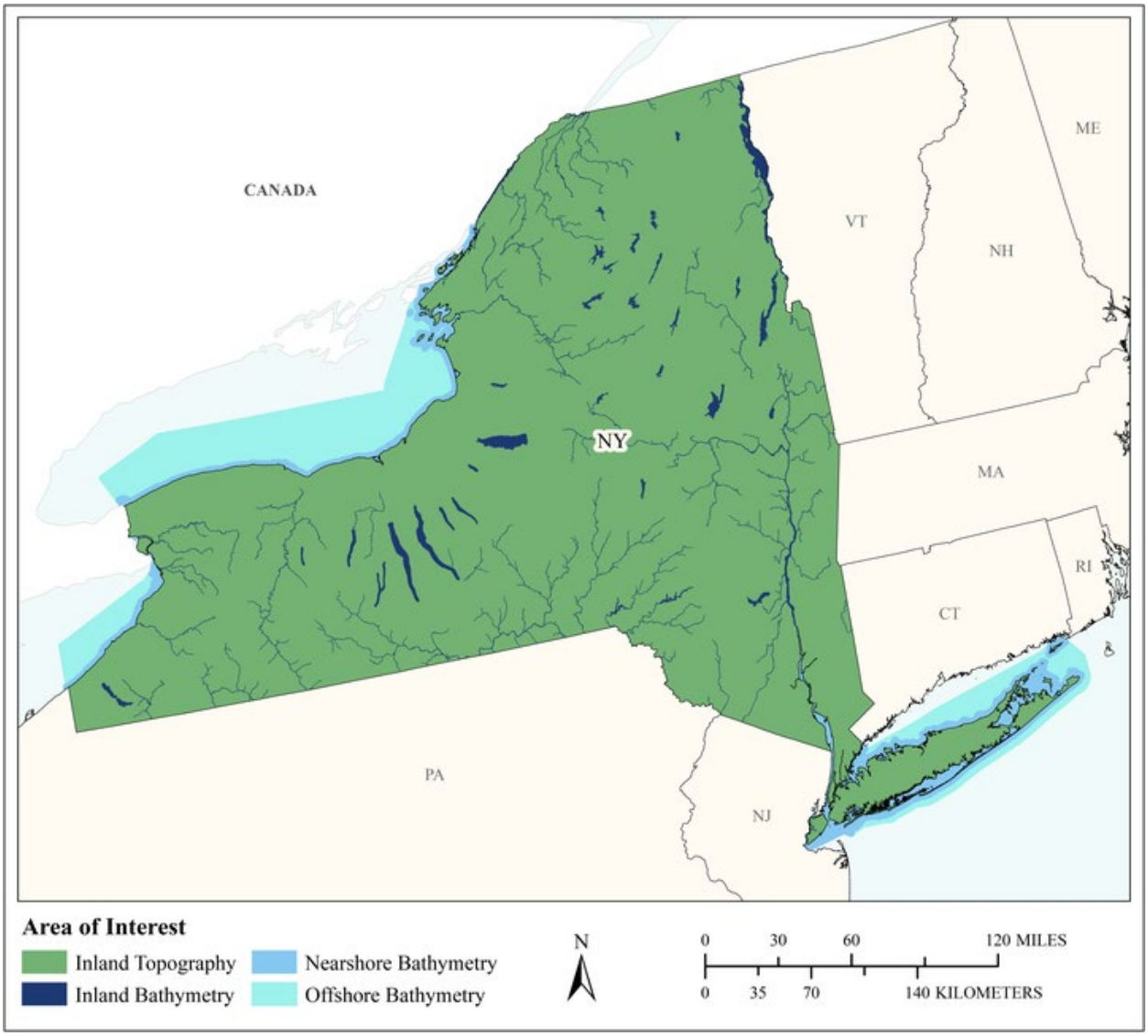
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide										
Cost savings/cost reduction	I don't know	Unable to provide										
Cost avoidance	I don't know	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	I don't know	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide										
Improved response or timeliness	I don't know	Unable to provide										
Improved customer experience	I don't know	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Geological Mapping



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Highly desirable	Highly desirable	Highly desirable
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Geological Mapping is our Mission Critical Activity. The goal of this work is to define the geologic framework. Historically this has been represented by 2D geologic maps, but within the last 10 years we have been striving to create 3D databases that define the spatial relationships between rock and soil from the surface to depth across NY State. Examples of this data and its derivative uses are farming, soil erosion, slope failures (landslides, bluff erosion, etc.), aggregate resources and mining, natural resource conservation, and groundwater protection.
MCA Title	Geological Mapping
MCA ID	21621
Organization Type	State or U.S. Territorial government
Organization Name	NY State Geologic Survey
Sub-Agency or Division	
Organization Mission	The New York State Museum serves the lifelong educational needs of New Yorkers and visitors through its collections, exhibitions, scholarship, programs, media and publications in science, history, anthropology, and art. The Museum explores and expresses New York State's significant natural and cultural diversity, past and present. Our mission as the Geologic Survey within the State Museum is as follows: The NYSGS is to conduct geologic research, evaluate mineral resources and geologic hazards of the State of New York, and make the data and advice derived from that research available to State agencies, the educational community, and the public for the health, safety, and economic welfare of the citizens of the State. Responsibilities of the NYSGS include maintaining a comprehensive inventory of the geologic resources, conducting research into the characteristics of, and processes operating in, the earth's crust, and making the resulting geologic knowledge readily available. The guiding principles require that the work of the NYSGS be synoptic and comprehensive throughout the State, be applicable to addressing the geologically related issues facing the citizens of the State, and be assembled in usable formats.
Program Name	Geological Mapping Program
Total Annual Program Budget	
Primary Business Use	BU 26 - Education K12 and Beyond, Basic Research
Secondary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Tertiary Business Use	BU 14 - Cultural Resources Preservation and Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)

General Geographic Area and Size	
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	For our geologic mapping work, being able to pick out small to medium sized boulders on the landscape would be essential to interpreting geology and geologic processes. This becomes increasingly important for geologic hazards and identifying features. For work identifying and predicting cultural resources this scale would also be essential to ID features at the site level.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL1B	QL3B	Order 1
Update Frequency	6-10 years	6-10 years	6-10 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 1 meter	Up to 1 meter
Acceptable Vertical Error	Up to 10 cm	Up to 1 meter	Up to 50 cm	Less than 1 meter
How far onshore needed			1 kilometer inland	
How far down the beach profile needed	To MLLW		To MLLW	
Tide correction requirement			I don't know	I don't know
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have		Highly desirable	Not required
Entire AOI under same environmental conditions	Not required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Required	Highly desirable	Required		Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level		Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Highly desirable	Highly desirable
DTM	Required	Required	Highly desirable	Highly desirable
DEM	Required	Required	Highly desirable	Highly desirable
Raw point cloud data	Required	Nice to have	Nice to have	Nice to have
Classified point cloud	Required	Highly desirable	Nice to have	
Edited/cube XYZ		Highly desirable	Nice to have	Nice to have
Full waveform	Highly desirable	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Nice to have	Nice to have
Ground control/ground truthing	Highly desirable	Highly desirable	Nice to have	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Not required	Not required
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Highly desirable	Required	Highly desirable	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Required	Required
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Required	Required	Required	Required
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Nice to have	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Nice to have	Nice to have
Habitat distribution and classification			Not required	Not required
Boundaries			Highly desirable	Highly desirable
Routes			Not required	Not required
Offshore cadastral			Not required	Not required
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Not required	Not required
Floating observation/navigation systems			Not required	Not required
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Nice to have	Highly desirable	Not required	Not required
Wetlands	Required	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Required	Nice to have	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Highly desirable	Highly desirable	Nice to have	
Coastal and riverine structures	Highly desirable	Nice to have	Nice to have	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Lidar terrain data at the QL 2. We use it to surgically identify landforms and to build geologic cross sections.	NOAA.gov	NOAA	NOAA
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast		Yes	Yes	Yes
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS			Yes	Yes
State Repositories	Yes		Yes	
State repositories used	GIS Program Office of Information Technology Services		NY GIS clearing house	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	None	None
Cost savings/cost reduction	Moderate	Minor	None	None

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Cost avoidance	Major	None	None	None
Increased revenues	None	None	None	None
Mission-driven performance improvements	Major	Minor	Minor	None
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None	None	None
Improved response or timeliness	Moderate	None	None	None
Improved customer experience	Moderate	None	None	None
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Minor	None
Environmental	Major	Moderate	None	None
Public safety, including life and property	Major	Moderate	None	None

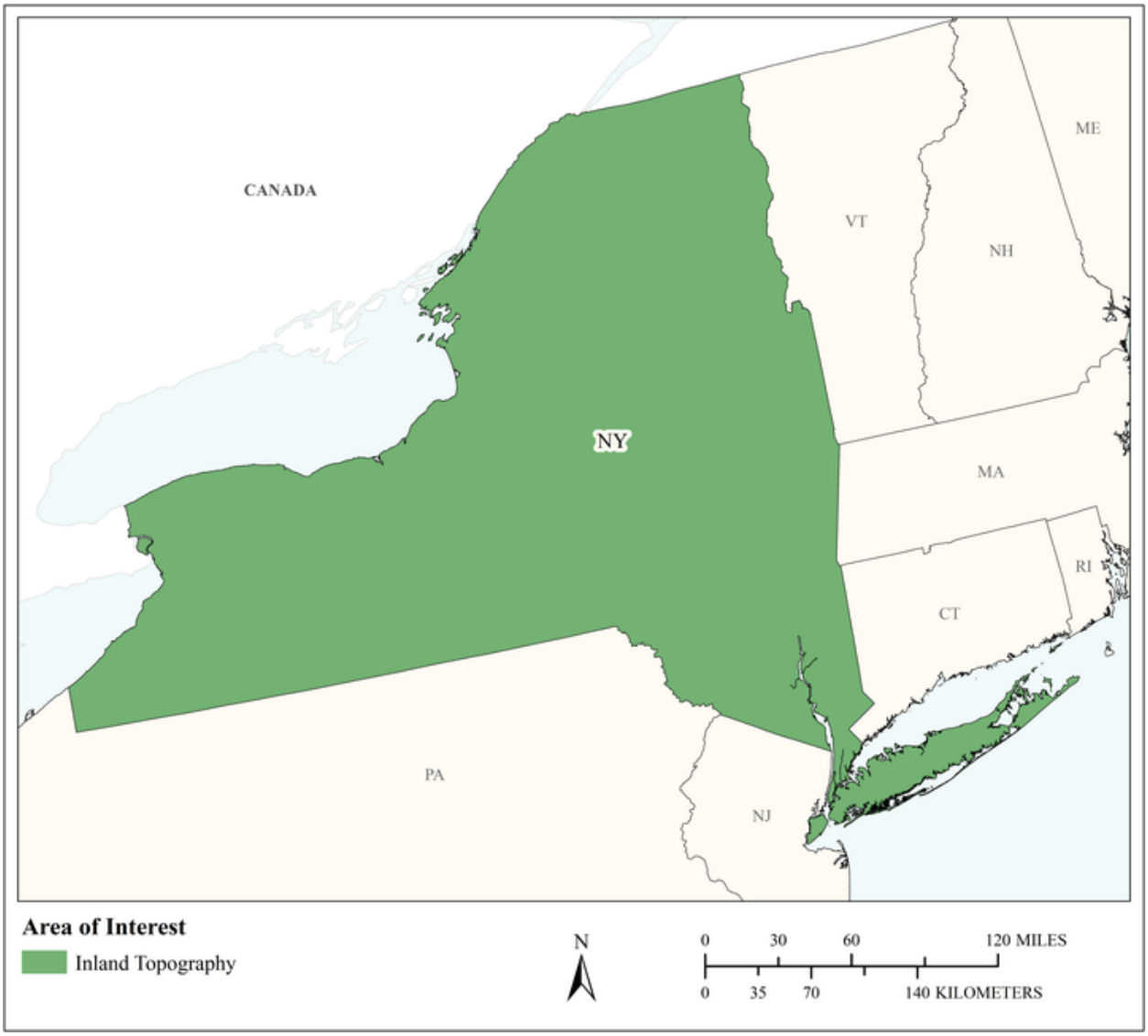
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$6,332	Moderate	Annual dollars saved/realized	$2,412	Minor	Annual dollars saved/realized	$603	I don't know	Unable to provide	
Time savings description	Minimal impact to our geologic projects. Same as above response, saves on required field visits. However all maps are still constructed from field based collected data, geologic samples. Lidar terrain models help us evaluate landforms in order to surgically target sites to check when field mapping. Through use of lidar we often can identify scarps that will provide exposures of rock or surficial geologic materials. This results in less field visits per quadrangle. Major impact, using a team based approach we often discuss topography and possible geologic setting on a per quadrangle basis. This allows us to proceed more efficiently and develop multiple working hypotheses for geologic maps. Using lidar data we are better able to target sites and features for exploration drilling. Minimal impact to our geologic products.			Again uncertain be assuredly. Provides continuity for terrestrial geologic mapping. Uncertain.								
Cost savings/cost reduction	Major	Annual dollars saved/realized	$25,000	Minor	Annual dollars saved/realized	$10,000	None			I don't know	Unable to provide	
Cost savings/cost reduction description	If we had to acquire lidar terrain data for our mapping program this amount would likely be the minimal amount allocated.											
Cost avoidance	Major	Unable to provide		Minor	Annual dollars saved/realized	$240,000	None			I don't know	Unable to provide	
Cost avoidance description	Not certain of dollar value, however identification of preexisting landslides and slope failures. Certainly provide a highly valuable data set upon which land owners and planning officials can utilize to either mitigate or avoid building on. Same as above, avoidance of geologic hazards, karst, landslides.			Bluff failure. Human induced bluff failure.								
Increased revenues	None			Minor	Unable to provide		None			None		
Mission-driven performance improvements	Major	Annual percent improvement	47%	Moderate	Annual percent improvement	8%	Minor	Annual percent improvement	5%	I don't know	Unable to provide	
Mission-driven performance improvements description	Enhanced decision making, planning and recognition of key landforms. Enhanced. Enhanced decision making and planning.											
Other operational benefits	Major	Unable to provide		Moderate	Unable to provide							
Other operational benefits description	We evaluate high resolution lidar data in an analogy to an MRI for the medical field. Our ability to visualize the terrain in the office saves time and creates better field work. Enhanced geomorphic visualization.			Enhanced visualization of subaqueous landforms and deposits will provide increased value to Geological Mapping activities.								
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide	
Value added to products or services description	Geologic visualization.											

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Improved response or timeliness	Moderate	Unable to provide		Moderate	Unable to provide		None			I don't know	Unable to provide	
Improved response or timeliness description	Improved delineation of historic slope failures, provides better ability to forecast areas susceptible to potential landslides triggered by hurricanes or tropical storms. Better assessment to public inquiries about slope failures.			Delineation of slope failures.								
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide		None			I don't know	Unable to provide	
Improved customer experience description	Geologic visualization applications such as online cross section tools.			Better potential to develop geologic applications.								
Other customer service benefits	Moderate	Unable to provide										
Other customer service benefits description												
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major			I don't know		
Education or outreach description	We incorporate topographic data into our education products, maps and Museum Publications			Information would allow us develop more integrated Geological Educational Maps and materials			Could greatly enhance Educational products and opportunities to explore NY Great Lake Educational Programming					
Environmental	Moderate			Minor			Minor			I don't know		
Environmental description	Delineation and protection of Natural Resources, Aggregates, groundwater, etc											
Public safety, including life and property	Major			Minor			None			I don't know		
Public safety, including life and property description	Slope failures, if we had high resolution Lidar data in 2011 for the Keene Valley landslide in the Adirondacks, we would have been able to identify landslide dimensions and houses in jeopardy											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes	Yes		
Curvature maps	Yes	Yes		
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes	Yes	Yes	
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: State Forest Preserve Trail Planning and Implementation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	State forest preserve trail planning and implementation. Microtopography is needed to find the best route for trails; we need to see small elevation changes. High vertical accuracy is needed.
MCA Title	State Forest Preserve Trail Planning and Implementation
MCA ID	1217
Organization Type	State or U.S. Territorial government
Organization Name	New York State Office of Information Technology Services
Sub-Agency or Division	
Organization Mission	Representing environmental and recreational applications.
Program Name	New York State Department of Environmental Conservation Division of Lands and Forests.
Total Annual Program Budget	
Primary Business Use	BU 27 - Recreation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Microtopography - pits, mounds, outcrops, etc.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	>10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have					
DEM for entire AOI needs to be seamless	Nice to have					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required			
DTM	Not required			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Not required			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Not required			
Landmark features	Not required			
Cultural resources	Not required			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	http://gis.ny.gov/elevation/			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	http://gis.ny.gov/elevation/			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	None			
Cost avoidance	I don't know			
Increased revenues	None			
Mission-driven performance improvements	I don't know			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	None			
Improved customer experience	None			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	Moderate			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$9,045									
Cost savings/cost reduction	None											
Cost avoidance	Minor	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide										
Improved response or timeliness	Minor	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None											
Environmental	Moderate											
Environmental description	More environmentally sound trail planning											
Public safety, including life and property	Moderate											
Public safety, including life and property description	Safer trail routing											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

North Carolina

Current status of elevation data for North Carolina

North Carolina continues to be a leader in lidar acquisition and emerging technology. The first statewide lidar collection at Quality Level 3 (QL3) was initiated in 2001 and completed in 2006. In 2014, the Department of Public Safety, Emergency Management Division (NCEM) began a five-phase refresh of lidar at QL2. The QL2 refresh included 60 counties of 2 points per square meter (ppsm) in the east (phases 1, 2, and 3) and 40 counties of 8 ppsm in the west (phases 4 and 5). This collection includes breaklines that match the Lidar Base Elevation Specifications from USGS and a detailed classification. This collection was done in coordination with NC Department of Transportation, NC General Assembly, USGS, NRCS, and all military installations in North Carolina. The state also coordinated with counties to make sure they had the ability to use the data when it was available. This was a coordinated effort over several years with a multitude of agencies, collection companies, and users of the data. Planning was an integral part of this collection effort. The needs of floodplain mapping, transportation, federal needs, and local needs were all taken into consideration. Education and coordination were an immense part of this project. The success of the project was due in part to the time taken for training and informing local governments, private companies, and the general public of what can be done with the data.

Once phases 1, 2, and 3 were complete, the NCEM embarked on a QL1 collection for the remainder of the state, evaluating and implementing Geiger mode lidar systems for collection.

https://sdd.nc.gov/sdd/docs/LiDARSummary.pdf

Lidar data, both the point cloud and digital elevation models, are hosted and served, free of charge through NC Floodplain Mapping Program's Spatial Data Download site (https://sdd.nc.gov/sdd/DataDownload.aspx).

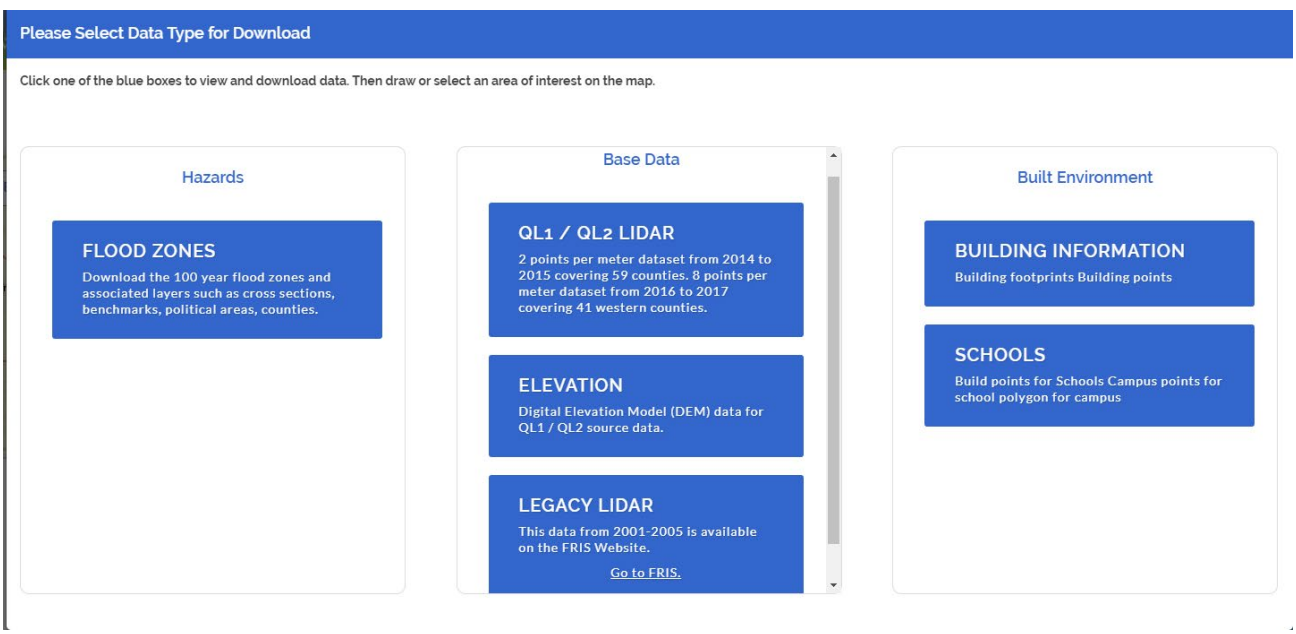


Figure 1. North Carolina Floodplain Mapping Program Data Download Dashboard

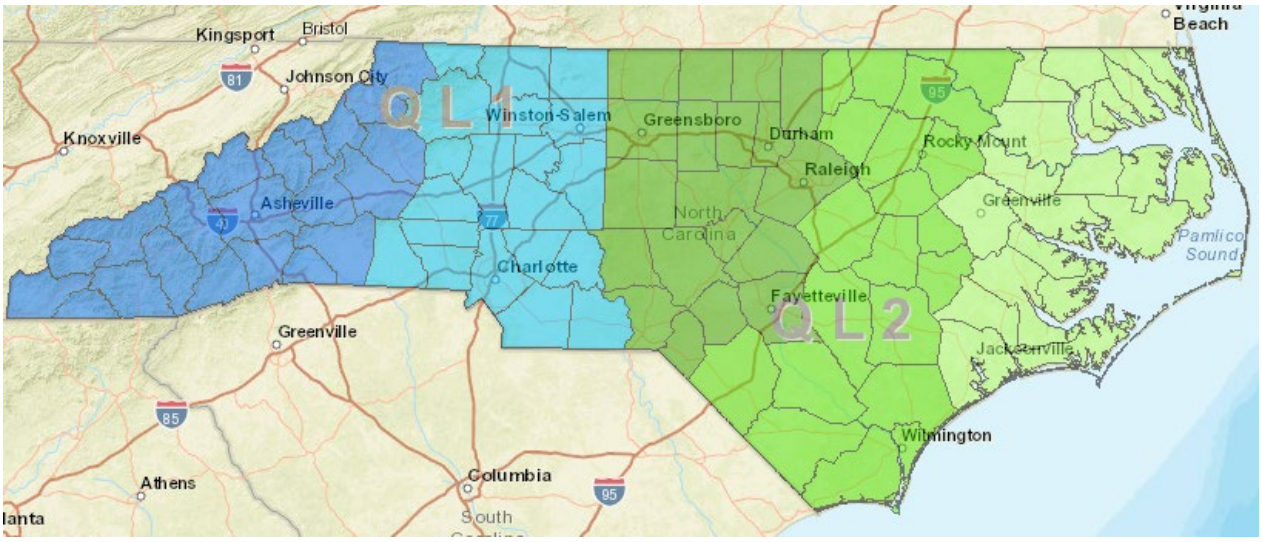


Figure 2. North Carolina Lidar Quality Levels

It is also shared with NOAA and USGS and has been incorporated into the Digital Coast and National Map for download, along with the topobathy and bathymetry provided by NOAA.

Current collections:

Lidar collection covering most of phase 1 and 2 is currently being flown as a QL1 linear mode product using Federal Emergency Management Agency (FEMA) Hurricane Supplemental funds. NOAA is assisting in completion of the Coastal Plain and creating a QL1 compliant topobathy product for the coast.

NC_HurricaneFlorence_2020_D20

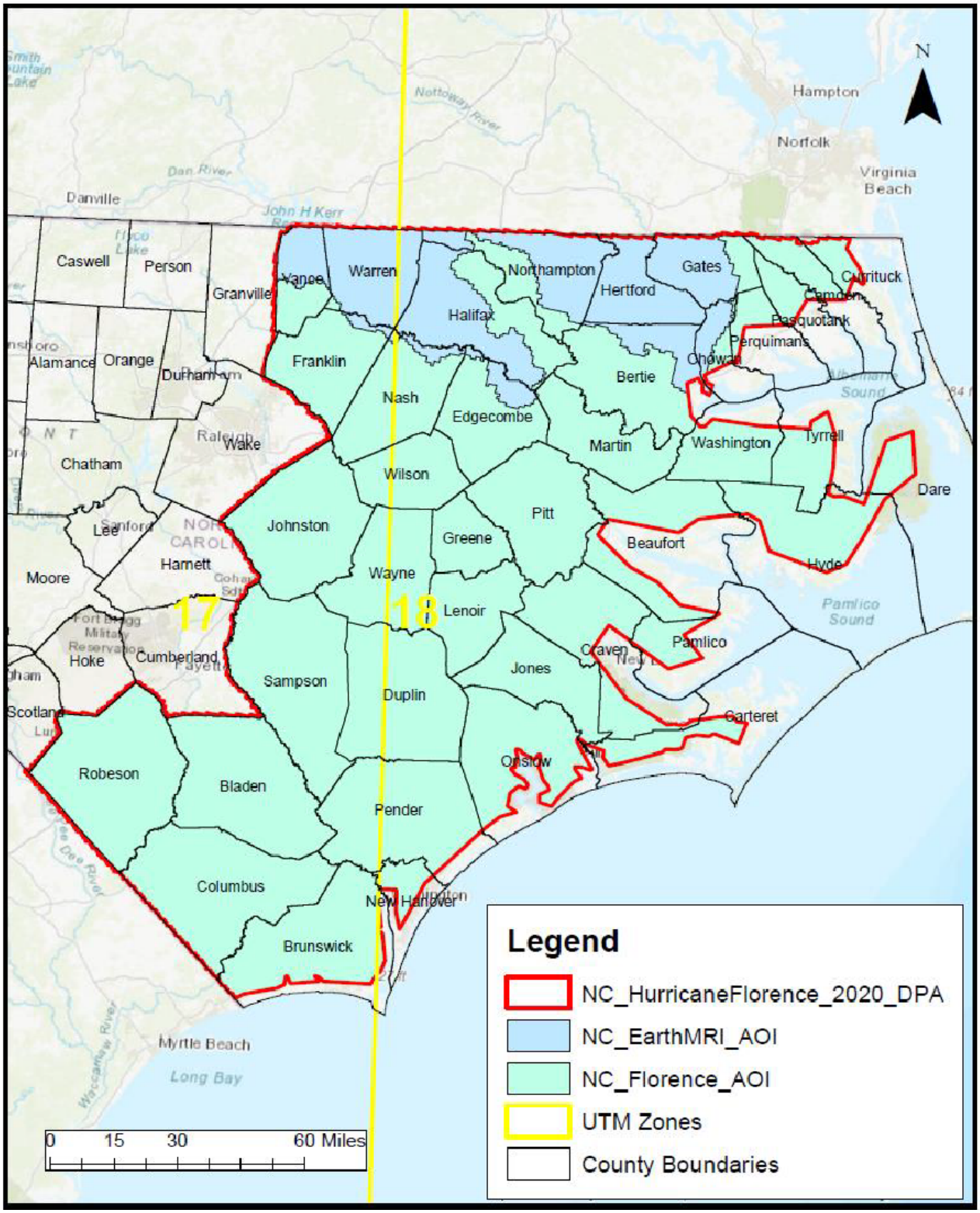


Figure 3. 2020 North Carolina Lidar Acquisitions

Importance of elevation data to North Carolina

Because lidar has been available in North Carolina for over 17 years, many state and local agencies and educational institutions use the data for a wide variety of purposes and Mission Critical Activities. The following are examples of activities that rely on topographic or bathymetric data within the state:

State agencies:

- NC Department of Environmental Quality – Environmental restoration and protection of natural resources. Topographic and bathymetric data are needed for the inland modeling of water quantity and quality. The data are also needed to identify permitted livestock facilities that might be inundated during storms, to model runoff, and to establish buffers for groundwater. Elevation data are used for both restoration planning and protection. Another use for both elevation and bathymetry is for prioritizing culvert to bridge retrofit to allow fish passage during low flow. A future use would be to refine the stream origin models for updating the hydrography. The Division of Coastal Management manages and monitors coastal processes and resilience and has immediate requirements for both topographic and bathymetric elevation data. Uses include beach renourishment, habitat monitoring, and change detection. Division of Marine Fisheries are responsible for stewardship of the State's marine and estuarine resources, including submerged public trust lands, artificial reef programs, shellfish and aquaculture leasing programs. The jurisdiction extends to three miles offshore.
- NC Department of Agriculture – Emergency Response to hurricanes and flooding, farm pond design and timber harvesting. High-resolution topography is used for detailed site analysis to support precision farming: analysis of farm sedimentation and runoff, fertilizer management, and irrigation planning. Elevation is also used to identify streams from the DEMs for pond design.
- NC Geological Survey – Geologic mapping and analysis. Identification of geomorphologic units. Landslide hazard mapping and assessment. Karst mapping, including springs and caves.
- NC Emergency Management – Both topographic and bathymetric data is needed for floodplain mapping, geodetic control, flood warning, coastal hazard mitigation, emergency management, risk management, storm surge modeling, post-storm change detection and development of geoid models.
- NC Department of Transportation – Transportation Infrastructure. Bathymetry is needed for H&H modeling and coastal modeling, to address navigation concerns for the ferry system in the Outer Banks, for water quality modeling, bridge scour, and submerged aquatic vegetation. SHOALS data transects were used for previous Outer Banks studies. Topographic data are needed for project planning, environmental screening in advance of projects, and as input into 2D hydraulic models. The data are also used to improve transportation facilities. Topography and bathymetry are also used for natural resource conservation. Elevation data are needed for review of environmentally sensitive areas as they pertain to federal and state-funded transportation projects.
- NC Center for Geographic Information and Analysis – Aerial imagery rectification. Aerial imagery is collected on a four-year cycle, with one quarter of the state being collected per year. Elevation data are needed for orthorectification of the imagery.

Educational institutions:

- NC Agricultural and Technical State University – Education, research and applied projects. Environmental modeling. Interdisciplinary work in a broad selection of colleges and departments. There are ongoing research activities almost on all Business Uses mentioned in the table in:

College of Agriculture and Environmental Sciences, College of Engineering, College of Health and Human Sciences, and the College of Science and Technology (Geomatics).

- NC State University – Educating the undergraduate and graduate level workforce for geospatial industry, government and academia, interdisciplinary basic and applied geospatial research and services. Geospatial services cover the following relevant Business Uses: Environmental, agriculture, natural resources, forestry, water quality, air quality, hazards, and coastal change.
- Cape Fear Community College – Education about sampling and surveying the marine and aquatic environments. Training for bathymetric data collection.

Local governments:

- Pasquotank Co – Topographic and bathymetric data is needed for flood management in planning and mitigation.
- City of Charlotte – Roadway, bridge, and storm water infrastructure improvements rely on both riverine bathymetry and topographic lidar

Coordination:

The NC Geographic Information Coordinating Council (GICC) is composed of state, local, private, and federal geospatial users. The GICC includes the State Mapping Advisory Committee and the Working Group for Orthoimagery and Elevation in which lidar activities are reported quarterly. The Landcover working group and Hydrography working group are also invested in lidar activities and products. A priority of the working groups is to develop methods to derive products from the lidar data in the state.

High-level summary of elevation data requirements

Elevation and bathymetry needs vary somewhat within the state. Bare-earth topography is needed throughout the state, but other products are also required. The nearshore elevation of waterbodies, vegetation structure and building footprints, and lake and river bathymetry are all highly desired or required components of user activities.

Understandably there are stronger needs for offshore bathymetry within coastal areas of North Carolina, but a large part of the state (around 1/5 of the counties) has an ocean or estuary coastline. Many state agencies that provide services to the coastal counties also have offshore bathymetry needs.

The need for a higher quality level of data has increased as the availability has increased – many users are now integrating and comparing the QL2 with QL1 data in the state and finding that the increased resolution is allowing them to create better derivative products and have increased confidence in the surfaces and analysis performed with the data. In general users require QL1 inland topography, QL0B inland and nearshore bathymetry, and varying offshore bathymetric requirements. All data types should be updated every 4-5 years.

High-level summary of benefits that would come from higher resolution elevation data

Emergency managers and planners have benefited from increased resolution of the elevation data. When planning for road closures, inundation of buildings, or landslide risks, a highly resolved surface increases the identification of risks and allows for plans that minimize disruption while increasing public safety. The addition of high-resolution bathymetric data would enhance the ability of emergency managers to model, respond and plan for public safety events.

Environmental applications also benefit from increased accuracy when modeling overland flow paths of sediment and pollutants and increases the effectiveness of placement of farm best management practices, ponds, or dams.

Inland bathymetry and hydrography that matches the elevation is an unmet need that would benefit many environmental and emergency managers in the state.

The State of North Carolina has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

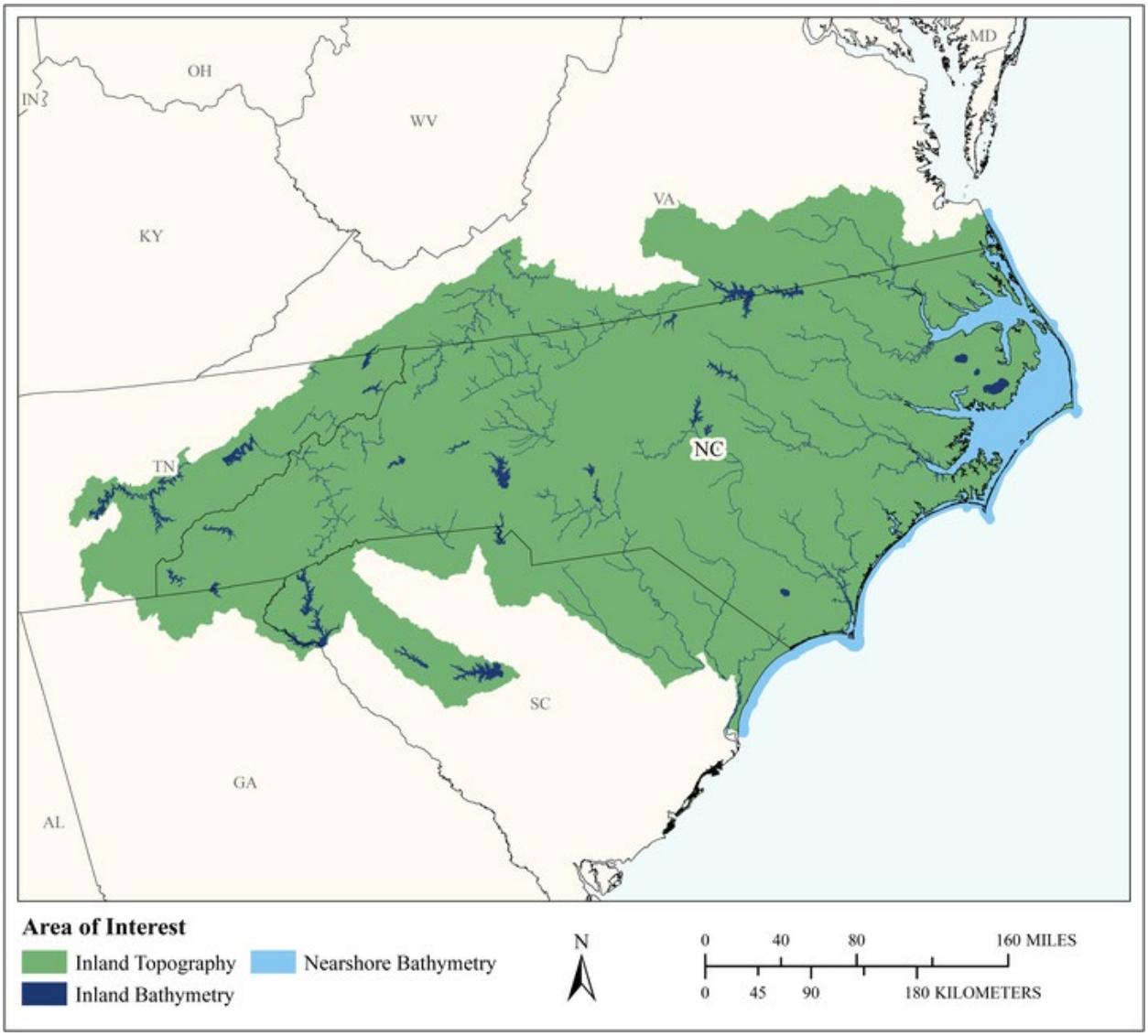
MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	North Carolina Department of Environmental Quality	1155	Environmental Restoration and Protection of Natural Resources	Inland Topo	QL2	4-5 years	$274,963	$73,318	Moderate	Moderate	Minor
				Inland Bathy	QL2B	4-5 years	$1,184,151	$123,748	Moderate	Moderate	Minor
				Nearshore Bathy	QL1B	2-3 years	$141,559	$233,203	Moderate	Minor	Moderate
BU 02 – Riverine Ecosystem Management	State of North Carolina	60319	Riverine Ecosystem Management	Inland Topo	QL1	4-5 years	$75,563	$7,547	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$300,000	$2,836	Major	Major	Major
				Nearshore Bathy	QL0B	4-5 years	$429,319	$328,067	Moderate	Moderate	Moderate
				Offshore Bathy	I don't know	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 03 – Coastal Zone Management	State of North Carolina	60320	Coastal Zone Management	Inland Topo	QL1	4-5 years	$2,545,207	$444,955	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$1,092,210	$640,305	Minor	Moderate	Moderate
				Nearshore Bathy	QL0B	4-5 years	$961,351	$1,626,241	Moderate	Major	Major
				Offshore Bathy	I don't know	4-5 years	$48,642	$9,711	Minor	Moderate	Moderate
BU 04 – Forest Resource Management	State of North Carolina	60321	Forest Resources Management	Inland Topo	QL1	4-5 years	$250,000	$282,950	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	I don't know
BU 06 – Natural Resource Management	NCDOT	22261	Natural Resource Conservation	Inland Topo	QL1	Annually	$400,000	$700,000	Minor	Moderate	Moderate
BU 07 – Wildlife and Habitat Management	State of North Carolina	60322	Wildlife and Habitat Management	Inland Topo	QL1	4-5 years	$11,759	$33,965	Moderate	Major	Moderate
				Inland Bathy	QL0B	4-5 years	$94,243	$56,964	Moderate	Moderate	Moderate
				Nearshore Bathy	QL0B	4-5 years	$4,250	$251	Moderate	Major	Moderate
				Offshore Bathy	I don't know	4-5 years	$612	$42	Moderate	Major	Major
BU 08 – Agriculture	NC Dept. of Agriculture	22119	Emergency Response, Farm Pond Design, Forest Management, and Precision Agriculture	Inland Topo	QL2	4-5 years	$60,297	$360,000	I don't know	I don't know	Minor

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 09 – Fisheries Management and Aquaculture	State of North Carolina	60323	Fisheries Management and Aquaculture	Inland Topo	QL1	4-5 years	$50,463	$109,610	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	4-5 years	$98,779	$44,958	Major	Major	Moderate
				Nearshore Bathy	QL0B	4-5 years	$674,293	$49,521	Moderate	Major	Minor
				Offshore Bathy	I don't know	4-5 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Minor
BU 10 – Geologic Assessment	N.C. Geological Survey	1373	Geologic Mapping and Analysis	Inland Topo	QL1	2-3 years	$10,420,976	$182,940	Moderate	Moderate	Major
BU 12 – Renewable Energy Resources	State of North Carolina	60324	Renewable Energy Resources	Inland Topo	QL1	4-5 years	Unable to quantify	Unable to quantify	Minor	Minor	None
				Inland Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Offshore Bathy	I don't know	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 14 – Cultural Resource Management	State of North Carolina	60325	Cultural Resources Preservation and Management	Inland Topo	QL1	4-5 years	$60,000	$30,000	Minor	Minor	Minor
				Inland Bathy	QL0B	4-5 years	$21,699	Unable to quantify	Moderate	Minor	Minor
				Nearshore Bathy	QL0B	4-5 years	$12,284	Unable to quantify	Minor	Moderate	Minor
				Offshore Bathy	I don't know	4-5 years	$1,508	Unable to quantify	Minor	Moderate	Minor
BU 15 – Flood Risk Management	North Carolina Emergency Management/Risk Management/ Geodetic Survey	1098	Multi Hazard Identification and Mitigation	Inland Topo	QL0HD	4-5 years	$3,440,700	$602,002	Moderate	Moderate	Major
				Inland Bathy	QL0B	2-3 years	$239,009	$268,346	Moderate	Moderate	Major
				Nearshore Bathy	QL0B	2-3 years	$406,330	$301,148	Moderate	Minor	Major
				Offshore Bathy	Special Order	2-3 years	Unable to quantify	Unable to quantify	Major	I don't know	Major
BU 15 – Flood Risk Management	Pasquotank County, NC	1139	Flood Risk Management and Mitigation	Inland Topo	QL1	>10 years	$50,225	$8,787	Moderate	Moderate	Moderate
				Inland Bathy	Cross sections and/or transects meet needs	>10 years	$3,489	$3,917	None	None	None
BU 15 – Flood Risk Management	NC A&T State University	1348	Environmental Modeling	Inland Topo	QL0	Annually	$3,440,628	$602,002	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$239,009	$268,346	Major	Major	Major
				Nearshore Bathy	QL0B	4-5 years	$406,330	$301,148	Major	Major	Major
BU 16 – Sea Level Rise and Subsidence	State of North Carolina	60326	Sea Level Rise and Subsidence	Inland Topo	QL1	4-5 years	$1,700,000	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Minor
				Offshore Bathy	I don't know	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Moderate

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 17 – Wildfire Management	State of North Carolina	60327	Wildfire Management, Planning, and Response	Inland Topo	QL1	4-5 years	$265,244	Unable to quantify	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Offshore Bathy	I don't know	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 18 – Homeland Security	NC Center for Geographic Information and Analysis	1468	Aerial Imagery Rectification	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	None	None	Major
BU 18 – Homeland Security	State of North Carolina	60328	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management	Inland Topo	QL1	4-5 years	$1,456,348	$25,740	Major	Moderate	Major
				Inland Bathy	QL0B	4-5 years	$410,144	$26,167	Major	Moderate	Major
				Nearshore Bathy	QL0B	4-5 years	$39,541	$1,135	Moderate	Moderate	Major
				Offshore Bathy	Dependent	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 19 – Land Navigation	State of North Carolina	60329	Land Navigation and Safety	Inland Topo	QL1	4-5 years	$639,524	$100,000	Minor	Major	Major
				Inland Bathy	QL0B	4-5 years	$27,278	$282	Minor	Moderate	Moderate
				Nearshore Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	None	Moderate	Moderate
				Offshore Bathy	I don't know	4-5 years	Unable to quantify	Unable to quantify	None	Moderate	Moderate
BU 20 – Marine and Riverine Navigation	State of North Carolina	60330	Marine and Riverine Navigation and Safety	Inland Topo	QL1	4-5 years	$900,000	Unable to quantify	None	None	Minor
				Inland Bathy	QL0B	4-5 years	$1,400,000	$118,516	Moderate	Moderate	Moderate
				Nearshore Bathy	QL0B	4-5 years	$928,000	$111,397	Minor	Major	Major
				Offshore Bathy	I don't know	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 21 – Aviation Navigation	State of North Carolina	60331	Aviation Navigation and Safety	Inland Topo	QL1	4-5 years	$166,889	$207,854	Minor	Moderate	Moderate
				Inland Bathy	QL0B	4-5 years	$33,232	Unable to quantify	Moderate	Major	Major
				Nearshore Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Offshore Bathy	I don't know	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 22 – Infrastructure Management	NCDOT Photogrammetry Unit	21578	Transportation Infrastructure	Inland Topo	QL0 HD	(a) 2-3 years (b) 4-5 years	$2,194,268	$6,457,290	I don't know	I don't know	I don't know
				Inland Bathy	Cross sections and/or transects meet needs	Event driven	$747,468	$77,615	I don't know	I don't know	I don't know
				Nearshore Bathy	QL1B	4-5 years	$89,694	$12,332	I don't know	I don't know	I don't know

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 22 – Infrastructure Management	City of Charlotte	22158	Roadway, Bridge, and Storm Water Infrastructure Improvements	Inland Topo	QL0	Annually	$24,292	$71,488	Major	Major	Major
BU 23 – Urban and Regional Planning	State of North Carolina	60332	Urban and Regional Planning	Inland Topo	QL1	4-5 years	$1,000,000	$1,533,512	Moderate	Major	Major
				Inland Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Major
				Nearshore Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
				Offshore Bathy	I don't know	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 25 – Real Estate, Banking, and Insurance	State of North Carolina	60333	Real Estate, Banking, Mortgage, and Insurance	Inland Topo	QL1	4-5 years	$1,000,000	$1,500,000	Minor	Minor	Major
BU 26 – Education and Basic Research	Cape Fear Community College	21629	Education About Sampling and Surveying the Marine and Aquatic Environments	Inland Topo	QL1	Annually	Unable to quantify	Unable to quantify	Major	None	None
				Inland Bathy	Cross sections and/or transects meet needs	Event driven	Unable to quantify	Unable to quantify	Major	None	None
				Nearshore Bathy	Cross sections and/or transects meet needs	2-3 years	Unable to quantify	Unable to quantify	Major	I don't know	I don't know
				Offshore Bathy	Cross sections and/or transects meet needs	2-3 years	Unable to quantify	Unable to quantify	Major	I don't know	I don't know
BU 26 – Education and Basic Research	State of North Carolina	60334	Education K12 and Beyond, Basic Research	Inland Topo	QL1 HD	4-5 years	$500,000	$620,117	Major	Major	Major
				Inland Bathy	QL1B	4-5 years	$67,844	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL2B	4-5 years	$28,150	$1,110	Major	Major	Minor
				Offshore Bathy	Order 1a	4-5 years	$1,204	Unable to quantify	Major	Minor	Minor
BU 29 – Military	State of North Carolina	60335	Military	Inland Topo	QL1	4-5 years	$100,000	Unable to quantify	I don't know	I don't know	I don't know
				Inland Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 30 – Maritime and Land Boundary Management	State of North Carolina	60336	Maritime and Land Boundary Management	Inland Topo	QL1	4-5 years	$200,000	$212,987	Moderate	Minor	None
				Inland Bathy	QL0B	4-5 years	$200,000	Unable to quantify	Major	Major	Moderate
				Nearshore Bathy	QL0B	4-5 years	$278,000	Unable to quantify	Moderate	Major	Moderate
				Offshore Bathy	I don't know	4-5 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate

MCA Title: Environmental Restoration and Protection of Natural Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more Hydrologic Units (HUC8s)	One or more Hydrologic Units (HUC8s)	Nearshore areas along the coast (including the Great Lakes) off one or more Hydrologic Units (HUC8s)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Environmental restoration and protection of natural resources. Topography and bathymetry are needed for the inland for modeling of water quantity and quality. The data are also needed to identify public safety/facilities that are permitted (livestock facilities) that might be inundated during storms, to model runoff, and to establish buffers for groundwater, etc. Elevation data are used for both restoration planning and protection. Another use is for prioritizing culvert to bridge retrofit to allow fish passage during low flow. A future use would be to refine the stream origin models for updating the hydrography.
MCA Title	Environmental Restoration and Protection of Natural Resources
MCA ID	1155
Organization Type	State or U.S. Territorial government
Organization Name	North Carolina Department of Environmental Quality
Sub-Agency or Division	
Organization Mission	The Division of Water Resources, with central offices in Raleigh and seven regional offices located across the state, ensures safe drinking water in accordance with federal requirements, issues pollution control permits, monitors permit compliance, evaluates environmental water quantity and quality, and carries out enforcement actions for violations of environmental regulations. The division's administrative staff and five sections (Public Water Supply, Water Planning, Water Quality Permitting, Water Quality Regional Operations and Water Sciences) administer the laws, policies and rules established by the U.S Environmental Protection Agency, the state's Environmental Management Commission and the N.C. General Assembly, the state legislative body.
Program Name	Environmental Quality
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 02 - Riverine Ecosystem Management
Tertiary Business Use	BU 03 - Coastal Zone Management

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Livestock, well heads, culverts

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B	QL1B	
Update Frequency	4-5 years	4-5 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI			Depends on open water or estuarine coves, bays and tidal creeks	
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter	Up to 1 meter	
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 30 cm	
How far onshore needed			500 meters inland	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MSL	
Cross sections and/or transects meet needs			Partial	
Cross section/transect requirement			Transects for oceanside are fine; full for lagunal estuaries, bays and coves. Model error is GT 1 meter	

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have		Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Nice to have		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Nice to have		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Nice to have		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level		Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Nice to have	
DTM	Required	Highly desirable	Nice to have	
DEM	Highly desirable	Highly desirable	Highly desirable	
Raw point cloud data	Highly desirable	Nice to have	Nice to have	
Classified point cloud	Highly desirable	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Highly desirable	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Nice to have	
Ground control/ground truthing	Highly desirable	Nice to have	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Highly desirable	Highly desirable	Nice to have	
Water column properties - Physical			Highly desirable	
Water column properties - Chemical			Highly desirable	
Water column properties - Biological			Highly desirable	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Highly desirable	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Highly desirable	Highly desirable	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL3 from 2001-2005, and some QL2 and QL1 data now becoming available	NOAA products in a few coastal areas and site specific studies when needed and resources are available	NOAA data	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI		Yes	Yes	
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Center for Geographic Information and Analysis and Emergency Management Floodplain Mapping Program			
Data that meet my needs are not available				

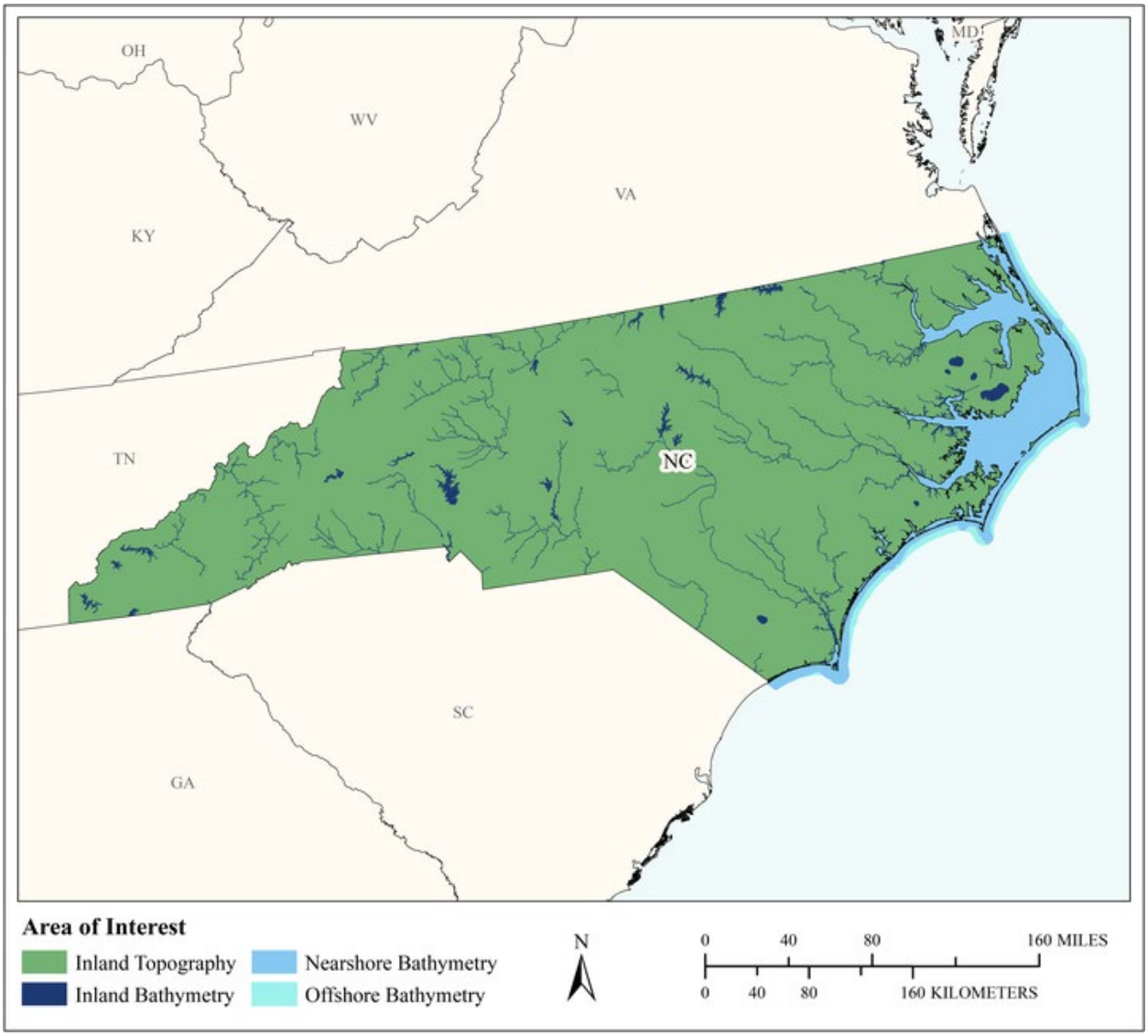
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Minor	
Cost savings/cost reduction	Moderate	Minor	Minor	
Cost avoidance	Major	None	Minor	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None	Moderate	
Improved response or timeliness	Major	None	Minor	
Improved customer experience	Major	None	Moderate	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	None	Minor	
Environmental	Moderate	Minor	Moderate	
Public safety, including life and property	I don't know	None	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$60,300	Major	Unable to provide		Moderate	Unable to provide				
Time savings description	Potentially 1FTE as we expand watershed planning. Better data leads to more accurate modeling.			Better data leads to more accurate modeling. Would be able to add bathymetric component without site specific field studies.			Better data leads to more accurate modeling.					
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Minor	Unable to provide				
Cost savings/cost reduction description				Could be very high if programs implement this component into business rules.								
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Increased revenues	None			None			Moderate	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Mission-driven performance improvements description	Improvement will depend on leveraging 3d data with current programs that are minimally operational at this time. Higher confidence in the data will increase speed of decision making.			Increase decision speed with better and better documented data.								
Other operational benefits				Major	Unable to provide							
Other operational benefits description				Faster and some new modeling capabilities.								
Future annual operational benefits added during validation		Annual dollars saved/ realized	$214,663		Annual dollars saved/ realized	$1,184,151		Annual dollars saved/ realized	$141,559			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved customer experience description	Several new tools could be developed to encourage citizen science in watershed plan development.			In modeling processes and in visualization.								
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$73,318		Annual dollars saved/ realized	$123,748		Annual dollars saved/ realized	$233,203			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate					
Environmental	Moderate			Moderate			Minor					
Public safety, including life and property	Minor			Minor			Moderate					
Other												
Other benefits							Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps				
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps				
Viewshed maps		Yes	Yes	
Hydrologic Flow Direction Grids	Yes	Yes	Yes	
Hydrologic Flow Accumulation Grids	Yes	Yes	Yes	
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Riverine Ecosystem Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Stream channel analysis and mapping. Stream bank erosion analysis. Aquatic and terrestrial species habitat management. Environmental management.
MCA Title	Riverine Ecosystem Management
MCA ID	60319
Organization Type	State or U.S. Territorial government
Organization Name	State of North Carolina
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	I don't know
Update Frequency	4-5 years	4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable	I don't know	Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Required	I don't know	Highly desirable	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	I don't know	Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Required	Required	I don't know	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	I don't know
DTM	Required	Highly desirable	Required	I don't know
DEM	Required	Required	Required	I don't know
Raw point cloud data	Nice to have	Nice to have	Nice to have	I don't know
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Not required	Nice to have	I don't know
Full waveform	Nice to have	Nice to have	Highly desirable	I don't know
Bathymetric Attributed Grid (BAG)		Not required	Nice to have	I don't know
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	I don't know
Tide Predictions			Not required	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			Not required	I don't know
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Nice to have	I don't know
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	I don't know
Nautical and/or navigation charts			Not required	I don't know
Acoustic imagery of the seafloor			Highly desirable	I don't know
Aerial and/or satellite imagery	Required	Highly desirable	Required	I don't know
Underwater videography			Not required	I don't know
Bottom texture			Highly desirable	I don't know
Bottom type			Required	I don't know
Submerged features			Highly desirable	I don't know
Subbottom characteristics			Highly desirable	I don't know
Geologic and seismic data	Nice to have	Nice to have	Not required	I don't know
Water column properties - Physical			Nice to have	I don't know
Water column properties - Chemical			Nice to have	I don't know
Water column properties - Biological			Nice to have	I don't know
Currents			Nice to have	I don't know
Tide/wave heights			Not required	I don't know
Sea ice conditions			Not required	I don't know
Habitat distribution and classification			Nice to have	I don't know
Boundaries			Not required	I don't know
Routes			Not required	I don't know
Offshore cadastral			Not required	I don't know
Lease areas			Not required	I don't know
Fixed obstructions			Not required	I don't know
Floating observation/navigation systems			Not required	I don't know
Shorelines – current, historic, change rates	Nice to have	Nice to have	Highly desirable	
Land use/land cover	Highly desirable	Nice to have	Required	I don't know
Wetlands	Highly desirable	Highly desirable	Required	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	I don't know
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have	Not required	
Cultural resources	Nice to have	Nice to have	Not required	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	I don't know
Cost savings/cost reduction	Moderate	Minor	Moderate	I don't know
Cost avoidance	Moderate	None	None	I don't know
Increased revenues	None	None	None	I don't know
Mission-driven performance improvements	Major	None	Minor	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Minor	I don't know

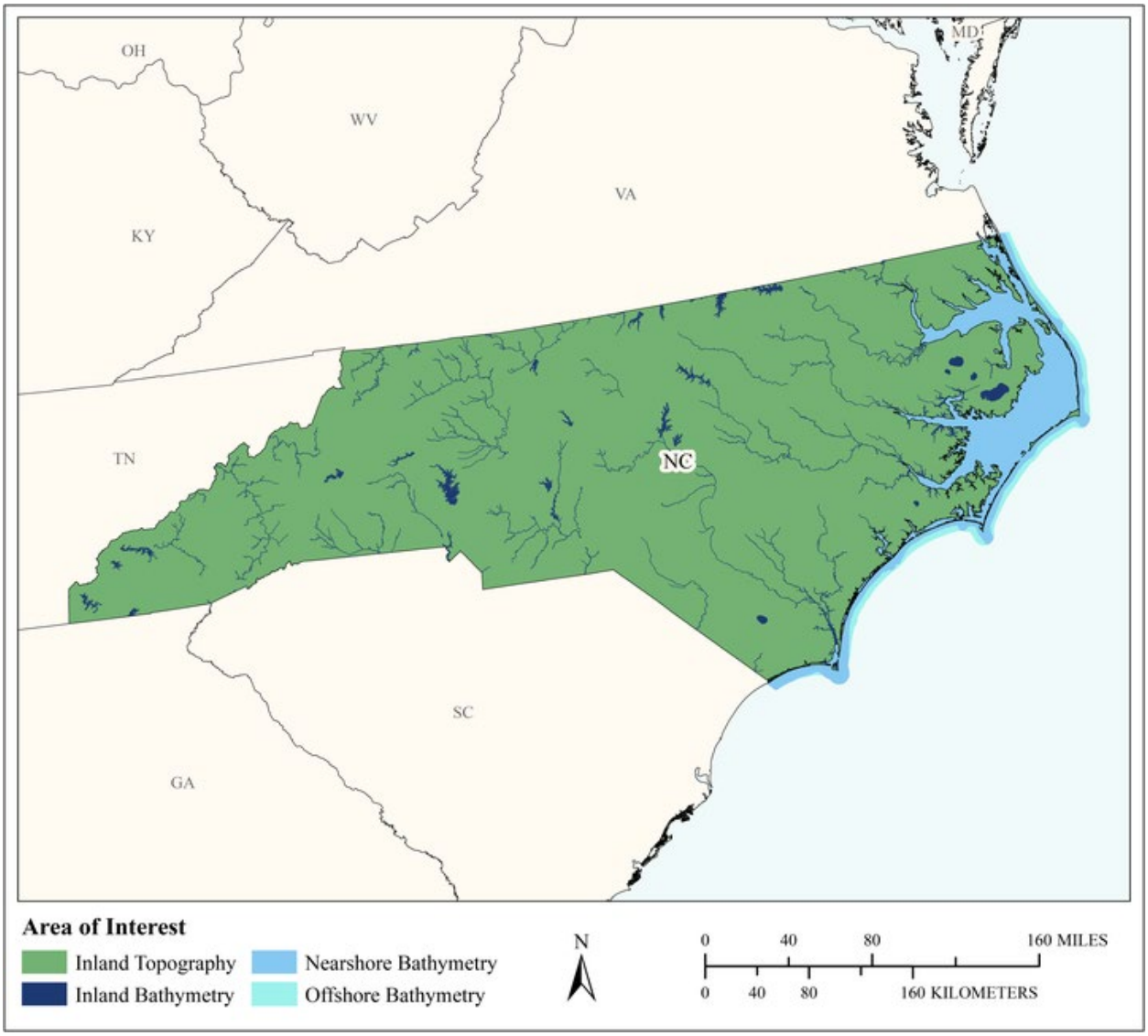
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Moderate	Minor	I don't know
Improved customer experience	Major	Minor	Minor	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Minor	I don't know
Environmental	Major	Major	Moderate	I don't know
Public safety, including life and property	Major	Moderate	Moderate	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$75,563		Annual dollars saved/ realized	$300,000		Annual dollars saved/ realized	$429,319			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$7,547		Annual dollars saved/ realized	$2,836		Annual dollars saved/ realized	$328,067			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate			I don't know		
Environmental	Major			Major			Moderate			I don't know		
Public safety, including life and property	Major			Major			Moderate			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps			Yes	
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints			Yes	
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Coastal Zone Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Analysis of coastal erosion and inundation. Hurricane storm surge and wind damage modeling and assessment. Coastal hazard modeling and mapping. Coastal hazard mitigation. Tsunami modeling. Land use and environmental planning. Coastal resiliency. Oil spill modeling. Littoral zone management including dunes and beaches.
MCA Title	Coastal Zone Management
MCA ID	60320
Organization Type	State or U.S. Territorial government
Organization Name	State of North Carolina
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	I don't know
Update Frequency	4-5 years	4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable	Nice to have	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Nice to have	Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable	Highly desirable	Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Nice to have	Highly desirable
DTM	Required	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Nice to have	Nice to have	Nice to have	Highly desirable
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Nice to have
Tide Predictions			Highly desirable	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Highly desirable	Required	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Required
Nautical and/or navigation charts			Nice to have	Nice to have
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Highly desirable
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Highly desirable	Nice to have
Tide/wave heights			Highly desirable	Nice to have
Sea ice conditions			Not required	Nice to have
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Nice to have
Wetlands	Required	Highly desirable	Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Nice to have
Inland surface water features	Highly desirable	Highly desirable	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Highly desirable	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Moderate	Moderate
Cost savings/cost reduction	Moderate	Moderate	Moderate	Moderate
Cost avoidance	Major	Minor	Moderate	Minor
Increased revenues	None	None	None	None
Mission-driven performance improvements	Major	Moderate	Moderate	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Moderate	Minor

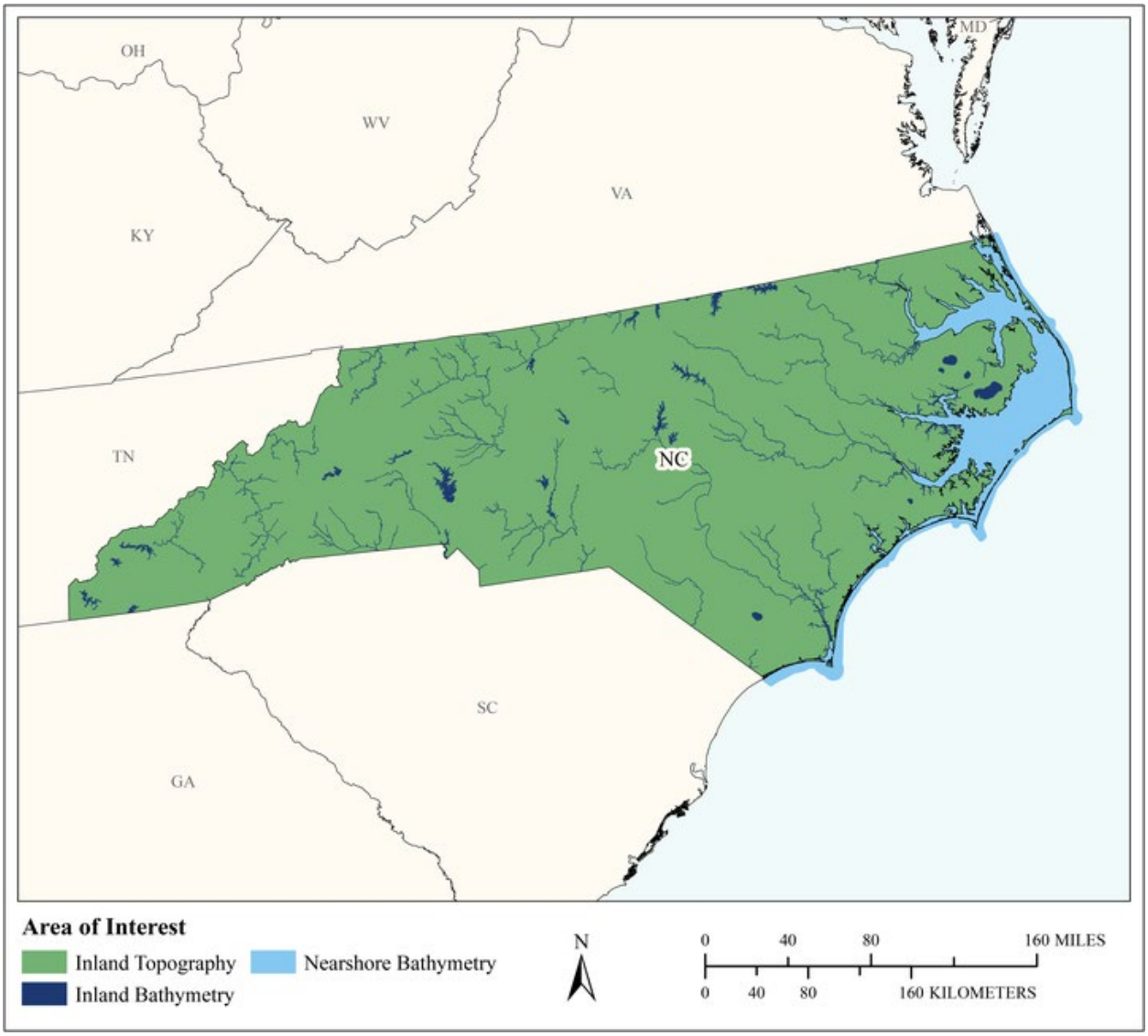
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	Moderate	Minor
Improved customer experience	Major	Moderate	Moderate	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Moderate	Minor
Environmental	Major	Moderate	Moderate	Moderate
Public safety, including life and property	Major	Moderate	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Increased revenues	None			None			Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,545,207		Annual dollars saved/ realized	$1,092,210		Annual dollars saved/ realized	$961,351		Annual dollars saved/ realized	$48,642
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$444,955		Annual dollars saved/ realized	$640,305		Annual dollars saved/ realized	$1,626,241		Annual dollars saved/ realized	$9,711
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Minor			Moderate			Minor		
Environmental	Major			Moderate			Major			Moderate		
Public safety, including life and property	Major			Moderate			Major			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Forest Resources Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Forest health assessment. Determination of standing inventory of forest resources. Prescribed burn planning. Analysis of carbon stocks for trade. Harvest systems planning.
MCA Title	Forest Resources Management
MCA ID	60321
Organization Type	State or U.S. Territorial government
Organization Name	State of North Carolina
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Not required		Highly desirable	Nice to have
Entire AOI under same environmental conditions	Required	Required	Highly desirable		Required	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Not required	Not required	
DTM	Required	Not required	Not required	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Highly desirable	Required	
Classified point cloud	Required	Highly desirable	Required	
Edited/cube XYZ		Not required	Not required	
Full waveform	Nice to have	Nice to have	Not required	
Bathymetric Attributed Grid (BAG)		Nice to have	Not required	
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Not required	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Not required	
Ground control/ground truthing	Highly desirable	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Not required	
Subbottom characteristics			Not required	
Geologic and seismic data	Nice to have	Not required	Not required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Not required	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Required	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates	Nice to have	Required	Required	
Land use/land cover	Required	Required	Required	
Wetlands	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Highly desirable	Required		
Landmark features	Nice to have	Nice to have	Not required	
Cultural resources	Highly desirable	Nice to have	Not required	
Coastal and riverine structures	Nice to have	Required	Not required	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	I don't know	
Cost savings/cost reduction	Major	Major	I don't know	
Cost avoidance	Major	Major	I don't know	
Increased revenues	Minor	Moderate	I don't know	
Mission-driven performance improvements	Major	Major	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	I don't know	

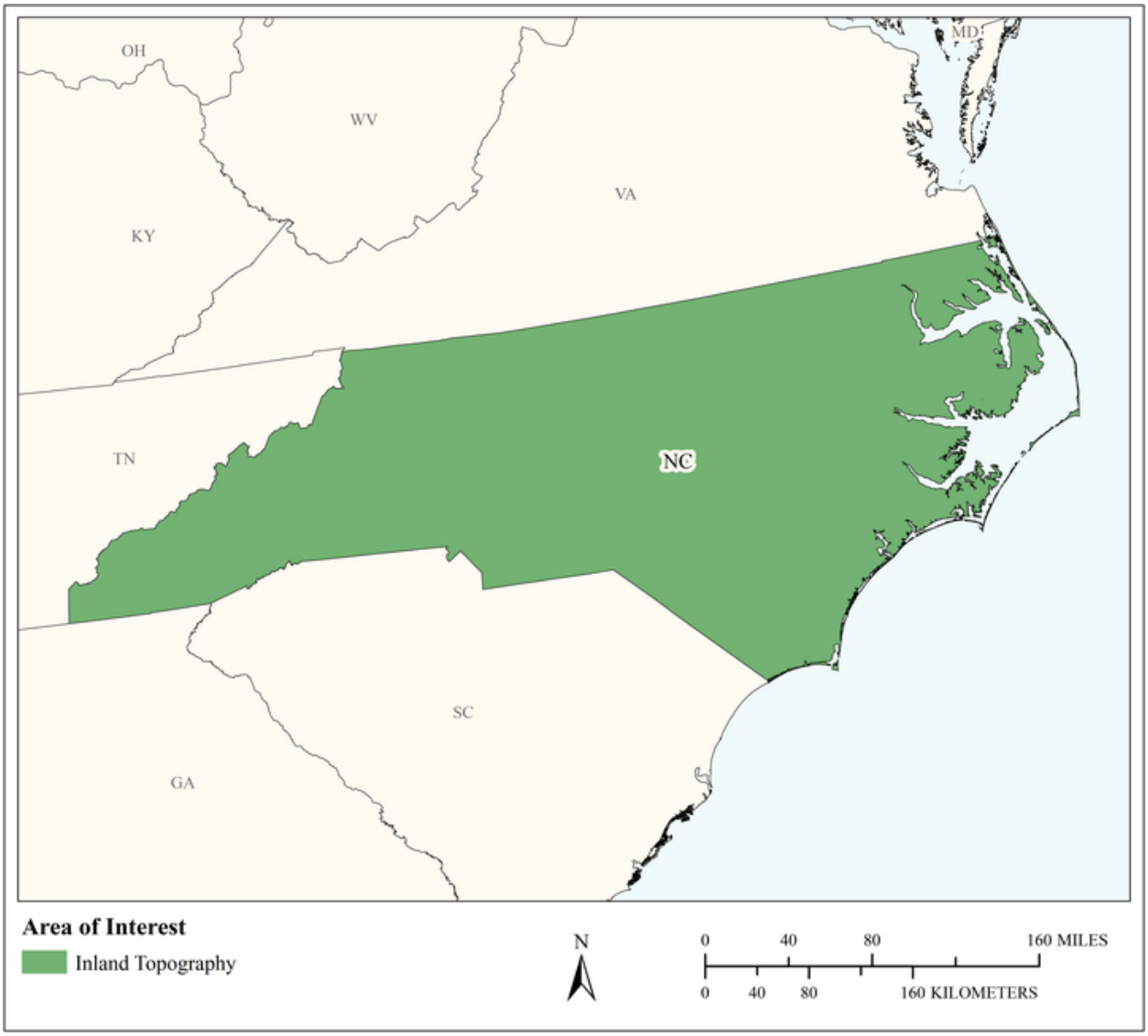
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	Major	I don't know	
Improved customer experience	Moderate	Major	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Major	Major	
Environmental	Major	Major	Major	
Public safety, including life and property	Moderate	Major	I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$250,000									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$282,950									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major					
Environmental	Major			Major			Major					
Public safety, including life and property	Major			Major			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes	Yes	
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes		Yes	
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Natural Resource Conservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Natural resource conservation. Elevation data are needed for review of environmentally sensitive areas as they pertain to federal and state-funded transportation projects.
MCA Title	Natural Resource Conservation
MCA ID	22261
Organization Type	State or U.S. Territorial government
Organization Name	NCDOT
Sub-Agency or Division	
Organization Mission	The mission of our Division's environmental department is to provide state contracted design teams consultation on and review of environmentally sensitive areas as they pertain to federal and state-funded transportation projects. Our unit works closely with the US Army Corps of Engineers and the North Carolina Department of Environmental Quality to ensure environmental compliance from awarded contractors.
Program Name	Natural resource conversation
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	BU 23 - Urban and Regional Planning
Tertiary Business Use	BU 01 - Water Supply and Quality

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Road centerlines are preferred

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed	To MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Nice to have			
Landmark features	Highly desirable			
Cultural resources	Required			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	DEM, LiDAR, state maintained shapefiles/KMZ files via online repository accessible to the public			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	NC OneMap, North Carolina State University Geospatial Library			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			

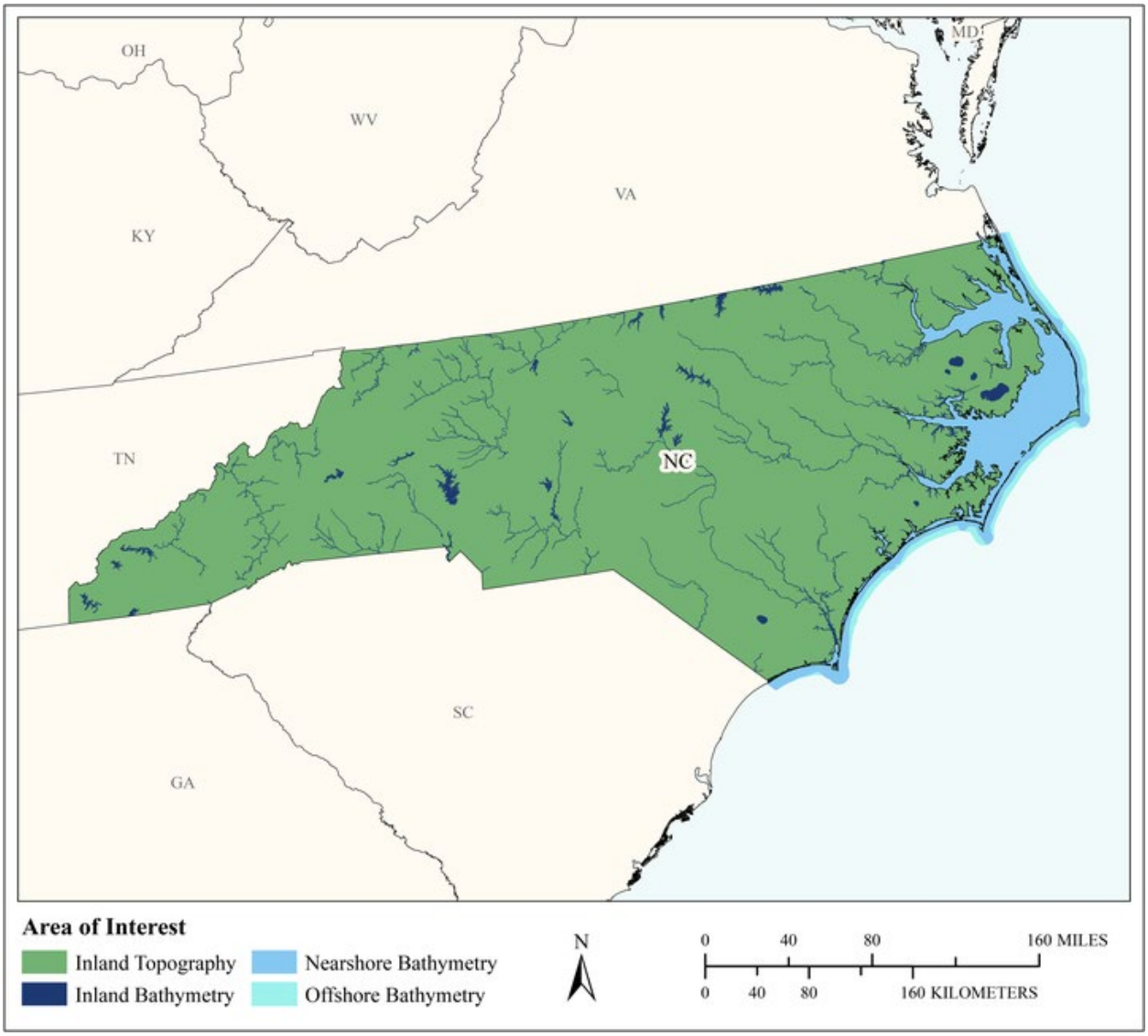
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost avoidance	Major			
Increased revenues	I don't know			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Moderate	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$400,000									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$700,000									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Moderate											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Wildlife and Habitat Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation planning for wildlife refuges and marine sanctuaries. Conservation of critical habitats. Management of diverse migratory bird habitats, coral reef and coral communities, marine mammals, protected fish species, and trust resources. Elevation data are needed for forestry uses including determination of loss of tree types and replanting.
MCA Title	Wildlife and Habitat Management
MCA ID	60322
Organization Type	State or U.S. Territorial government
Organization Name	State of North Carolina
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	I don't know
Update Frequency	4-5 years	4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 2 meters	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DTM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Nice to have	Nice to have	Highly desirable
Classified point cloud	Highly desirable	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Highly desirable
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Highly desirable	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Not required	Nice to have
Lease areas			Not required	Nice to have
Fixed obstructions			Nice to have	Highly desirable
Floating observation/navigation systems			Nice to have	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Nice to have
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Highly desirable	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Nice to have	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Minor	Moderate
Cost savings/cost reduction	Major	Minor	Minor	Minor
Cost avoidance	Major	Minor	Moderate	Major
Increased revenues	None	Minor	None	None
Mission-driven performance improvements	Moderate	Moderate	Moderate	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate	Minor	Minor

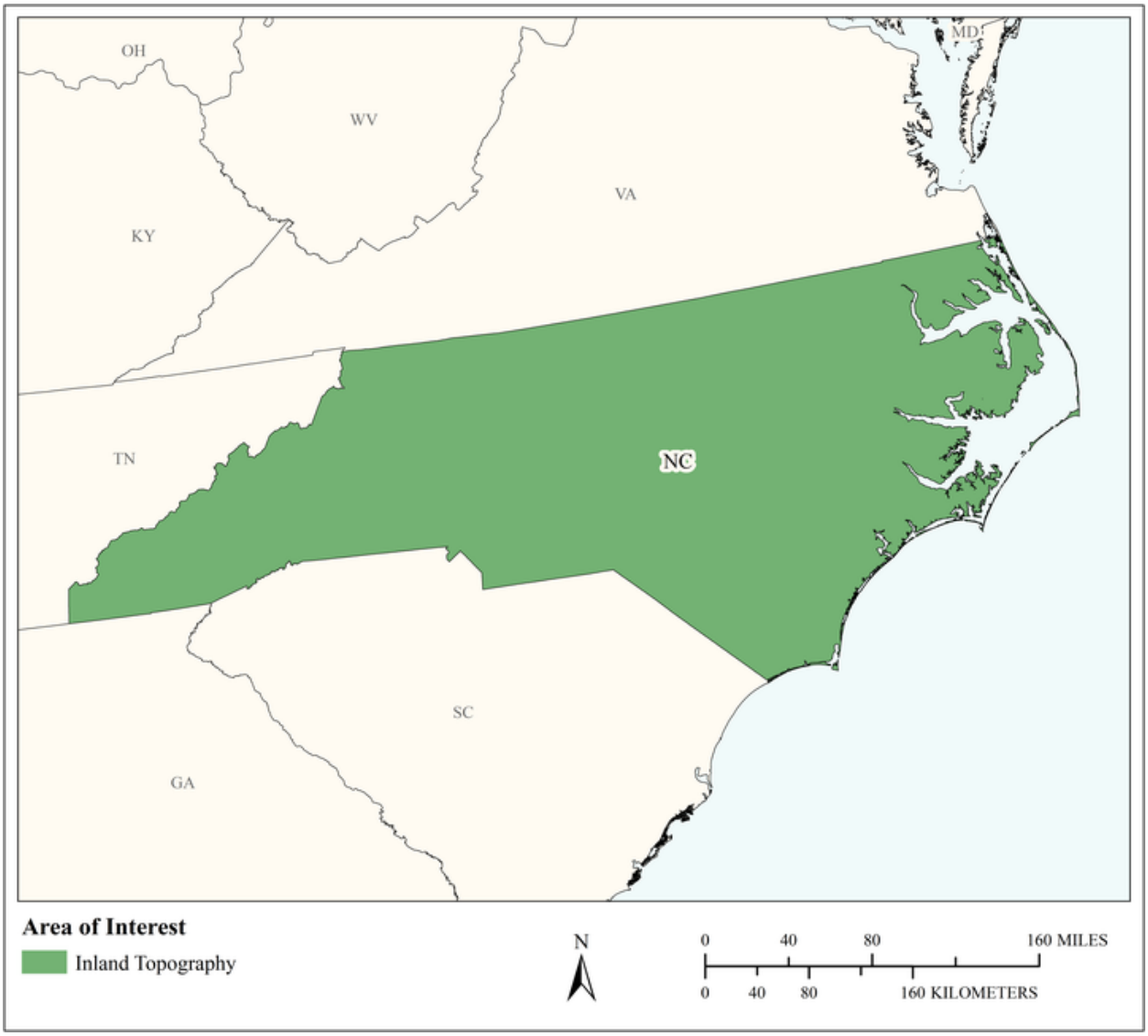
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Minor	Minor	Minor	Minor
Improved customer experience	Minor	Moderate	Minor	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Moderate	Minor	Minor
Environmental	Moderate	Moderate	Moderate	Major
Public safety, including life and property	Minor	Minor	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$11,759		Annual dollars saved/ realized	$94,243		Annual dollars saved/ realized	$4,250		Annual dollars saved/ realized	$612
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$33,965		Annual dollars saved/ realized	$56,964		Annual dollars saved/ realized	$251		Annual dollars saved/ realized	$42
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate			Moderate		
Environmental	Major			Moderate			Major			Major		
Public safety, including life and property	Moderate			Moderate			Moderate			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes			Yes
Curvature maps				
Cross sections	Yes			Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Emergency Response, Farm Pond Design, Forest Management, and Precision Agriculture



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Emergency Response (hurricane, flooding), Farm pond design. Timber harvesting. Detailed site analysis to support precision farming. Analysis of farm sedimentation and runoff. Precision Ag -- RYE, Calibration of fertilizer application, fertilizer management, and irrigation planning. There is a need to see streams in the DEMs for pond design. Sediment removal from ponds is the concern.
MCA Title	Emergency Response, Farm Pond Design, Forest Management, and Precision Agriculture
MCA ID	22119
Organization Type	State or U.S. Territorial government
Organization Name	NC Dept. of Agriculture
Sub-Agency or Division	
Organization Mission	The NCDA&CS Emergency Programs Division's mission is to support the agriculture community and protect consumers by coordinating the Department's efforts to plan for, respond to and recover from emergency events and public health concerns that may impact agriculture in NC.
Program Name	Wild land Fire Fighting
Total Annual Program Budget	
Primary Business Use	BU 08 - Agriculture and Precision Farming
Secondary Business Use	BU 04 - Forest Resources Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required
Other	Required
Other description	More accurate stream lines. NHD not meeting needs, need +/- 20 ft

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Farm pond

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have					
DEM for entire AOI needs to be seamless	Nice to have					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data				
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Nice to have			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Not required			
Landmark features	Not required			
Cultural resources	Not required			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	USGS DEMs			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	NC One Map			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	I don't know			
Mission-driven performance improvements	Minor			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

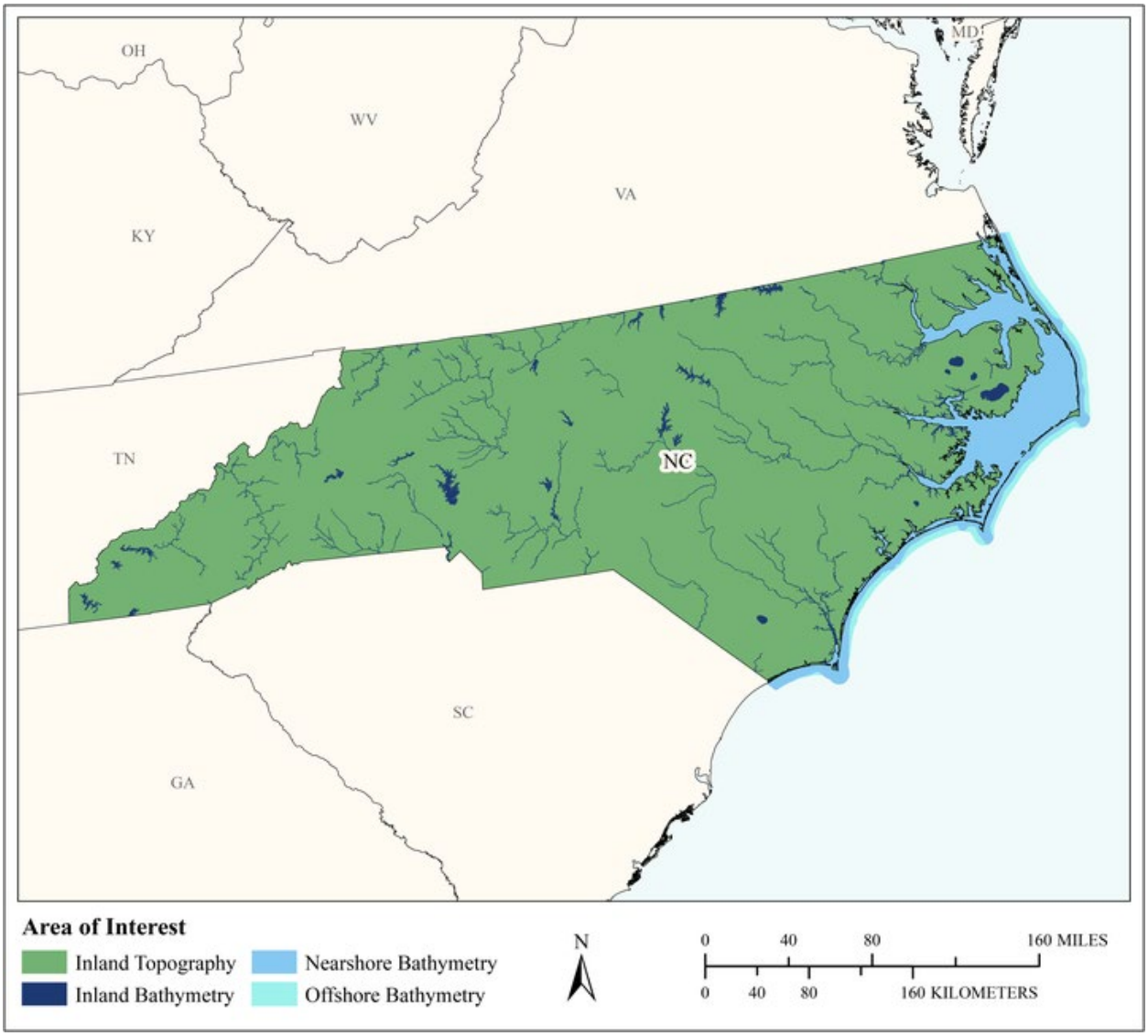
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	I don't know			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	Minor			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$14,472									
Time savings description	Use DEM before we do field surveys of drainage areass/farm ponds.											
Cost savings/cost reduction	I don't know	Unable to provide										
Cost avoidance	I don't know	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$45,825									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	None											
Improved response or timeliness	Minor	Unable to provide										
Improved customer experience	I don't know	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$360,000									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	Minor											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Fisheries Management and Aquaculture



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Management of fisheries. Sustainable aquaculture.
MCA Title	Fisheries Management and Aquaculture
MCA ID	60323
Organization Type	State or U.S. Territorial government
Organization Name	State of North Carolina
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	I don't know
Update Frequency	4-5 years	4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Nice to have	Nice to have	Required	Nice to have
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Required	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Required
DTM	Required	Highly desirable	Highly desirable	Nice to have
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Nice to have	Highly desirable	Nice to have
Classified point cloud	Highly desirable	Nice to have	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Nice to have
Tide Predictions			Not required	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Highly desirable	Required
Ground control/ground truthing	Required	Highly desirable	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Nice to have	Required
Acoustic imagery of the seafloor			Highly desirable	Required
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Required
Underwater videography			Nice to have	Highly desirable
Bottom texture			Nice to have	Required
Bottom type			Highly desirable	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Highly desirable	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Required
Floating observation/navigation systems			Nice to have	Required
Shorelines – current, historic, change rates	Required	Highly desirable	Highly desirable	
Land use/land cover	Required	Highly desirable	Nice to have	Nice to have
Wetlands	Required	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Highly desirable
Inland surface water features	Required	Required	Nice to have	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Not required	
Coastal and riverine structures	Required	Highly desirable	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	Moderate
Cost savings/cost reduction	Major	Moderate	Major	Minor
Cost avoidance	Moderate	Moderate	Minor	Minor
Increased revenues	Moderate	Moderate	Minor	None
Mission-driven performance improvements	Major	Major	Moderate	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Minor	Moderate

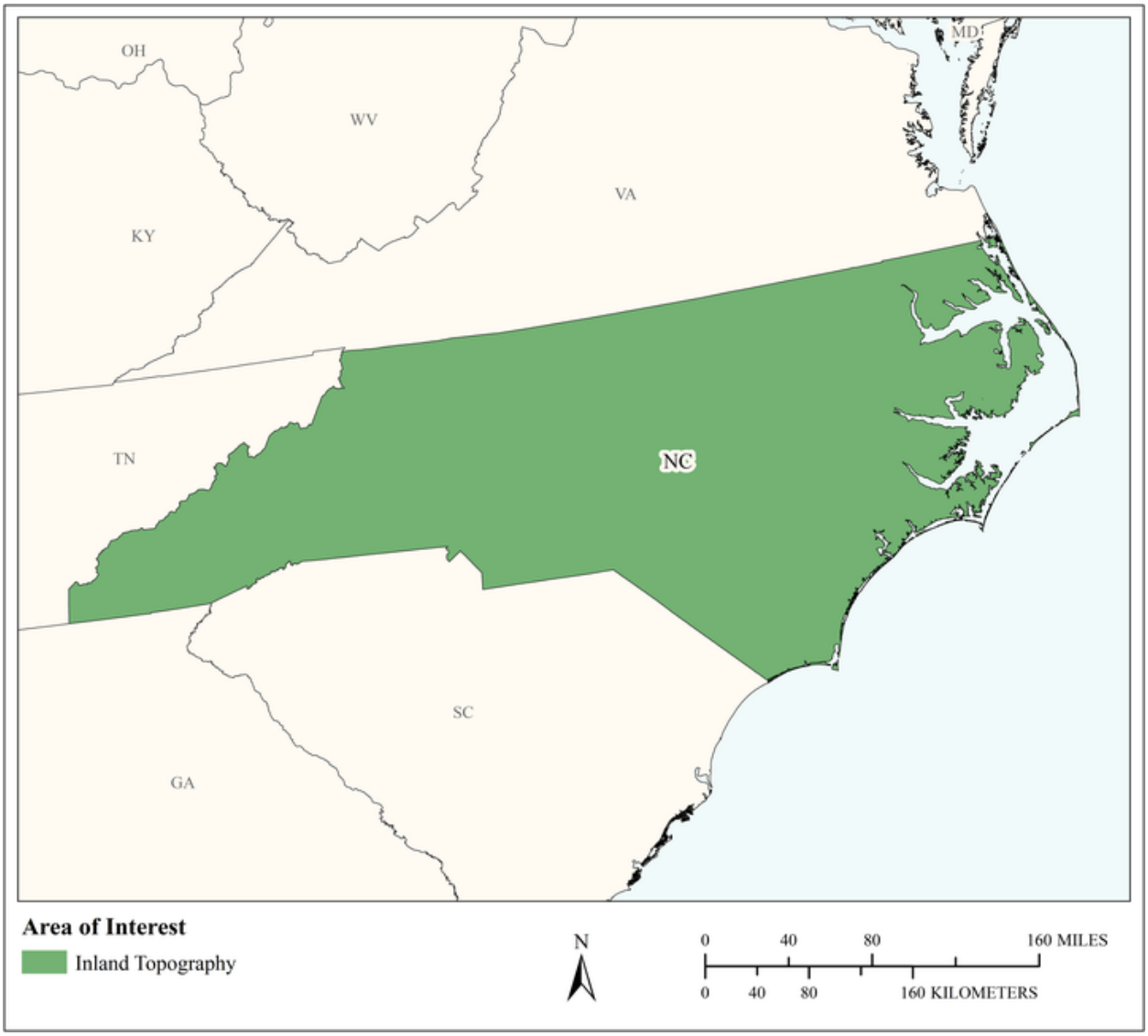
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major	Moderate	Minor
Improved customer experience	Moderate	Major	Minor	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Moderate	Moderate
Environmental	Major	Moderate	Moderate	Minor
Public safety, including life and property	Moderate	Minor	Minor	None

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		None		
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		None		
Increased revenues	Minor	Unable to provide		None			Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$50,463		Annual dollars saved/ realized	$98,779		Annual dollars saved/ realized	$674,293			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$109,610		Annual dollars saved/ realized	$44,958		Annual dollars saved/ realized	$49,521			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Moderate			Moderate		
Environmental	Moderate			Major			Major			Moderate		
Public safety, including life and property	Moderate			Moderate			Minor			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes		Yes	Yes
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic Mapping and Analysis



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Geologic mapping and analysis. Identification of geomorphologic units. Landslide hazard mapping and assessment. Karst mapping, including springs and caves.
MCA Title	Geologic Mapping and Analysis
MCA ID	1373
Organization Type	State or U.S. Territorial government
Organization Name	N.C. Geological Survey
Sub-Agency or Division	
Organization Mission	During the N.C. Geological Survey's 194 years of service to the State, we have been tasked to examine, describe and map the geology, geologic hazards, and mineral resources of the State and publish these findings in NCGS reports and maps. We are required to provide unbiased, impartial and relevant technical information to all parties and be the custodian of maps, reports, rock cores, cuttings, geophysical logs, and working papers generated by the Survey or donated to the Survey.
Program Name	North Carolina Geological Survey
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	One meter pixel.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 30 cm			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed	To MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial			
Cross section/transect requirement	10 cm			

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Highly desirable			
DEM	Highly desirable			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Highly desirable			
Wetlands	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Not required			
Landmark features	Nice to have			
Cultural resources	Not required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	LiDAR from 2004.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	NC One MAP			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	None			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

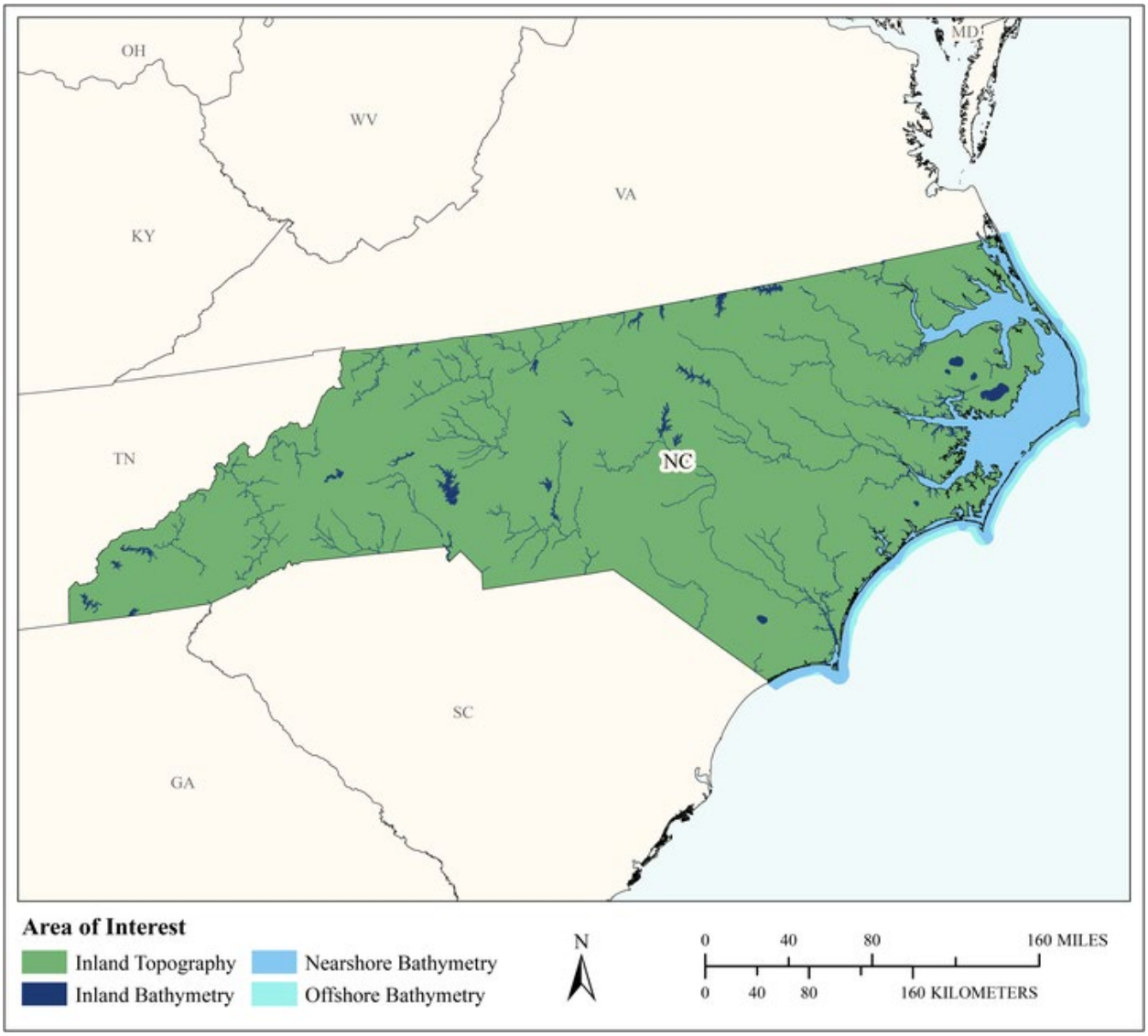
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$10,420,976									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$182,940									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Education or outreach description	Better hazard identification											
Environmental	Moderate											
Environmental description	Better hazard identification											
Public safety, including life and property	Major											
Public safety, including life and property description	Better hazard identification											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades				
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Renewable Energy Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Alternate energy development – solar, tidal, wind, wave, and ocean current. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Low head power potential for hydropower.
MCA Title	Renewable Energy Resources
MCA ID	60324
Organization Type	State or U.S. Territorial government
Organization Name	State of North Carolina
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	I don't know
Rivers and Streams	
Less than 10 ft	I don't know
10 - 50 ft	I don't know
51 - 100 ft	I don't know
101 - 500 ft	I don't know
501 - 2,500 ft	I don't know
Greater than 2,500 ft	I don't know
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	I don't know
½ - 1 acre	I don't know
1.1 – 2 acres	I don't know
2.1 – 5 acres	I don't know

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	I don't know
Greater than 10 acres	I don't know

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	I don't know
Update Frequency	4-5 years	4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	I don't know	I don't know	I don't know
Acceptable Vertical Error	Up to 20 cm	I don't know	I don't know	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					I don't know	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	I don't know	I don't know	I don't know	I don't know	I don't know
Entire AOI under same environmental conditions	Highly desirable	I don't know	I don't know	I don't know	I don't know	I don't know
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	I don't know	I don't know	I don't know	I don't know	I don't know
DEM for entire AOI needs to be seamless	Highly desirable	I don't know	I don't know	I don't know	I don't know	I don't know
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	I don't know	I don't know	I don't know
DTM	Required	I don't know	I don't know	I don't know
DEM	Required	I don't know	I don't know	I don't know
Raw point cloud data	Highly desirable	I don't know	I don't know	I don't know
Classified point cloud	Highly desirable	I don't know	I don't know	
Edited/cube XYZ		I don't know	I don't know	I don't know
Full waveform	Nice to have	I don't know	I don't know	I don't know
Bathymetric Attributed Grid (BAG)		I don't know	I don't know	I don't know
Breaklines required for standard hydro-flattening	Nice to have	I don't know		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			I don't know	I don't know
Tide Predictions			I don't know	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			I don't know	I don't know
Intensity imagery/sidescan imagery	Not required	I don't know	I don't know	I don't know
Ground control/ground truthing	Highly desirable	I don't know	I don't know	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			I don't know	I don't know
Nautical and/or navigation charts			I don't know	I don't know
Acoustic imagery of the seafloor			I don't know	I don't know
Aerial and/or satellite imagery	Highly desirable	I don't know	I don't know	I don't know
Underwater videography			I don't know	I don't know
Bottom texture			I don't know	I don't know
Bottom type			I don't know	I don't know
Submerged features			I don't know	I don't know
Subbottom characteristics			I don't know	I don't know
Geologic and seismic data	Not required	I don't know	I don't know	I don't know
Water column properties - Physical			I don't know	I don't know
Water column properties - Chemical			I don't know	I don't know
Water column properties - Biological			I don't know	I don't know
Currents			I don't know	I don't know
Tide/wave heights			I don't know	I don't know
Sea ice conditions			I don't know	I don't know
Habitat distribution and classification			I don't know	I don't know
Boundaries			I don't know	I don't know
Routes			I don't know	I don't know
Offshore cadastral			I don't know	I don't know
Lease areas			I don't know	I don't know
Fixed obstructions			I don't know	I don't know
Floating observation/navigation systems			I don't know	I don't know
Shorelines – current, historic, change rates	Nice to have	I don't know	I don't know	
Land use/land cover	Highly desirable	I don't know	I don't know	I don't know
Wetlands	Nice to have	I don't know	I don't know	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			I don't know	I don't know
Inland surface water features	Nice to have	I don't know	I don't know	
Bridges/culverts	Nice to have	I don't know		
Landmark features	Nice to have	I don't know	I don't know	
Cultural resources	Not required	I don't know	I don't know	
Coastal and riverine structures	Nice to have	I don't know	I don't know	
Overhead structures			I don't know	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	I don't know	I don't know	I don't know
Cost savings/cost reduction	Moderate	I don't know	I don't know	I don't know
Cost avoidance	Moderate	I don't know	I don't know	I don't know
Increased revenues	None	I don't know	I don't know	I don't know
Mission-driven performance improvements	Minor	I don't know	I don't know	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	I don't know	I don't know	I don't know

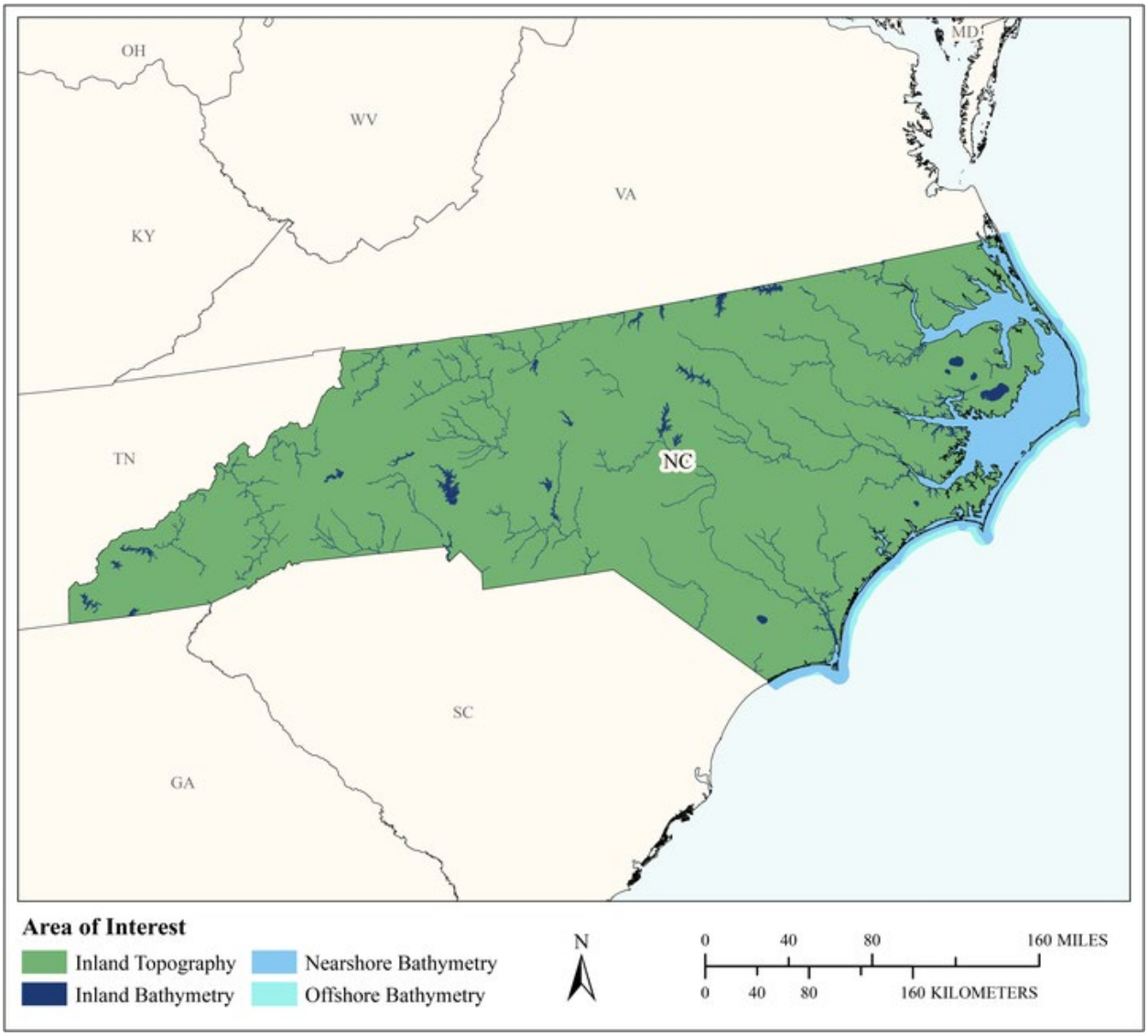
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor	I don't know	I don't know	I don't know
Improved customer experience	Minor	I don't know	I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	I don't know	I don't know	I don't know
Environmental	Minor	I don't know	I don't know	I don't know
Public safety, including life and property	Minor	I don't know	I don't know	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Minor	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			I don't know			I don't know			I don't know		
Environmental	Minor			I don't know			I don't know			I don't know		
Public safety, including life and property	None			I don't know			I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Cultural Resources Preservation and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Discovery and analysis of underwater archaeological and historical cultural sites. Site protection and preservation planning. Discovery and analysis of Native American and other historical cultural sites and subsistence activities. Lidar is being used to find historic sites.
MCA Title	Cultural Resources Preservation and Management
MCA ID	60325
Organization Type	State or U.S. Territorial government
Organization Name	State of North Carolina
Sub-Agency or Division	Office of Archaeology
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	I don't know
Update Frequency	4-5 years	4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Not required	Nice to have	Nice to have	Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	Required
DTM	Required	Highly desirable	Nice to have	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Not required	Not required	Not required	Not required
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Not required	Nice to have
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Nice to have	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Highly desirable
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Nice to have	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Required
Nautical and/or navigation charts			Highly desirable	Required
Acoustic imagery of the seafloor			Highly desirable	Required
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Nice to have
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Required	Required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have	Highly desirable	Highly desirable	Highly desirable
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Highly desirable	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Highly desirable	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Required	Required
Floating observation/navigation systems			Highly desirable	Required
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Required	
Land use/land cover	Nice to have	Highly desirable	Nice to have	Highly desirable
Wetlands	Nice to have	Highly desirable	Nice to have	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Nice to have	Highly desirable	Nice to have	
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Nice to have	Highly desirable	Highly desirable	
Cultural resources	Required	Highly desirable	Required	
Coastal and riverine structures	Nice to have	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	Moderate
Cost savings/cost reduction	Moderate	Minor	Minor	Minor
Cost avoidance	Minor	Minor	Minor	Minor
Increased revenues	None	Minor	None	None
Mission-driven performance improvements	Moderate	Moderate	Minor	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor	None	Minor

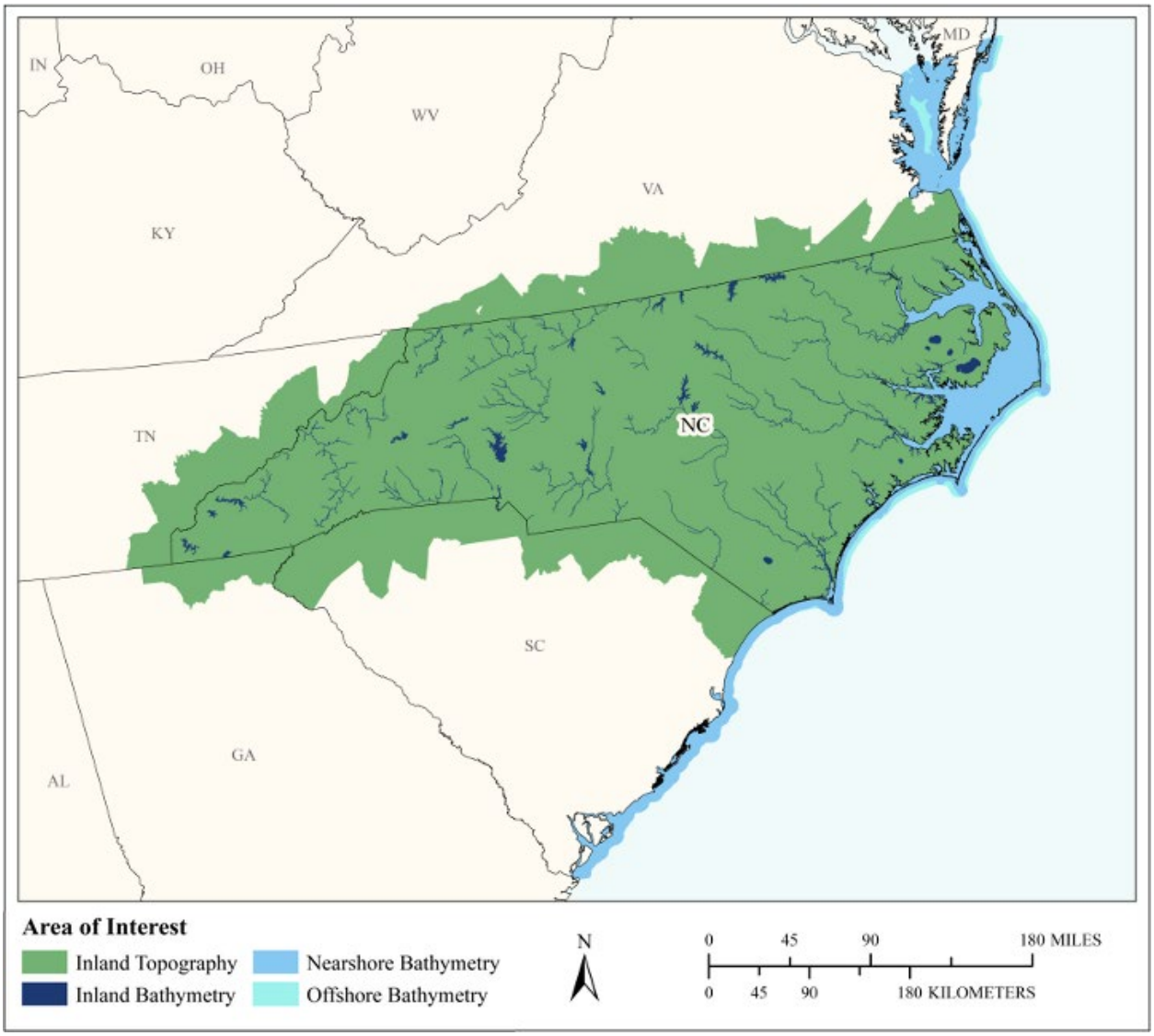
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major	Minor	Moderate
Improved customer experience	Moderate	Moderate	Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	Minor	Minor
Environmental	Minor	Moderate	Minor	Moderate
Public safety, including life and property	Minor	Moderate	None	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Increased revenues	None			None			None			None		
Mission-driven performance improvements	Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$60,000		Annual dollars saved/ realized	$21,699		Annual dollars saved/ realized	$12,284		Annual dollars saved/ realized	$1,508
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$30,000									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Moderate			Minor			Minor		
Environmental	Minor			Minor			Moderate			Moderate		
Public safety, including life and property	Minor			Minor			Minor			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				Yes

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Multi Hazard Identification and Mitigation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Custom description	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements	North Carolina and bordering Counties			

MCA Description	Response
Mission Critical Activity	Floodplain mapping, geodetic control, flood warning, coastal hazard mitigation, emergency management, risk management, and development of geoid models
MCA Title	Multi Hazard Identification and Mitigation
MCA ID	1098
Organization Type	State or U.S. Territorial government
Organization Name	North Carolina Emergency Management/Risk Management/Geodetic Survey
Sub-Agency or Division	
Organization Mission	NC Emergency Management helps North Carolinians prepare for, respond to, and recover from disasters and emergencies. NC Geodetic Survey develops and maintains the official survey base for the State of North Carolina.
Program Name	Floodplain Mapping program
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 30 - Maritime and Land Boundary Management
Tertiary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Curb, gutter, power lines, road edge, bridge features, building features, underwater obstacles, channel geometry.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0HD	QL0B	QL0B	Special Order
Update Frequency	4-5 years	2-3 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 40 cm	Less than 50 cm	Less than 50 cm	Less than 50 cm
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm	Up to 20 cm	Less than 1 meter
How far onshore needed			>1 kilometer inland	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			I don't know	I don't know
Cross sections and/or transects meet needs	Partial	Partial		
Cross section/transect requirement	Streams, rivers, and beach profiles.			

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Required	Required	Required	Required	Required
Other	Required					
Other description	Want as much as possible in the same year within reason.					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Other	Required					
Other description	Data will be left as approved and accepted with explanations as to why there is a difference in the data. Need to document discrepancies so differences can be taken into account when using the data.					

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Required	Highly desirable
DTM	Required	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Required	Required	Highly desirable
Raw point cloud data	Required	Required	Required	Required
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Highly desirable	Highly desirable	Highly desirable
Full waveform	Required	Highly desirable	Highly desirable	Highly desirable
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)			Required	Required
Tide Predictions			Required	Required
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery	Required	Required	Required	Highly desirable
Ground control/ground truthing	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Highly desirable	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Highly desirable	Highly desirable
Water column properties - Chemical			Highly desirable	Highly desirable
Water column properties - Biological			Highly desirable	Highly desirable
Currents			Highly desirable	Required
Tide/wave heights			Highly desirable	Required
Sea ice conditions			Nice to have	Nice to have
Habitat distribution and classification			Nice to have	Required
Boundaries			Highly desirable	Highly desirable
Routes			Highly desirable	Highly desirable
Offshore cadastral			Highly desirable	Highly desirable
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Nice to have	Nice to have	Highly desirable	Highly desirable
Wetlands	Highly desirable	Nice to have	Highly desirable	Highly desirable
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Required	Required	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Required	Required	Highly desirable	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Required			
Other	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other description	All layers above are used as a reference. Integration is not necessary for the data to be created but to create derivatives. Normally the Lidar is used to create these other layers (except imagery). All can be used with one another but are not necessary to integrate.			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Statewide LiDAR elevation data. QL2 in eastern NC and QL 1 in western NC.	NOAA	NOAA data.	NOAA data
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast		Yes	Yes	Yes
NCEI		Yes		
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	Sdd.nc.gov/sdd	NC		
Other	Yes			
Other description	NC Spatial Download tool			
Data that meet my needs are not available				

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Moderate	Moderate
Cost savings/cost reduction	Major	Moderate	Moderate	Moderate
Cost avoidance	Major	Major	Moderate	Moderate
Increased revenues	Major	I don't know	None	Moderate
Mission-driven performance improvements	Major	Moderate	Moderate	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Moderate	Moderate
Improved response or timeliness	Major	Moderate	Moderate	Major
Improved customer experience	Major	Moderate	Moderate	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Major	Moderate
Environmental	Major	Minor	Moderate	Moderate
Public safety, including life and property	Major	Moderate	Major	Major

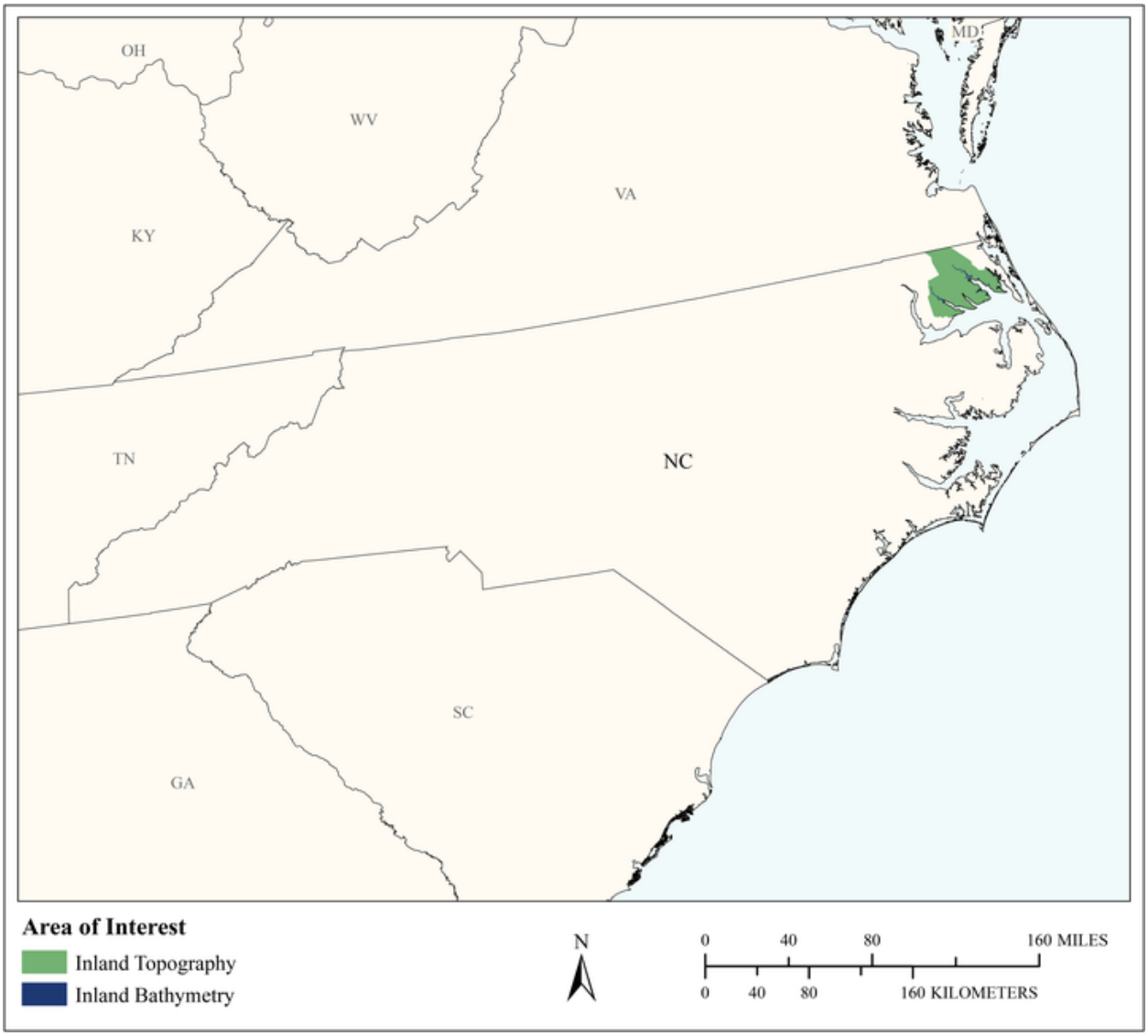
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$3,497	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Time savings description	Clean data leads to more precise answers. Approximately 20% improvement. This is difficult to estimate because projects have different levels of effort. A more complete terrain surface allows for more efficient modeling approximately 40% improvement, however this is difficult to estimate because projects have different levels of effort. Still have to manipulate data layers to co-exist with one another. Declarations on disasters can be done more quickly approximately 20% improvement, less field work is required because of the amount of data available with the lidar, however this is difficult to estimate because projects have different levels of effort.			Field surveys would be saved for flood modeling, especially smaller streams.			Improved Hurricane impacts, AdCIRC, SWANN modeling. Sounds need better data. USCG also needs sounds, channels.			Improved Hurricane impacts, AdCIRC, SWANN modeling. Sounds need better data. USCG also needs sounds, channels.		
Cost savings/cost reduction	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost avoidance description	We know that this will be used for modeling which will assist with avoided data processing. However we do not have a return on investment as of yet. Because of the amount of data available we know that data errors will be avoided. Again no way to validate at this time. We have used this information during events but we do not have a cost associated.											
Increased revenues	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Increased revenues description	We are in the process of testing new derivatives.											
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$3,437,203		Annual dollars saved/ realized	$239,009		Annual dollars saved/ realized	$406,330			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience description	There is a heavy lift on internal systems to hold and deliver all this data. This is not a cost savings.											
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$602,002		Annual dollars saved/ realized	$268,346		Annual dollars saved/ realized	$301,148			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate			Major		
Environmental	Moderate			Moderate			Minor			I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Public safety, including life and property	Major	Major	Major	Major

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes			
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Flood Risk Management and Mitigation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements	Pasquotank, Camden, and Perquimans Counties, NC	Pasquotank, Camden, and Perquimans Counties, NC		

MCA Description	Response
Mission Critical Activity	Flood management
MCA Title	Flood Risk Management and Mitigation
MCA ID	1139
Organization Type	Regional, County, City, or other local government
Organization Name	Pasquotank County, NC
Sub-Agency or Division	
Organization Mission	Local government.
Program Name	Flood management both in planning and mitigation in Emergency Management
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Buildings

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	Cross sections and/or transects meet needs		
Update Frequency	>10 years	>10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	Up to 5 meters		
Acceptable Vertical Error	Up to 10 cm	Up to 50 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs		Yes		
Cross section/transect requirement		Typically cross section may be 1000 feet apart in open reaches, with additional cross sections immediately upstream and downstream of hydraulic structures (culverts, bridges, weirs, etc.).		

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Not required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required			Highly desirable	
Entire AOI under same environmental conditions	Not required	Not required			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Not required			Highly desirable	
DEM for entire AOI needs to be seamless	Nice to have	Not required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have		
DTM	Nice to have	Nice to have		
DEM	Required	Nice to have		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Nice to have	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Nice to have	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Nice to have	Nice to have		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Highly desirable	Nice to have		
Wetlands	Highly desirable	Nice to have		
Estuaries				
Inland surface water features	Highly desirable	Nice to have		
Bridges/culverts	Highly desirable	Nice to have		
Landmark features	Nice to have	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Nice to have	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Currently using 2003(?) Lidar collected by NC. I don't know what the quality level is.	Have none		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Center for Geographic Information and Analysis; NC OneMap			
Other		Yes		
Other description		None		

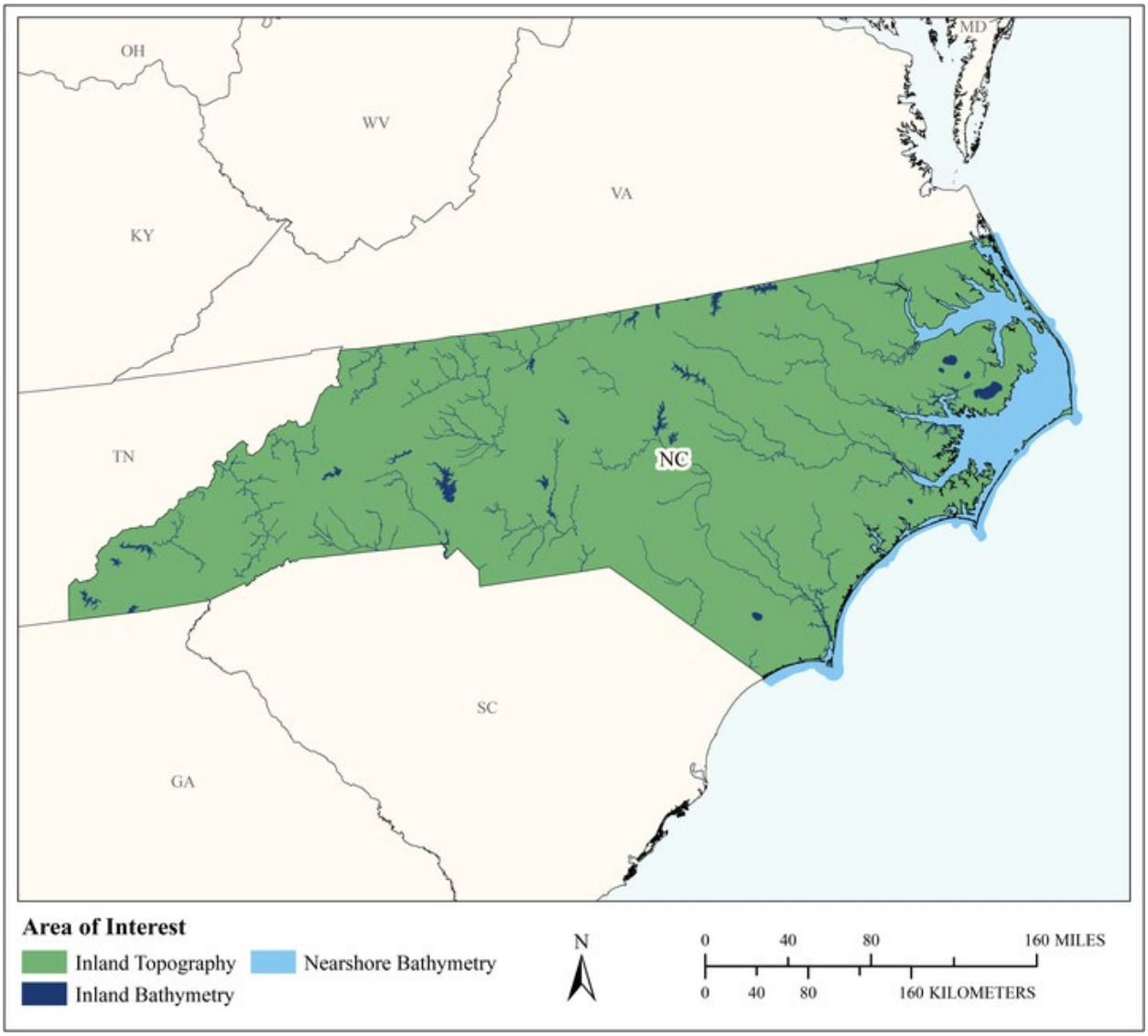
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available		
Cost savings/cost reduction	Major	Inland bathy data not available		
Cost avoidance	Major	Inland bathy data not available		
Increased revenues	None	Inland bathy data not available		
Mission-driven performance improvements	Moderate	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Inland bathy data not available		
Improved response or timeliness	Moderate	Inland bathy data not available		
Improved customer experience	Moderate	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Inland bathy data not available		
Environmental	Moderate	Inland bathy data not available		
Public safety, including life and property	Moderate	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		I don't know	Unable to provide							
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide							
Increased revenues	Minor	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$50,225		Annual dollars saved/ realized	$3,489						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	Major	Unable to provide		I don't know	Unable to provide							
Improved customer experience	Moderate	Unable to provide		I don't know	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$8,787		Annual dollars saved/ realized	$3,917						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			None								
Environmental	Moderate			None								
Public safety, including life and property	Moderate			None								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Environmental Modeling



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	North Carolina Agricultural and Technical (NCAT) State University offers interdisciplinary work in a broad selection of colleges and departments. There are ongoing research activities almost on all Business Uses mentioned in the table in: College of Agriculture and Environmental Sciences, College of Engineering, College of Health and Human Sciences, and College of Science and Technology.
MCA Title	Environmental Modeling
MCA ID	1348
Organization Type	Academic or Not-for-Profit
Organization Name	NC A&T State University
Sub-Agency or Division	
Organization Mission	North Carolina Agricultural and Technical State University's mission is advancing knowledge through scholarly exchange and transforms society with exceptional teaching, learning, discovery and community engagement. An 1890 land-grant doctoral research institution with a distinction in STEM and commitment to excellence in all disciplines, North Carolina A&T creates innovative solutions that address the challenges and economic needs of North Carolina, the nation and the world.
Program Name	College of Science and Technology, Department of Built Environment: Geomatics program Construction Management program. College of Engineering: Department of Civil, Architectural and Environmental Engineering, Department of Electrical and Computer Engineering
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 26 - Education K12 and Beyond, Basic Research
Tertiary Business Use	BU 08 - Agriculture and Precision Farming

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	We work on different geographic extent from local to national scale
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	In Geomatics program we are trying to extract infrastructures in 3D (roads, power lines, etc.) from geospatial data.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required

Inland Bathy Feature Size Requirements	Response
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Nice to have
Greater than 10 acres	Not required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL0B	QL0B	
Update Frequency	Annually	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Less than 50 cm	Less than 50 cm	
Acceptable Vertical Error	Less than 5 cm	Up to 20 cm	Up to 20 cm	
How far onshore needed			500 meters inland	
How far down the beach profile needed	Not applicable		None	
Tide correction requirement			No requirement for tide correction	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable		Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Not required	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Required		Highly desirable	Required
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Required		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have	Nice to have	
DTM	Highly desirable	Nice to have	Nice to have	
DEM	Highly desirable	Nice to have	Nice to have	
Raw point cloud data	Required	Required	Required	
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Highly desirable	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable	Required	Required	
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Not required	
Submerged features			Not required	
Subbottom characteristics			Not required	
Geologic and seismic data	Nice to have	Not required	Not required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Not required	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Required	Nice to have	Nice to have	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Nice to have	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Not required	
Inland surface water features	Highly desirable	Nice to have	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Nice to have	Nice to have	
Cultural resources	Highly desirable	Not required	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We are using different geospatial data including existing LiDAR data and creating our 3D topography data using image matching between remote sensing data as well as UAV data.	I don't have any bathymetry for my study area. I am processing UAV data and developing some remote sensing method to create the info while the accuracy can't be defined.	Remote sensing data are used to extract the data. NOAA topobathy also used.	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast			Yes	
NCEI			Yes	
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	North Carolina's Spatial Data Repository provides Quality Level 2 LiDAR Legacy LiDAR Digital Elevation Models			

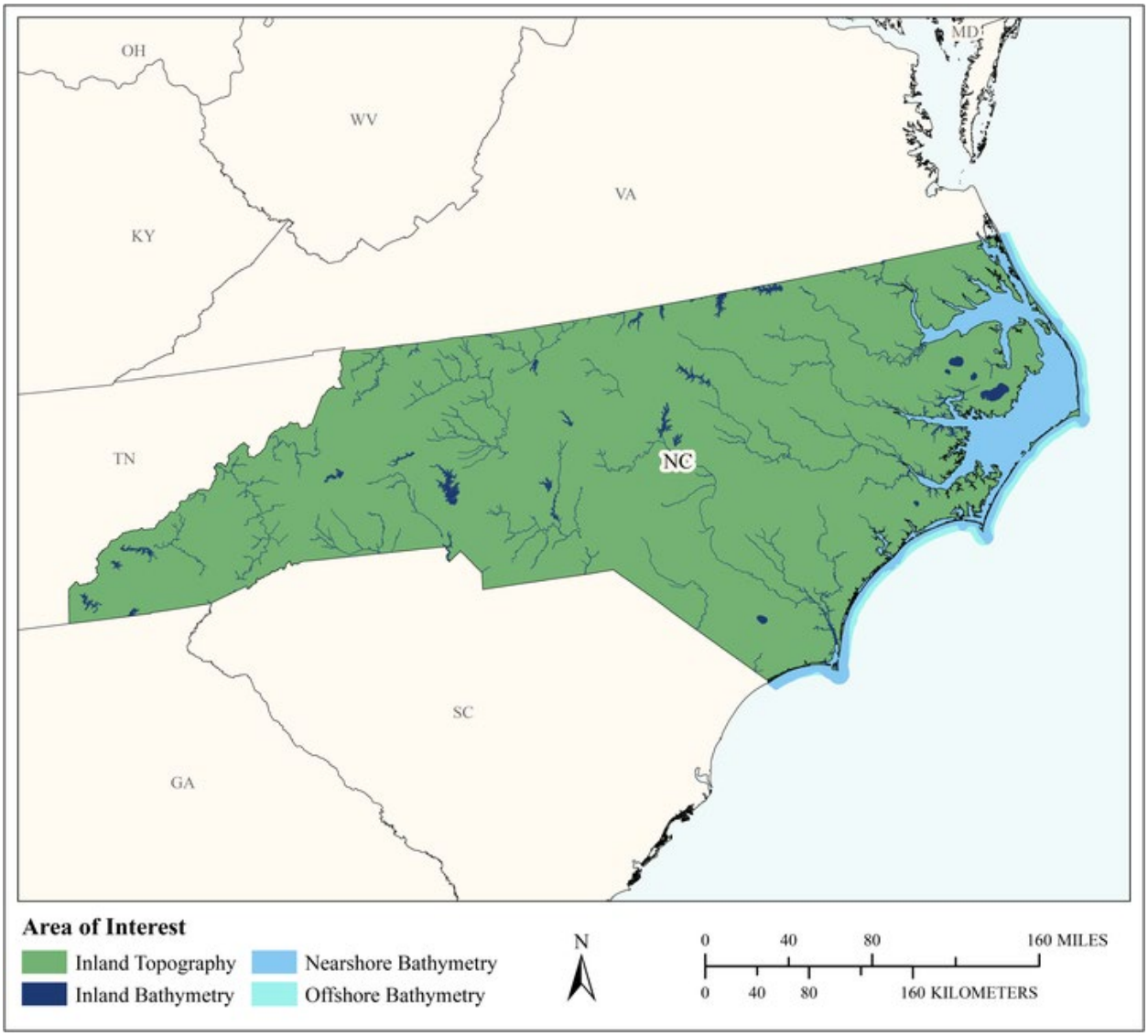
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other		Yes	Yes	
Other description		No data	RS methods are used	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available	I don't know	
Cost savings/cost reduction	Major	Inland bathy data not available	I don't know	
Cost avoidance	Moderate	Inland bathy data not available	I don't know	
Increased revenues	I don't know	Inland bathy data not available	I don't know	
Mission-driven performance improvements	Major	Inland bathy data not available	Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available	Major	
Improved response or timeliness	Moderate	Inland bathy data not available	Major	
Improved customer experience	I don't know	Inland bathy data not available	Major	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Inland bathy data not available	Major	
Environmental	Major	Inland bathy data not available	Major	
Public safety, including life and property	I don't know	Inland bathy data not available	Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Time savings description	Saves time for modeling and validating results for research.			Saves time for modeling and validating results for research.			Saves time for modeling and validating results for research.					
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide				
Increased revenues description	Evaluate.											
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$3,440,628		Annual dollars saved/ realized	$239,009		Annual dollars saved/ realized	$406,330			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$602,002		Annual dollars saved/ realized	$268,346		Annual dollars saved/ realized	$301,148			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major					
Environmental	Major			Major			Major					
Public safety, including life and property	Major			Major			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes	Yes		
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Sea Level Rise and Subsidence



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Modeling and mapping the effects of sea level rise or subsidence. Population and economic vulnerability assessments. Coastal inundation and infrastructure assessment.
MCA Title	Sea Level Rise and Subsidence
MCA ID	60326
Organization Type	State or U.S. Territorial government
Organization Name	State of North Carolina
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 16 - Sea Level Rise and Subsidence
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	I don't know
Update Frequency	4-5 years	4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	Up to 20 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	Up to 2 meters
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Required	Required	Highly desirable	Highly desirable	Required
Entire AOI under same environmental conditions	Highly desirable	Required	Required	Highly desirable	Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Required	Required	Highly desirable	Required
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have	Highly desirable	Highly desirable
DTM	Required	Required	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Highly desirable	Nice to have	Nice to have
Classified point cloud	Required	Nice to have	Highly desirable	
Edited/cube XYZ		Not required	Not required	Not required
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Not required	Not required	Not required
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	Required
Tide Predictions			Required	Required
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Required
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Highly desirable	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Required
Nautical and/or navigation charts			Highly desirable	Required
Acoustic imagery of the seafloor			Nice to have	Not required
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Not required	Not required
Bottom texture			Not required	Not required
Bottom type			Nice to have	Nice to have
Submerged features			Nice to have	Not required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Not required
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Not required
Water column properties - Biological			Not required	Not required
Currents			Nice to have	Nice to have
Tide/wave heights			Required	Required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Required
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Not required	Not required
Lease areas			Not required	Not required
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Required	Required	Highly desirable	Highly desirable
Wetlands	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Required	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes	Yes	Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Major	Major
Cost savings/cost reduction	Major	Major	Major	Major
Cost avoidance	Major	Major	Major	Major
Increased revenues	None	Minor	Minor	None
Mission-driven performance improvements	Major	Major	Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	Major

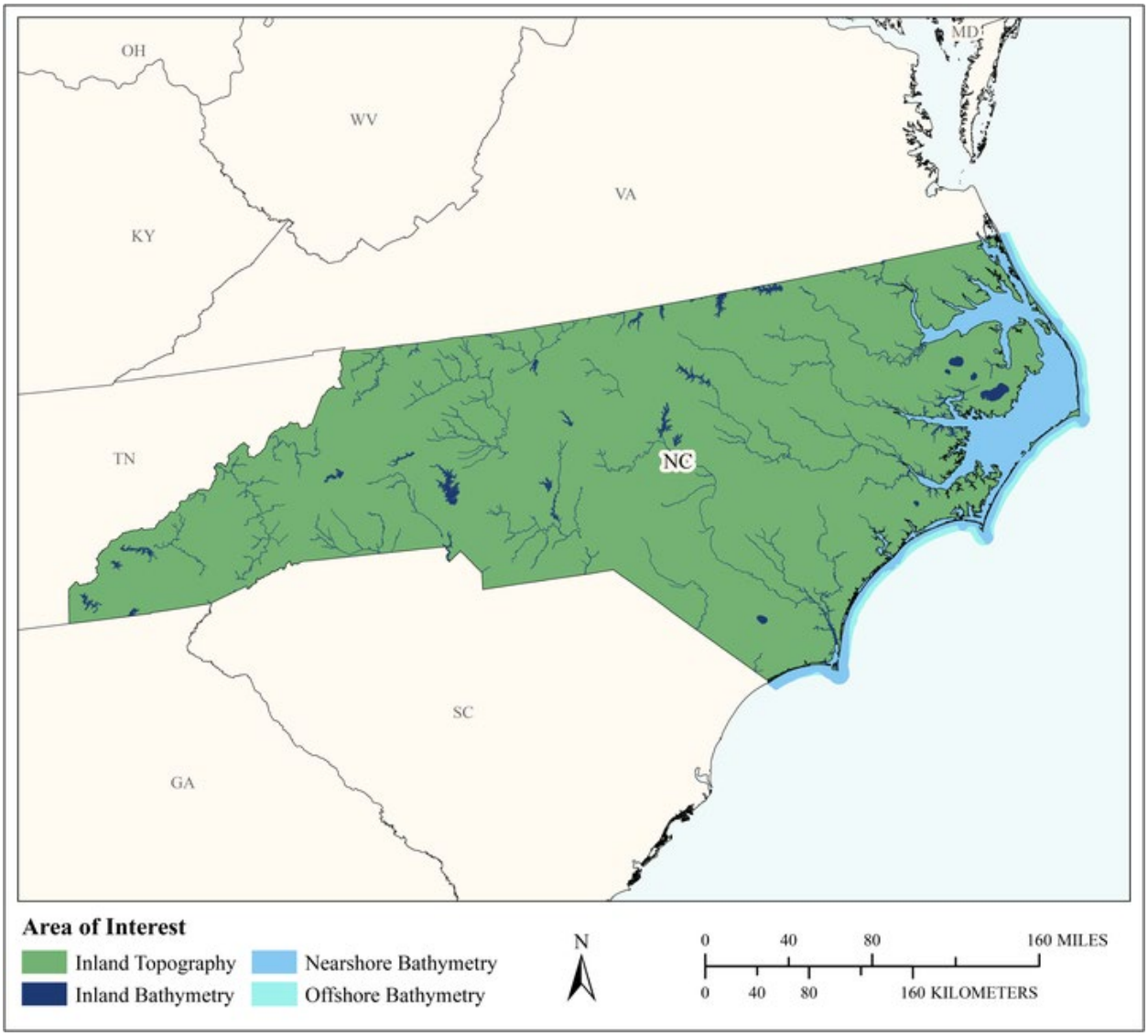
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Minor	Major	Major
Improved customer experience	Moderate	Moderate	Major	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Major	Moderate
Environmental	Moderate	Moderate	Major	Major
Public safety, including life and property	Major	Moderate	Major	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Increased revenues	Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,700,000									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Major			Major		
Environmental	Moderate			Major			Major			Major		
Public safety, including life and property	Moderate			Major			Minor			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		Yes
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Wildfire Management, Planning, and Response



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of forest fuel and fire susceptibility. Fire behavior modeling to support wildfire suppression activities. Wildland/urban interface building identification. Post fire analysis to determine landslide prone areas.
MCA Title	Wildfire Management, Planning, and Response
MCA ID	60327
Organization Type	State or U.S. Territorial government
Organization Name	State of North Carolina
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 17 - Wildfire Management, Planning, and Response
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	I don't know
Update Frequency	4-5 years	4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	I don't know	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	I don't know	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Required	I don't know	I don't know	Required	I don't know
Entire AOI under same environmental conditions	Required	Required	I don't know	I don't know	Required	I don't know
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	I don't know	I don't know	Required	I don't know
DEM for entire AOI needs to be seamless	Required	Required	I don't know	I don't know	Required	I don't know
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	I don't know	I don't know
DTM	Required	Required	I don't know	I don't know
DEM	Required	Required	I don't know	I don't know
Raw point cloud data	Nice to have	Required	I don't know	I don't know
Classified point cloud	Highly desirable	Required	I don't know	
Edited/cube XYZ		Nice to have	I don't know	I don't know
Full waveform	Not required	Nice to have	I don't know	I don't know
Bathymetric Attributed Grid (BAG)		Nice to have	I don't know	I don't know
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			I don't know	I don't know
Tide Predictions			I don't know	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			I don't know	I don't know
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	I don't know	I don't know
Ground control/ground truthing	Highly desirable	Nice to have	I don't know	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			I don't know	I don't know
Nautical and/or navigation charts			I don't know	I don't know
Acoustic imagery of the seafloor			I don't know	I don't know
Aerial and/or satellite imagery	Required	Required	I don't know	I don't know
Underwater videography			I don't know	I don't know
Bottom texture			I don't know	I don't know
Bottom type			I don't know	I don't know
Submerged features			I don't know	I don't know
Subbottom characteristics			I don't know	I don't know
Geologic and seismic data	Nice to have	Required	I don't know	I don't know
Water column properties - Physical			I don't know	I don't know
Water column properties - Chemical			I don't know	I don't know
Water column properties - Biological			I don't know	I don't know
Currents			I don't know	I don't know
Tide/wave heights			I don't know	I don't know
Sea ice conditions			I don't know	I don't know
Habitat distribution and classification			I don't know	I don't know
Boundaries			I don't know	I don't know
Routes			I don't know	I don't know
Offshore cadastral			I don't know	I don't know
Lease areas			I don't know	I don't know
Fixed obstructions			I don't know	I don't know
Floating observation/navigation systems			I don't know	I don't know
Shorelines – current, historic, change rates	Not required	Not required	I don't know	
Land use/land cover	Highly desirable	Required	I don't know	I don't know
Wetlands	Nice to have	Nice to have	I don't know	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			I don't know	I don't know
Inland surface water features	Highly desirable	Required	I don't know	
Bridges/culverts	Nice to have	Required		
Landmark features	Nice to have	Required	I don't know	
Cultural resources	Nice to have	Required	I don't know	
Coastal and riverine structures	Nice to have	Highly desirable	I don't know	
Overhead structures			I don't know	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Major	I don't know	I don't know
Cost savings/cost reduction	Major	Major	I don't know	I don't know
Cost avoidance	Major	Major	I don't know	I don't know
Increased revenues	Minor	Major	I don't know	I don't know
Mission-driven performance improvements	Major	Major	I don't know	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	I don't know	I don't know

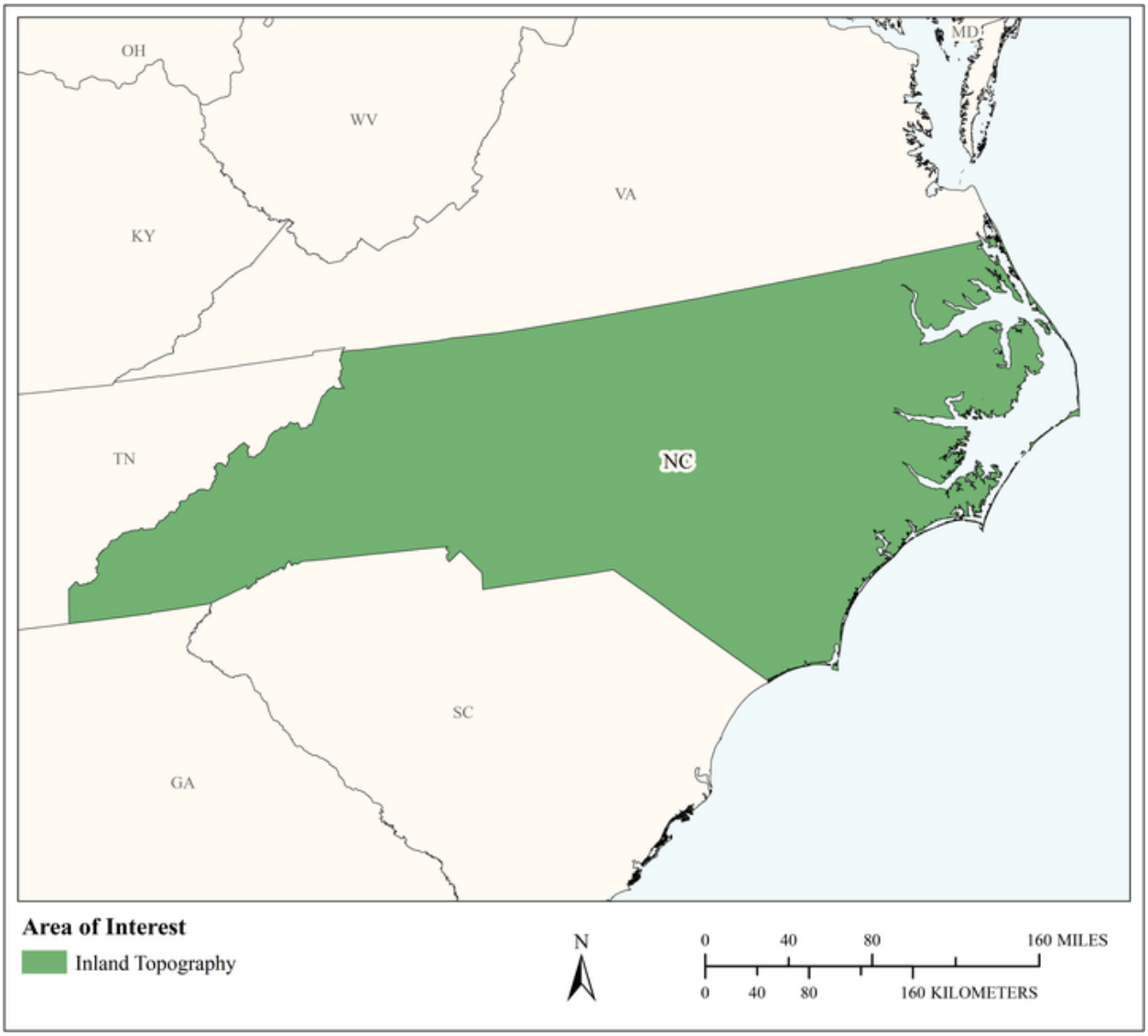
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major	I don't know	I don't know
Improved customer experience	Major	Major	I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major	I don't know	I don't know
Environmental	Major	Major	I don't know	I don't know
Public safety, including life and property	Major	Major	I don't know	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues	Minor	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$265,244									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			I don't know			I don't know		
Environmental	Major			Major			I don't know			I don't know		
Public safety, including life and property	Major			Major			I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement		Yes		
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Aerial Imagery Rectification



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Aerial imagery rectification. Aerial imagery is collected on a 4-year cycle, with one quarter of the state being collected per year. Elevation data are needed for orthorecitification of the imagery.
MCA Title	Aerial Imagery Rectification
MCA ID	1468
Organization Type	State or U.S. Territorial government
Organization Name	NC Center for Geographic Information and Analysis
Sub-Agency or Division	
Organization Mission	Coordinate statewide geospatial initiatives through the NC Geographic Information Coordinating Council (NC GICC) resulting in cost-effective ways to create, access, and apply geographic data and technology, primarily through the NC OneMap Geospatial Portal.
Program Name	North Carolina Orthoimagery Program
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Earth surface

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Vertical Error	Up to 50 cm			
How far onshore needed				
How far down the beach profile needed	To MHW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required			
DTM	Required			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Not required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL1/QL2 statewide lidar			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	NC Floodplain Mapping Program			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			

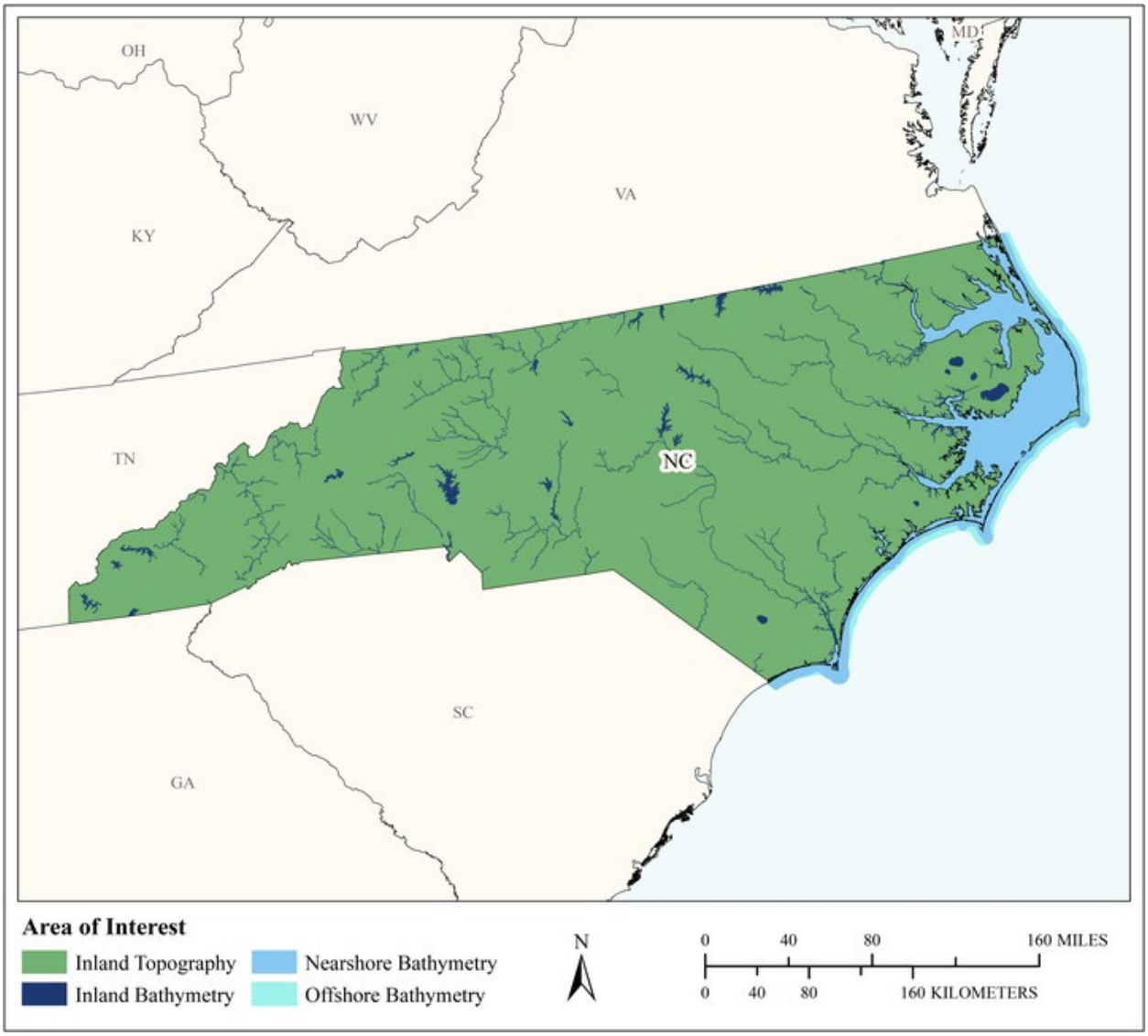
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	None											
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	None											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None											
Environmental	None											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Homeland Security, Law Enforcement, Disaster Response, and Emergency Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Infrastructure and border protection. Coastal search and rescue. Population dynamics. Emergency fuel supply and movement. Line of sight analysis in urban areas. Disaster response. Flood risk analysis resulting from acts of terrorism.
MCA Title	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
MCA ID	60328
Organization Type	State or U.S. Territorial government
Organization Name	State of North Carolina
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	Dependent
Update Frequency	4-5 years	4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 20 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Up to 2 meters
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable	Highly desirable	Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Required	Required
DTM	Required	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Nice to have	Highly desirable	Highly desirable	Required
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Highly desirable	Highly desirable	Highly desirable
Full waveform	Nice to have	Nice to have	Highly desirable	Highly desirable
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Highly desirable
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Nice to have	Highly desirable
Bottom texture			Nice to have	Highly desirable
Bottom type			Nice to have	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Highly desirable	Highly desirable
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Highly desirable	Required
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Nice to have	Nice to have
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Highly desirable	Highly desirable
Routes			Highly desirable	Highly desirable
Offshore cadastral			Nice to have	Highly desirable
Lease areas			Nice to have	Highly desirable
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Required
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	Major
Cost savings/cost reduction	Major	Major	Major	Major
Cost avoidance	Major	Moderate	Moderate	Major
Increased revenues	None	None	None	Major
Mission-driven performance improvements	Major	Moderate	Moderate	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Minor	Major

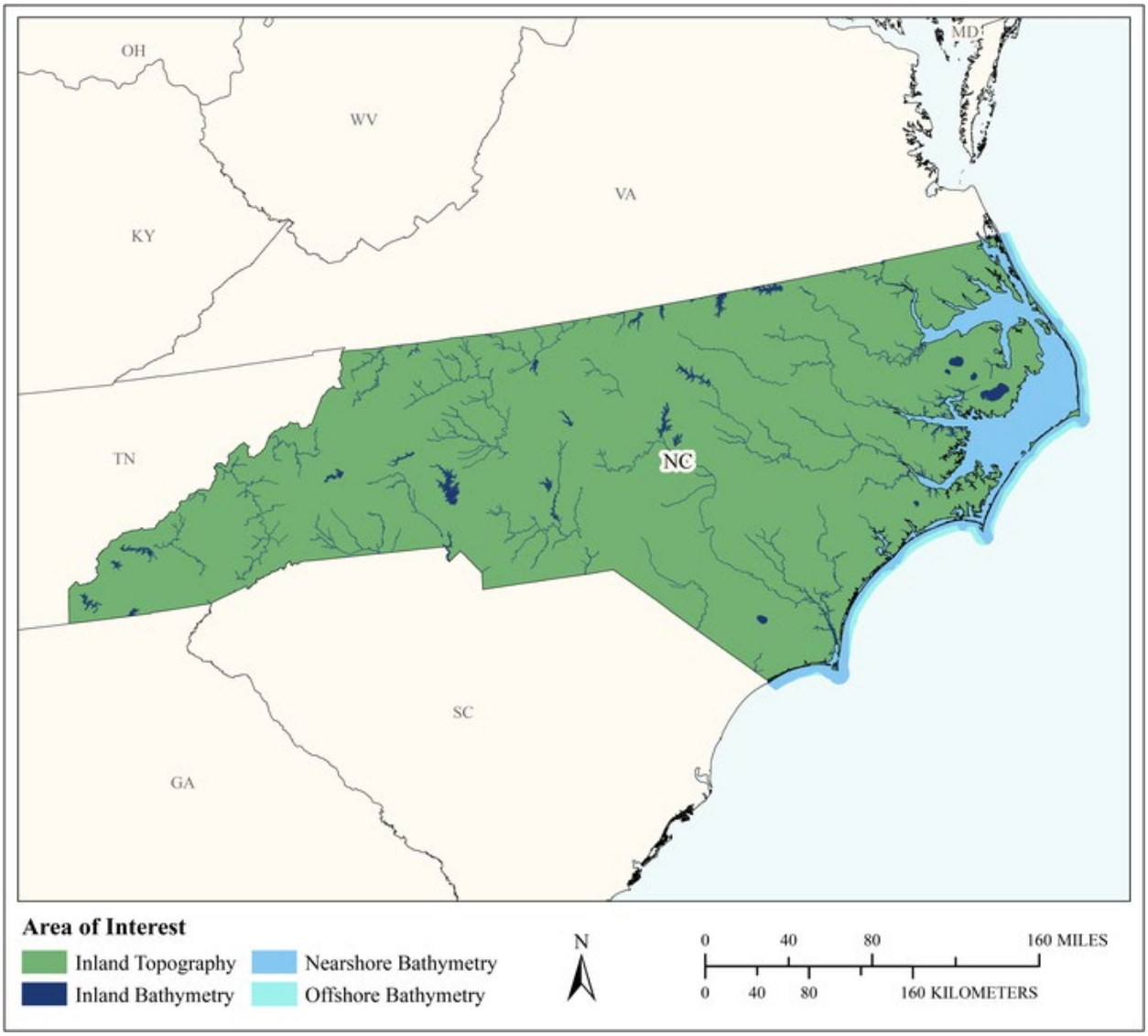
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major	Minor	Major
Improved customer experience	Major	Moderate	Minor	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	Minor	Major
Environmental	Minor	Moderate	Minor	Major
Public safety, including life and property	Major	Major	Moderate	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,456,348		Annual dollars saved/ realized	$410,144		Annual dollars saved/ realized	$39,541			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$25,740		Annual dollars saved/ realized	$26,167		Annual dollars saved/ realized	$1,135			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate			Major		
Environmental	Moderate			Moderate			Moderate			Major		
Public safety, including life and property	Major			Major			Major			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes		Yes
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Land Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Road and railroad route selection and maintenance. Slope analysis for autonomous cars. GPS navigation visualization.
MCA Title	Land Navigation and Safety
MCA ID	60329
Organization Type	State or U.S. Territorial government
Organization Name	State of North Carolina
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 19 - Land Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	I don't know
Update Frequency	4-5 years	4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	Up to 2 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable	Highly desirable	Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Required	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Required	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Highly desirable	Highly desirable
DTM	Required	Required	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Classified point cloud	Highly desirable	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Highly desirable	Highly desirable
Full waveform	Nice to have	Nice to have	Highly desirable	Highly desirable
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Required	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Required
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Required	Highly desirable	Required
Underwater videography			Nice to have	Highly desirable
Bottom texture			Highly desirable	Required
Bottom type			Highly desirable	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Highly desirable	Required
Geologic and seismic data	Highly desirable	Highly desirable	Highly desirable	Required
Water column properties - Physical			Highly desirable	Required
Water column properties - Chemical			Highly desirable	Required
Water column properties - Biological			Highly desirable	Required
Currents			Highly desirable	Required
Tide/wave heights			Highly desirable	Required
Sea ice conditions			Nice to have	Highly desirable
Habitat distribution and classification			Highly desirable	Required
Boundaries			Highly desirable	Required
Routes			Highly desirable	Required
Offshore cadastral			Highly desirable	Highly desirable
Lease areas			Highly desirable	Required
Fixed obstructions			Highly desirable	Required
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Nice to have	Required	Highly desirable	
Land use/land cover	Highly desirable	Required	Highly desirable	Required
Wetlands	Required	Required	Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Required
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Highly desirable	Highly desirable	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Minor	Minor
Cost savings/cost reduction	Major	Minor	Minor	Minor
Cost avoidance	Moderate	Minor	Minor	Minor
Increased revenues	None	None	None	None
Mission-driven performance improvements	Major	Minor	Minor	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	None	None

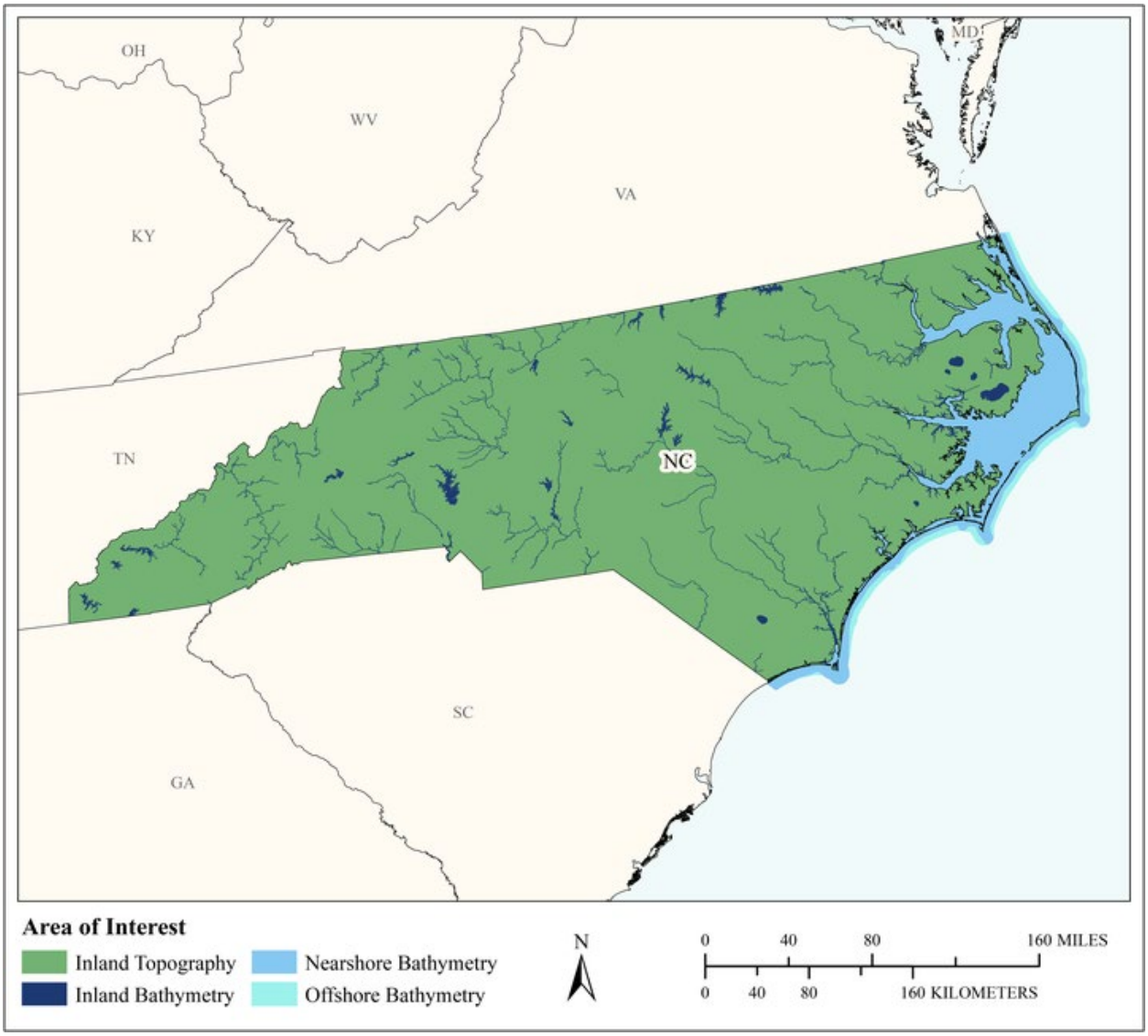
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	None	None
Improved customer experience	Major	Minor	None	None
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	None	None
Environmental	Moderate	Moderate	Moderate	Moderate
Public safety, including life and property	Major	Minor	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		None			None		
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$639,524		Annual dollars saved/ realized	$27,278						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$100,000		Annual dollars saved/ realized	$282						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			None			None		
Environmental	Major			Moderate			Moderate			Moderate		
Public safety, including life and property	Major			Moderate			Moderate			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes		Yes	Yes
Aspect maps	Yes			Yes
Curvature maps	Yes		Yes	Yes
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps	Yes			Yes
Viewshed maps	Yes		Yes	Yes
Hydrologic Flow Direction Grids	Yes			Yes
Hydrologic Flow Accumulation Grids				Yes
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		Yes
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	Yes
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Marine and Riverine Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Nautical charting. Bathymetric measurements of nearshore submerged coastal topography. Identification of hazards to navigation. Sediment management at coastal navigation projects. Precision marine navigation. Movement of goods and fishing vessels. Navigation of sounds and rivers is a major concern.
MCA Title	Marine and Riverine Navigation and Safety
MCA ID	60330
Organization Type	State or U.S. Territorial government
Organization Name	State of North Carolina
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Nice to have
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	I don't know
Update Frequency	4-5 years	4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	Up to 2 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have	Nice to have	I don't know	Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Nice to have	Nice to have	I don't know	Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required	I don't know	Required	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required	I don't know	Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Required	I don't know
DTM	Required	Highly desirable	Required	I don't know
DEM	Required	Required	Required	I don't know
Raw point cloud data	Required	Nice to have	Required	I don't know
Classified point cloud	Required	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Highly desirable	I don't know
Full waveform	Not required	Not required	Not required	I don't know
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	I don't know
Breaklines required for standard hydro-flattening	Highly desirable	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	I don't know
Tide Predictions			Required	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	I don't know
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Highly desirable	I don't know
Ground control/ground truthing	Required	Nice to have	Highly desirable	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	I don't know
Nautical and/or navigation charts			Highly desirable	I don't know
Acoustic imagery of the seafloor			Highly desirable	I don't know
Aerial and/or satellite imagery	Required	Required	Highly desirable	I don't know
Underwater videography			Nice to have	I don't know
Bottom texture			Highly desirable	I don't know
Bottom type			Highly desirable	I don't know
Submerged features			Highly desirable	I don't know
Subbottom characteristics			Nice to have	I don't know
Geologic and seismic data	Not required	Not required	Nice to have	I don't know
Water column properties - Physical			Nice to have	I don't know
Water column properties - Chemical			Nice to have	I don't know
Water column properties - Biological			Nice to have	I don't know
Currents			Highly desirable	I don't know
Tide/wave heights			Highly desirable	I don't know
Sea ice conditions			Nice to have	I don't know
Habitat distribution and classification			Highly desirable	I don't know
Boundaries			Nice to have	I don't know
Routes			Required	I don't know
Offshore cadastral			Nice to have	I don't know
Lease areas			Nice to have	I don't know
Fixed obstructions			Required	I don't know
Floating observation/navigation systems			Required	I don't know
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Nice to have	Nice to have	Nice to have	I don't know
Wetlands	Highly desirable	Required	Highly desirable	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	I don't know
Inland surface water features	Highly desirable	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Required	Nice to have	Nice to have	
Cultural resources	Highly desirable	Highly desirable	Nice to have	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts		Yes	Yes	
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	I don't know
Cost savings/cost reduction	Major	I don't know	Minor	I don't know
Cost avoidance	Moderate	Major	Minor	I don't know
Increased revenues	Moderate	None	Minor	I don't know
Mission-driven performance improvements	Moderate	Minor	Minor	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	None	Minor	I don't know

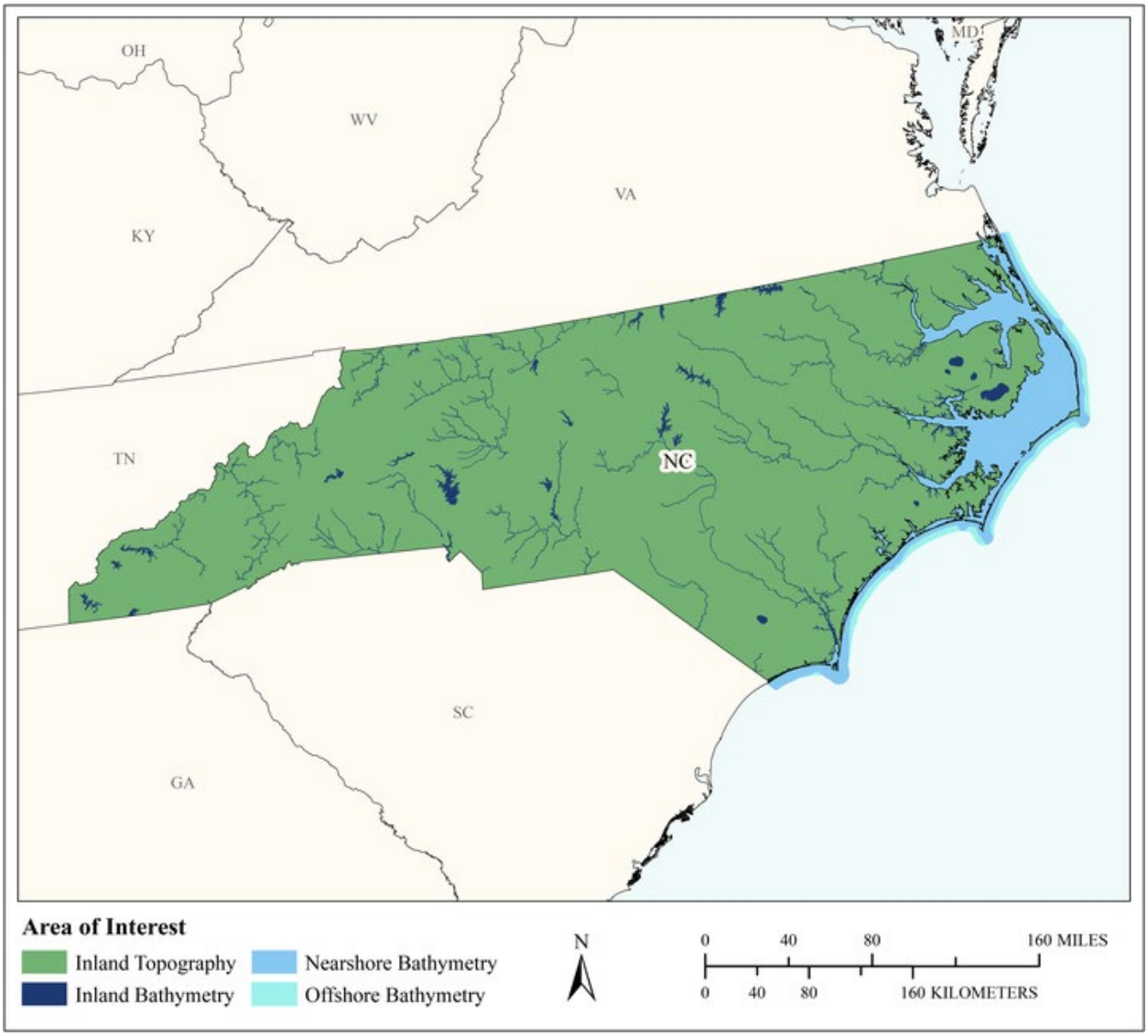
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor	None	Minor	I don't know
Improved customer experience	Moderate	None	Minor	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	None	Minor	I don't know
Environmental	Moderate	None	Minor	I don't know
Public safety, including life and property	Major	None	Major	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Increased revenues	None			Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$900,000		Annual dollars saved/ realized	$1,400,000		Annual dollars saved/ realized	$928,000			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Future annual customer service benefits added during validation					Annual dollars saved/ realized	$118,516		Annual dollars saved/ realized	$111,397			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			Moderate			Minor			I don't know		
Environmental	None			Moderate			Major			I don't know		
Public safety, including life and property	Minor			Moderate			Major			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			
Slope maps				
Aspect maps				
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps				Yes
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				Yes

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Aviation Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of in-flight hazards and path obstructions. Aeronautical charting. Runway construction and repair.
MCA Title	Aviation Navigation and Safety
MCA ID	60331
Organization Type	State or U.S. Territorial government
Organization Name	State of North Carolina
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 21 - Aviation Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Nice to have
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	I don't know
Update Frequency	4-5 years	4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	I don't know	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	I don't know	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Nice to have	I don't know	Highly desirable	Nice to have
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable	I don't know	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	I don't know	Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	I don't know	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Highly desirable	I don't know
DTM	Required	Required	Highly desirable	I don't know
DEM	Required	Required	Highly desirable	I don't know
Raw point cloud data	Highly desirable	Highly desirable	Nice to have	I don't know
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Nice to have	I don't know
Full waveform	Highly desirable	Nice to have	Nice to have	I don't know
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	I don't know
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	I don't know
Tide Predictions			Nice to have	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	I don't know
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Nice to have	I don't know
Ground control/ground truthing	Required	Required	Required	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	I don't know
Nautical and/or navigation charts			Highly desirable	I don't know
Acoustic imagery of the seafloor			Highly desirable	I don't know
Aerial and/or satellite imagery	Required	Required	Required	I don't know
Underwater videography			Not required	I don't know
Bottom texture			Not required	I don't know
Bottom type			Nice to have	I don't know
Submerged features			Not required	I don't know
Subbottom characteristics			Not required	I don't know
Geologic and seismic data	Nice to have	Nice to have	Not required	I don't know
Water column properties - Physical			Not required	I don't know
Water column properties - Chemical			Not required	I don't know
Water column properties - Biological			Not required	I don't know
Currents			Not required	I don't know
Tide/wave heights			Not required	I don't know
Sea ice conditions			Not required	I don't know
Habitat distribution and classification			Nice to have	I don't know
Boundaries			Highly desirable	I don't know
Routes			Nice to have	I don't know
Offshore cadastral			Nice to have	I don't know
Lease areas			Not required	I don't know
Fixed obstructions			Nice to have	I don't know
Floating observation/navigation systems			Nice to have	I don't know
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Required	Required	Required	I don't know
Wetlands	Required	Required	Required	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	I don't know
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Required	Highly desirable	Not required	
Cultural resources	Required	Highly desirable	Nice to have	
Coastal and riverine structures	Highly desirable	Nice to have	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	I don't know
Cost savings/cost reduction	Major	Major	Moderate	I don't know
Cost avoidance	Major	Major	Moderate	I don't know
Increased revenues	Major	None	None	I don't know
Mission-driven performance improvements	Major	Major	Minor	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Moderate	I don't know

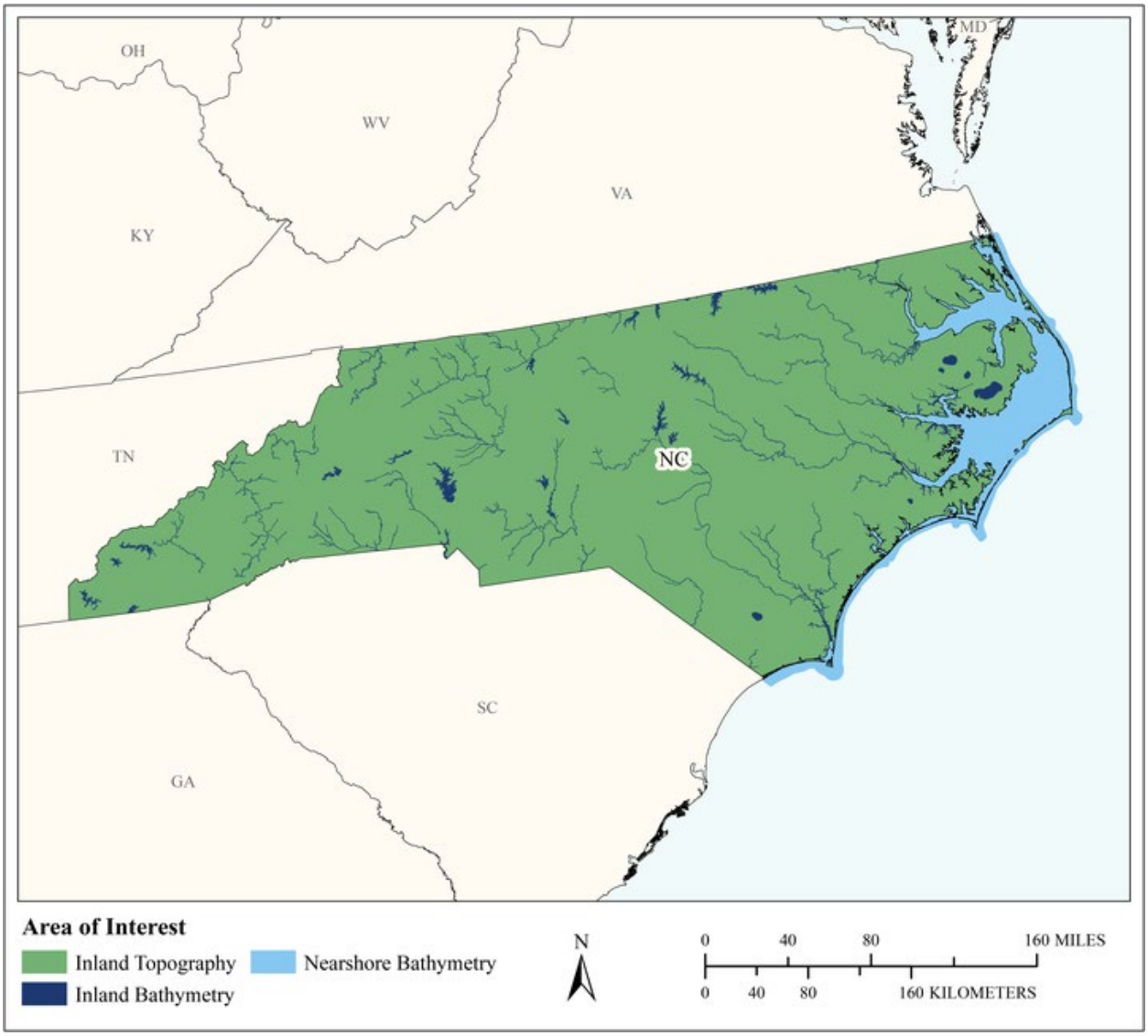
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major	Minor	I don't know
Improved customer experience	Major	Major	Minor	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	Minor	None	I don't know
Environmental	Major	Moderate	None	I don't know
Public safety, including life and property	Major	Moderate	None	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$166,889		Annual dollars saved/ realized	$33,232						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$207,854									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Moderate			I don't know			I don't know		
Environmental	Moderate			Major			I don't know			I don't know		
Public safety, including life and property	Moderate			Major			I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes	Yes	Yes	
Curvature maps	Yes			
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Transportation Infrastructure



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Area split by varying quality level or update frequency	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements	North Carolina			

MCA Description	Response
Mission Critical Activity	Transportation Infrastructure. Requirements for elevation data are project specific. Bathymetry is needed for H&H modeling and coastal modeling, to address navigation concerns for the ferry system in the Outer Banks, for water quality modeling, bridge scour, and submerged aquatic vegetation. SHOALS data used transects for previous Outer Banks studies. Topographic data are needed for project planning, environmental screening in advance of projects, and as input into 2D hydraulic models along with velocities in a mesh (not XS). The data are also used to improve transportation facilities. NC DOT self collects data if needed. MicroStation CADD is mainly used and for more efficient workflows, breaklines collected where there are changes to the surface (e.g. curb, road crest, etc.) instead of lidar points. 10' DEMs are used for planning, then photogrammetrically derived breaklines are used in conjunction with mobile lidar collection of pavement information for Right-of-Way acquisition and detailed plans. Typical scale in urban areas is 1”=20'. Orthoimagery collected on a 4-year cycle (twice yearly on the Outer Banks) is used for asset management, also Geiger Mode lidar. Culverts are collected from field surveys, although lidar is also used to predict culvert locations. The use of lidar for this application has yielded some improvement prior to field work. NC DOT reviews 20% of its 80,000 mile system annually. Culverts that are 54' and larger are most important to know locations, smaller ones are are nice to know. Lidar can facilitate locating the culverts, but field survey data are still needed. Adding DOT assets to the hydrography as connectors would be a great future use.
MCA Title	Transportation Infrastructure
MCA ID	21578
Organization Type	State or U.S. Territorial government
Organization Name	NCDOT Photogrammetry Unit
Sub-Agency or Division	
Organization Mission	Plan, design, construct and maintain transportation infrastructure
Program Name	Plan, design, construct and maintain transportation facilities
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 02 - Riverine Ecosystem Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	For final design, ROW acquisition, and construction: utility point features such as a water valve or telecommunications pedestal

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Nice to have
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Not required
5.1 – 10 acres	Not required
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	Cross sections and/or transects meet needs	QL1B	
Update Frequency	(a) 2-3 years (b) 4-5 years and certain events.	Event driven only – Data need to coincide with a specific event.	4-5 years	
Event type(s)	Data is collected when a project is programmed and funded; available statewide data is used at planning stage; ground and photogrammetric surveys conducted for final design, right of way, and construction phases	Initial sampling, Event driven, and then more frequent in areas that are experiencing hydraulic change		
Quality Level and/or update frequency variability across AOI	Urban areas require data on 2-3 year update frequency			
Acceptable Horizontal Error	Less than 20 cm	Up to 1 meter	Less than 50 cm	
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm	Up to 20 cm	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed			To Mean Lower Low Water (MLLW)	
How far down the beach profile needed	To MHW		Below MLLW	
Tide correction requirement			No requirement for tide correction	
Cross sections and/or transects meet needs		Yes		
Cross section/transect requirement		Primarily for bridge and culvert structures across rivers and lakes. The vertical accuracy would need to be less than 10cm. Sampling density would need to be upstream and downstream of crossing structures and then whenever a significant change in channel geometry (shape) occurs.		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required	Nice to have		Not required	Highly desirable
Entire AOI under same environmental conditions	Nice to have	Not required	Not required		Not required	Highly desirable
Other	Required					
Other description	It's project specific corridor type study areas					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Not required	Highly desirable		Not required	Required
DEM for entire AOI needs to be seamless	Required	Not required	Highly desirable		Not required	Required
Other	Required					
Other description	It's project specific corridor type study areas					

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Amount of acceptable vertical manipulation to achieve spatial seamlessness	For corridor specific study areas, all data must fit seamlessly. Certain features such as pavement require the highest accuracy, while natural features require less accurate terrain data. The most stringent horizontal & vertical accuracy requirements have been selected in previous questions.	I don't know	I don't know		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Nice to have	Not required	
DTM	Required	Required	Required	
DEM	Nice to have	Nice to have	Not required	
Raw point cloud data	Not required	Nice to have	Not required	
Classified point cloud	Not required	Nice to have	Not required	
Edited/cube XYZ		Nice to have	Not required	
Full waveform	Not required	Nice to have	Not required	
Bathymetric Attributed Grid (BAG)		Highly desirable	Not required	
Breaklines required for standard hydro-flattening	Not required	Required		
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Intensity imagery/sidescan imagery	Not required	Nice to have	Highly desirable	
Ground control/ground truthing	Required	Highly desirable	Nice to have	
Other	Required			
Other description	Breaklines are required to accurately define the terrain and man made features in a much more efficient manner than zillons of points at all changes in slope (e.g. curb, crown of road, top of bank, etc.)			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required	Nice to have	Required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Not required	
Submerged features			Highly desirable	
Subbottom characteristics			Not required	
Geologic and seismic data	Required	Not required	Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents				
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Required	
Boundaries			Not required	
Routes			Required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Floating observation/navigation systems			Required	
Shorelines – current, historic, change rates	Required	Nice to have	Required	
Land use/land cover	Required	Highly desirable	Not required	
Wetlands	Required	Highly desirable	Not required	
Estuaries			Not required	
Inland surface water features	Required	Highly desirable	Required	
Bridges/culverts	Required	Required		
Landmark features	Required		Not required	
Cultural resources	Required	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Not required			
Other	Required			
Other description	Project specific corridors, not statewide			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Statewide QL2 LiDAR ground elevations at a 10 foot spacing are augmented with photogrammetric breaklines for natural features. Ground surveys are used for pavement breaklines at QL0 accuracy. Drainage edge of bank and channel are surveyed using ground based techniques.	Capturing cross sections, channel and lake DEMs from sonar field surveys,	Capturing wave heights, surge, velocity, scour from sonar scans self-collected near projects.	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				

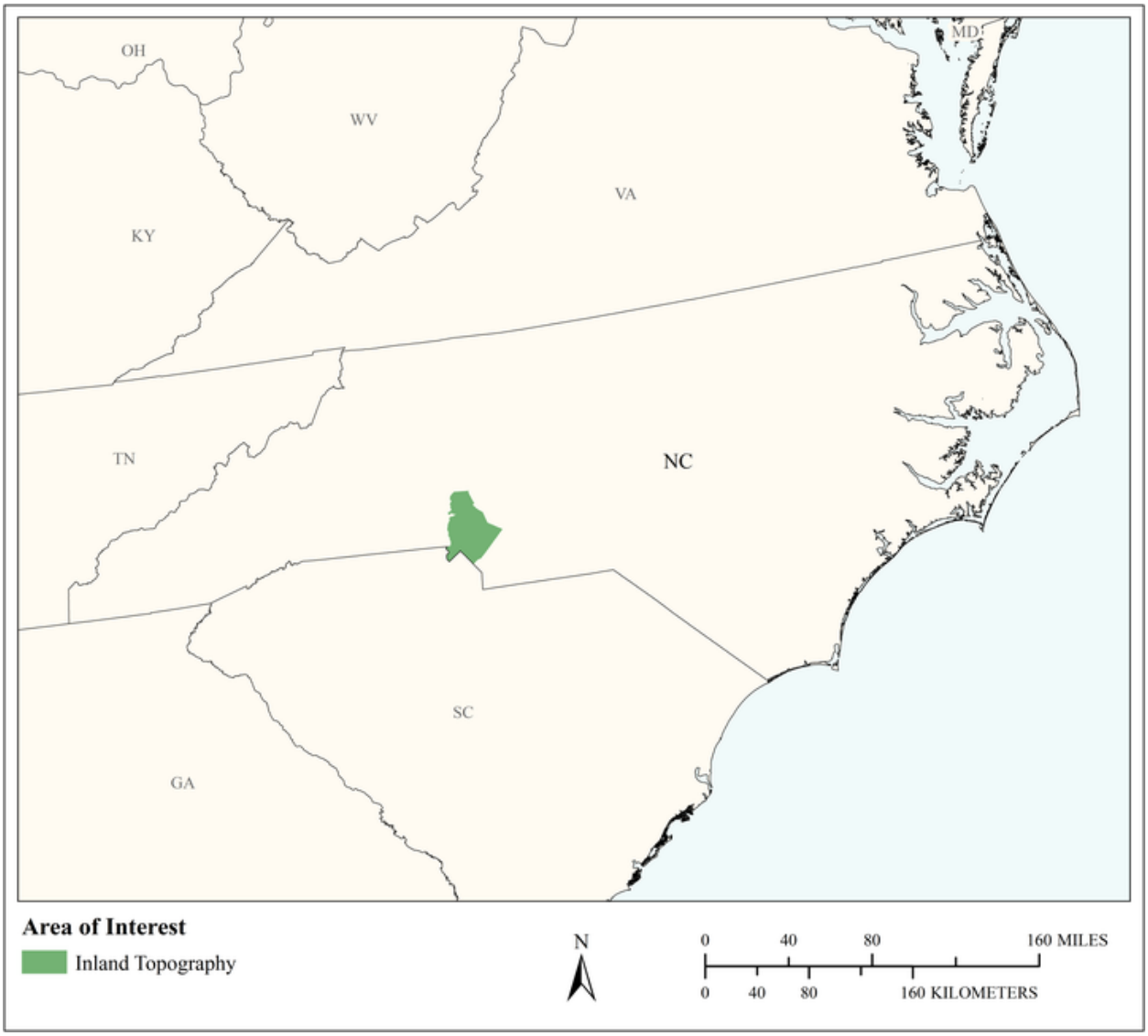
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories		Yes		
State repositories used		NCDOT Locations and Survey		
Other	Yes	Yes	Yes	
Other description	Statewide QL2 LiDAR, Photogrammetric surveys, Ground surveys	Contractors	Self-collected sonar	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Moderate	I don't know	
Cost savings/cost reduction	Moderate	Moderate	I don't know	
Cost avoidance	Moderate	Moderate	I don't know	
Increased revenues	None	Minor	I don't know	
Mission-driven performance improvements	Minor	Major	I don't know	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	Moderate	I don't know	
Improved response or timeliness	Minor	Major	I don't know	
Improved customer experience	Minor	Major	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	I don't know	
Environmental	Minor	Major	I don't know	
Public safety, including life and property	Minor	Major	I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,194,268		Annual dollars saved/ realized	$747,468		Annual dollars saved/ realized	$89,694			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$6,457,290		Annual dollars saved/ realized	$77,615		Annual dollars saved/ realized	$12,332			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know			I don't know					
Environmental	I don't know			I don't know			I don't know					
Public safety, including life and property	I don't know			I don't know			I don't know					
Other												
Other benefits				I don't know								
Other description				Would need more time to think through items marked "Don't know"								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes	Yes	Yes	
Curvature maps				
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Roadway, Bridge, and Storm Water Infrastructure Improvements



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements	Mecklenburg County, NC			

MCA Description	Response
Mission Critical Activity	Roadway, bridge, and storm water infrastructure improvements.
MCA Title	Roadway, Bridge, and Storm Water Infrastructure Improvements
MCA ID	22158
Organization Type	Regional, County, City, or other local government
Organization Name	City of Charlotte
Sub-Agency or Division	
Organization Mission	Mainly infrastructure improvement projects, which includes roadway, sidewalk, and storm water improvements.
Program Name	Capital Investment Program
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Not required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	A gas valve that may be in the roadway is an example of the smallest 3D feature that I would be interested in.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm			
Acceptable Vertical Error	Less than 5 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Nice to have					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Highly desirable			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Not required			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	0.25' at 95% confidence in clear areas and 0.50' in partially clear areas based for 1' contour mapping. Mecklenburg County flies lidar at least every two years or more frequently.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	Local Aerial Photography			
Data that meet my needs are not available				

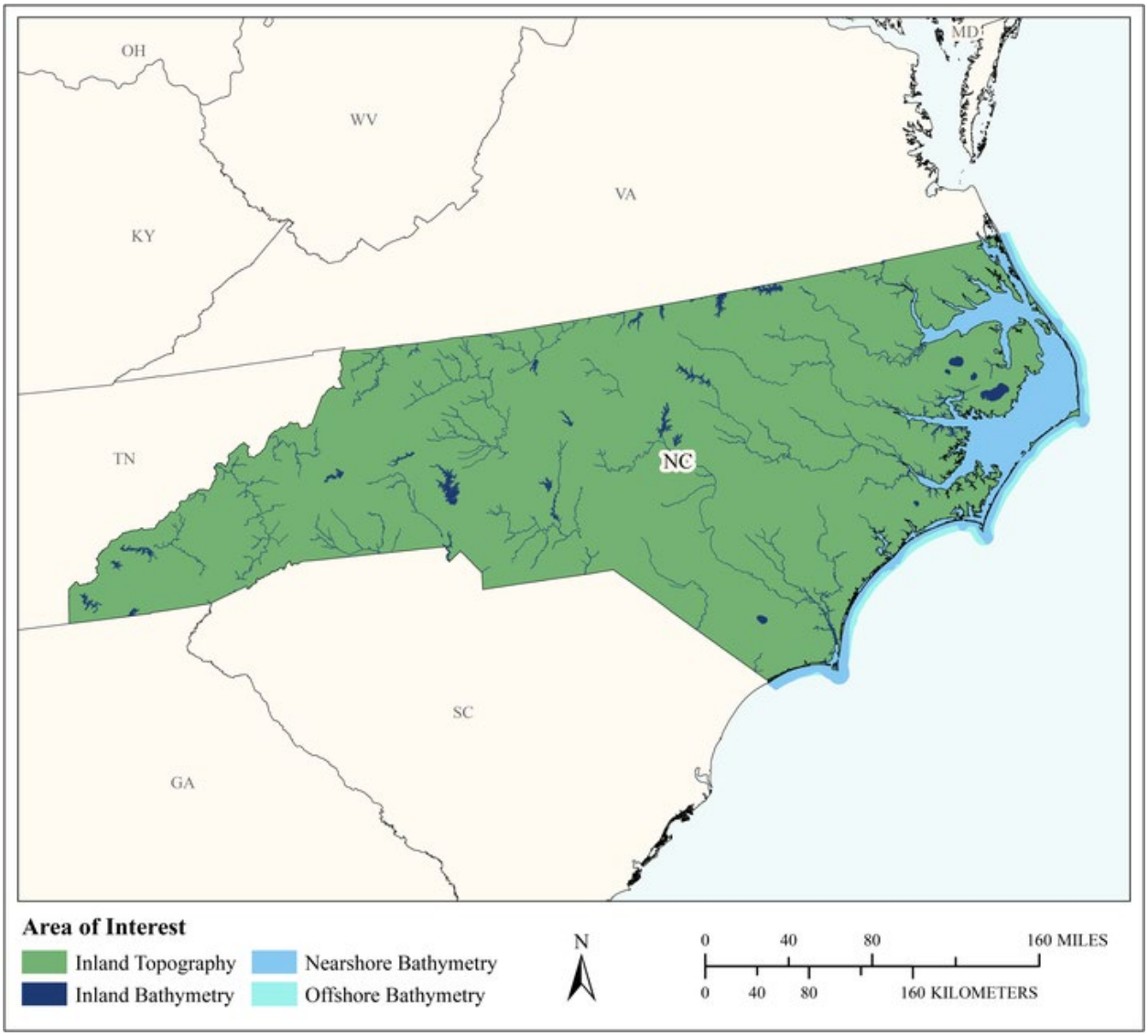
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Major			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$24,292									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$71,488									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Urban and Regional Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Land development and zoning. Municipal mapping of building footprints and elevations. Port resilience planning. Parks and transportation planning. Virtual city creation. Urban ecology planning. Building footprints are a major business need.
MCA Title	Urban and Regional Planning
MCA ID	60332
Organization Type	State or U.S. Territorial government
Organization Name	State of North Carolina
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	I don't know
Update Frequency	4-5 years	4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Required	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Required	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Required	Required
DTM	Required	Required	Required	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Required	Nice to have	Highly desirable	Highly desirable
Classified point cloud	Required	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Highly desirable
Full waveform	Nice to have	Nice to have	Nice to have	Required
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Highly desirable
Tide Predictions			Nice to have	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Highly desirable
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Highly desirable
Ground control/ground truthing	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	Required
Nautical and/or navigation charts			Highly desirable	Required
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Highly desirable
Underwater videography			Not required	Nice to have
Bottom texture			Nice to have	Highly desirable
Bottom type			Nice to have	Highly desirable
Submerged features			Nice to have	Highly desirable
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Not required	Highly desirable
Water column properties - Chemical			Not required	Highly desirable
Water column properties - Biological			Not required	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Nice to have	Required
Routes			Nice to have	Highly desirable
Offshore cadastral			Nice to have	Highly desirable
Lease areas			Nice to have	Highly desirable
Fixed obstructions			Nice to have	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Required	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Nice to have	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Minor	Major
Cost savings/cost reduction	Major	Minor	Minor	Major
Cost avoidance	Major	Minor	Minor	Major
Increased revenues	Minor	Minor	None	Moderate
Mission-driven performance improvements	Major	Minor	Minor	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Minor	Major

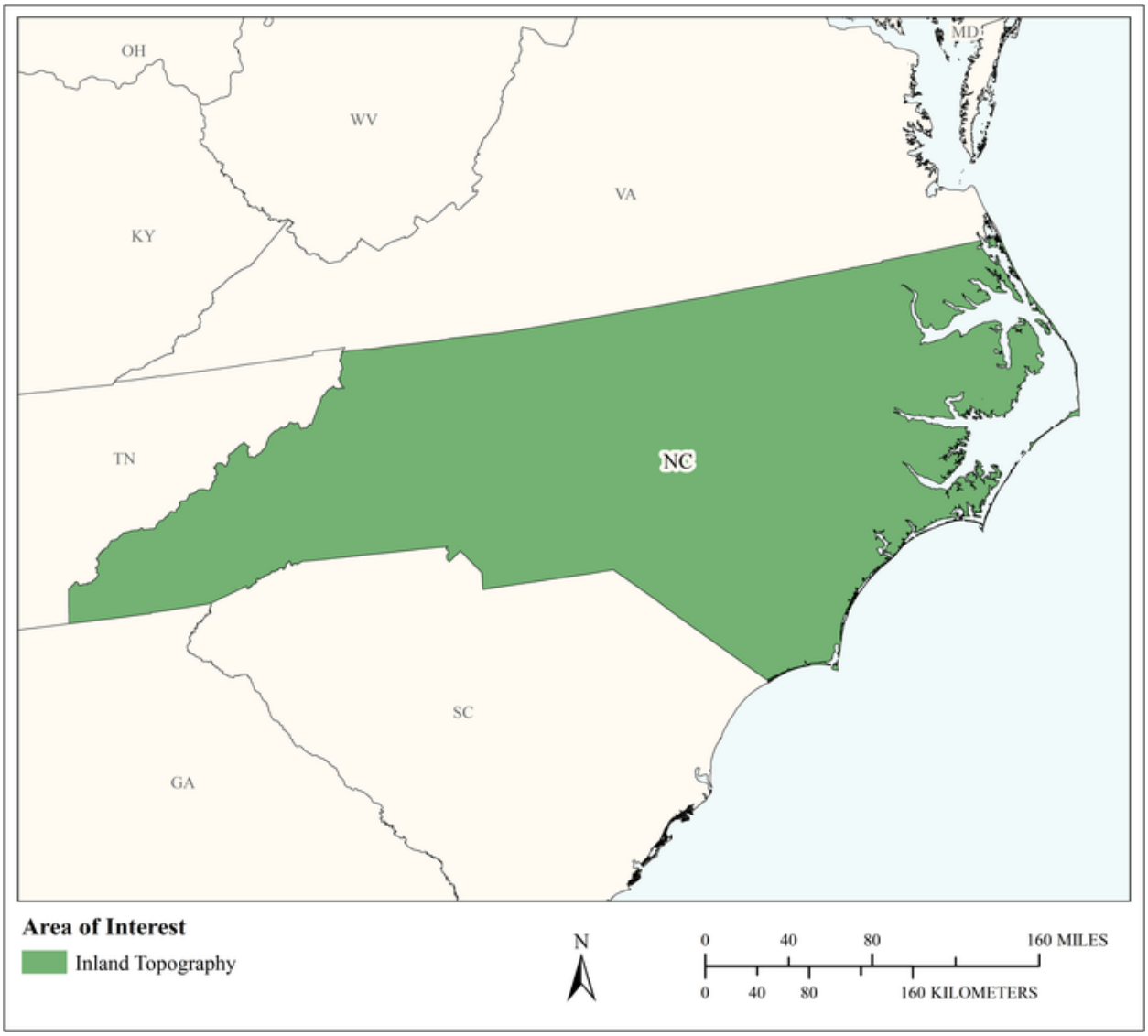
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	Minor	Major
Improved customer experience	Major	Moderate	Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	Major
Environmental	Major	Minor	Minor	Major
Public safety, including life and property	Major	Minor	Minor	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide		Major	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Major	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,000,000									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,533,512									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate			Major		
Environmental	Major			Moderate			Moderate			Major		
Public safety, including life and property	Major			Major			Moderate			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes		Yes	
Aspect maps	Yes			Yes
Curvature maps				Yes
Cross sections		Yes	Yes	Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Real Estate, Banking, Mortgage, and Insurance



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Assessment of risk for natural hazards (e.g., sinkholes, flooding) to inform insurance policy rates and the determination of mandatory insurance. Building permit compliance.
MCA Title	Real Estate, Banking, Mortgage, and Insurance
MCA ID	60333
Organization Type	State or U.S. Territorial government
Organization Name	State of North Carolina
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 25 - Real Estate, Banking, Mortgage, and Insurance
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

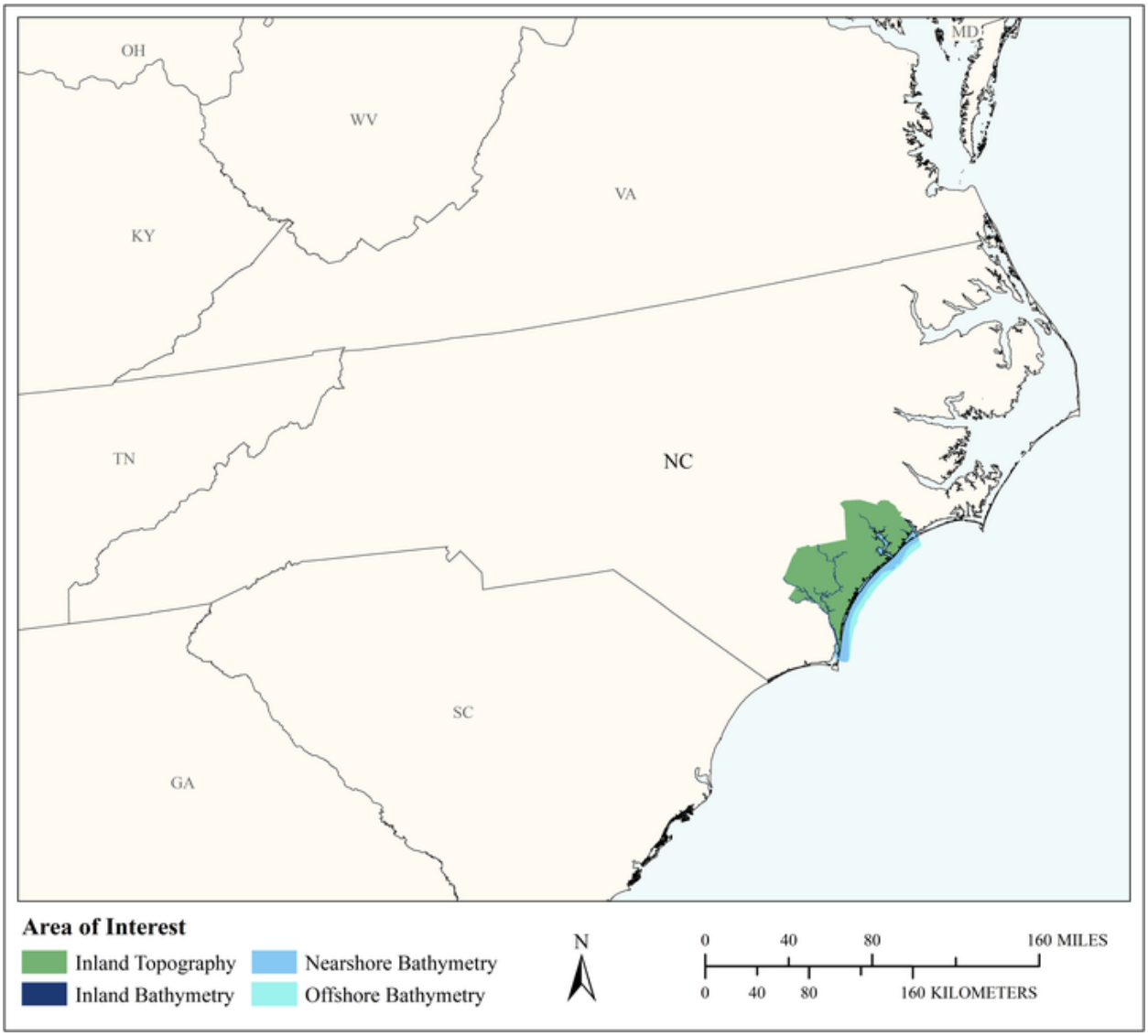
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Moderate			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,000,000									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,500,000									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Education About Sampling and Surveying the Marine and Aquatic Environments



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements	Pender, Onslow, and New Hanover Counties, NC	Pender, Onslow, and New Hanover Counties, NC	Pender, Onslow, and New Hanover Counties, NC	Pender, Onslow, and New Hanover Counties, NC

MCA Description	Response
Mission Critical Activity	Education about sampling and surveying the marine and aquatic environments. Training for bathymetric data collection.
MCA Title	Education About Sampling and Surveying the Marine and Aquatic Environments
MCA ID	21629
Organization Type	Academic or Not-for-Profit
Organization Name	Cape Fear Community College
Sub-Agency or Division	
Organization Mission	To train technicians in the Oceanographic and Hydrographic industries.
Program Name	Marine Technology
Total Annual Program Budget	
Primary Business Use	BU 26 - Education K12 and Beyond, Basic Research
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Highly desirable
Other	Required
Other description	MLLW Surfaces

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Survey monuments, submerged shipwrecks (~150')

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Not required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Nice to have
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	Cross sections and/or transects meet needs	Cross sections and/or transects meet needs	Cross sections and/or transects meet needs
Update Frequency	Annually	Event driven only – Data need to coincide with a specific event.	2-3 years	2-3 years
Event type(s)		Event driven only		
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 1 meter	Up to 1 meter
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm	Less than 10 cm	Less than 1 meter
How far onshore needed			To cover the beach slope	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MLLW	MLLW
Cross sections and/or transects meet needs	Partial	Yes	Yes	Yes
Cross section/transect requirement	Tolerances of 6 CM or less and 100' cross section spacing	When I work with data sets in the classroom that the class or myself did not collect, there is not a requirement. The higher resolution and tighter cross sections the better. Also, love a messy data set to use as teaching tool.	Any is fine; 500' cross sections and 25 foot point separations is ideal.	Any, I do not use offshore data that much, inshore/nearshore data is much more critical for education as it is more of a challenge to process.

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required	Not required	Not required	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Nice to have	Not required	Not required	Not required	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Nice to have	Not required	Not required	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Nice to have	Not required	Not required	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Up to double the required TVU at the 95% confidence level	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Required	Required
DTM	Required	Highly desirable	Required	Not required
DEM	Required	Highly desirable	Required	Required
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	Required
Classified point cloud	Nice to have	Not required	Nice to have	
Edited/cube XYZ		Not required	Nice to have	Highly desirable
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Highly desirable	Not required	Not required

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Not required	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)			Not required	Not required
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Not required	Highly desirable	Not required	Not required
Ground control/ground truthing	Nice to have	Highly desirable	Not required	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Highly desirable	Required
Aerial and/or satellite imagery	Required	Required	Required	Not required
Underwater videography			Not required	Not required
Bottom texture			Not required	Not required
Bottom type			Nice to have	Not required
Submerged features			Nice to have	Not required
Subbottom characteristics			Nice to have	Not required
Geologic and seismic data	Not required	Nice to have	Not required	Not required
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Not required	Not required
Tide/wave heights			Not required	Not required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Not required	Not required
Boundaries			Not required	Highly desirable
Routes			Highly desirable	Not required
Offshore cadastral			Not required	Not required
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Required	Highly desirable
Floating observation/navigation systems			Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Nice to have	Nice to have		Nice to have
Wetlands	Highly desirable	Nice to have	Highly desirable	Nice to have
Estuaries			Highly desirable	Nice to have
Inland surface water features	Required	Nice to have	Highly desirable	
Bridges/culverts	Not required	Highly desirable		
Landmark features	Not required	Not required	Highly desirable	
Cultural resources	Not required	Not required	Highly desirable	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			
Other			Highly desirable	
Other description			Donuts Shops. You know personal preference!	

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Metropolitan and County lidar/photogrammetry elevations and contours.	Data supplied from individual survey companies that associate with our institution or public cloud/server based data from government entities.	I use data sets provided by Army Corps of Engineers. They are usually cross sections single beam or single point topographic data sets from beach nourishment and monitoring projects. This data comes straight from companies or from USACE colleagues.	Not known
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				

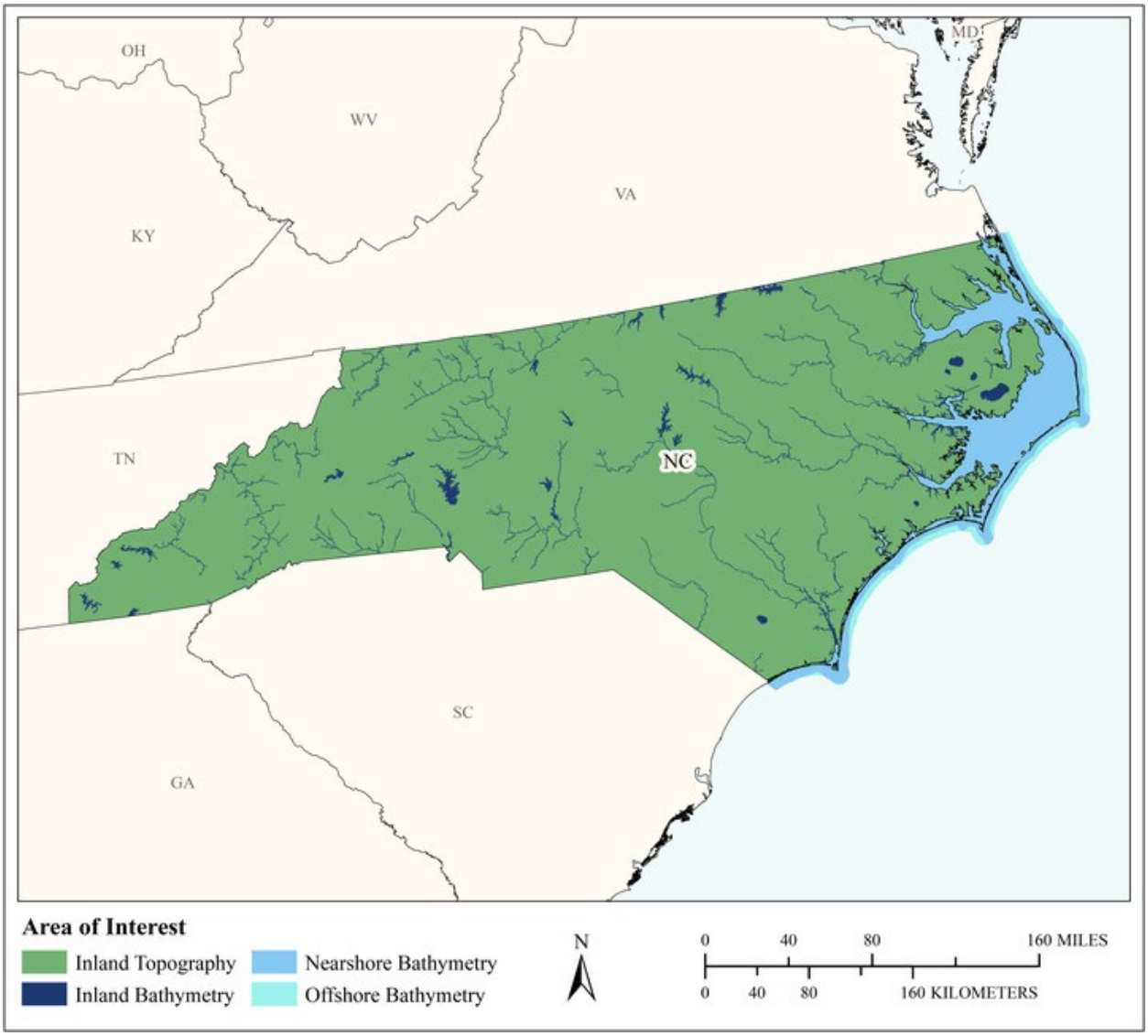
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	Mostly department of transportation or county GIS systems, some universities.	County servers, XYZ and SHP downloads from various city/ county gov't sites and other institutions.		
Other			Yes	Yes
Other description			Friends	Friends or our own data sets collected from our research vessel
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know	None	Major	I don't know
Cost savings/cost reduction	I don't know	None	Major	I don't know
Cost avoidance	I don't know	None	Major	I don't know
Increased revenues	I don't know	None	I don't know	I don't know
Mission-driven performance improvements	Major	None	I don't know	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know	None	I don't know	I don't know
Improved response or timeliness	I don't know	None	I don't know	I don't know
Improved customer experience	Major	None	I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major	Major	Major
Environmental	I don't know	None	I don't know	I don't know
Public safety, including life and property	I don't know	None	I don't know	I don't know
Other Current Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other		Major		
Other description		I do not work for anyone or any government. I use data for classroom instruction.		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		None			None		
Time savings description	Classroom time is limited, filling in missing data would be a major benefit.											
Cost savings/cost reduction	Major	Unable to provide		None			None			None		
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		None			Moderate	Unable to provide	
Increased revenues	None			None			None			None		
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		None			Major	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	None			None			None			Major	Unable to provide	
Improved response or timeliness	None			Moderate	Unable to provide		None			None		
Improved customer experience	None			Major	Unable to provide		Major	Unable to provide		None		
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major			Major		
Environmental	None			None			I don't know			I don't know		
Public safety, including life and property	None			None			I don't know			I don't know		
Other	More DATA											
Other benefits	Moderate			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Education K12 and Beyond, Basic Research



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Development of 3-D visualizations to help students understand the Earth they live on. Understanding of continental-scale climate change impacts. Ocean science. Ocean education. Scientific research. Data dissemination. Development of training simulators.
MCA Title	Education K12 and Beyond, Basic Research
MCA ID	60334
Organization Type	State or U.S. Territorial government
Organization Name	State of North Carolina
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 26 - Education K12 and Beyond, Basic Research
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL1B	QL2B	Order 1a
Update Frequency	4-5 years	4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Nice to have	Not required	Highly desirable	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Required	Nice to have	Not required	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required	Highly desirable	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Required	Required
DTM	Required	Highly desirable	Required	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Required	Required	Required	Required
Classified point cloud	Required	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Nice to have	Nice to have
Ground control/ground truthing	Highly desirable	Highly desirable	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Highly desirable
Underwater videography			Nice to have	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Highly desirable	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Highly desirable
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Required	Highly desirable	Highly desirable	Nice to have
Wetlands	Required	Highly desirable	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Nice to have	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Major	Minor
Cost savings/cost reduction	Major	Minor	Moderate	Minor
Cost avoidance	Major	Minor	Major	Moderate
Increased revenues	Minor	None	Minor	None
Mission-driven performance improvements	Major	Moderate	Major	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Major	Moderate

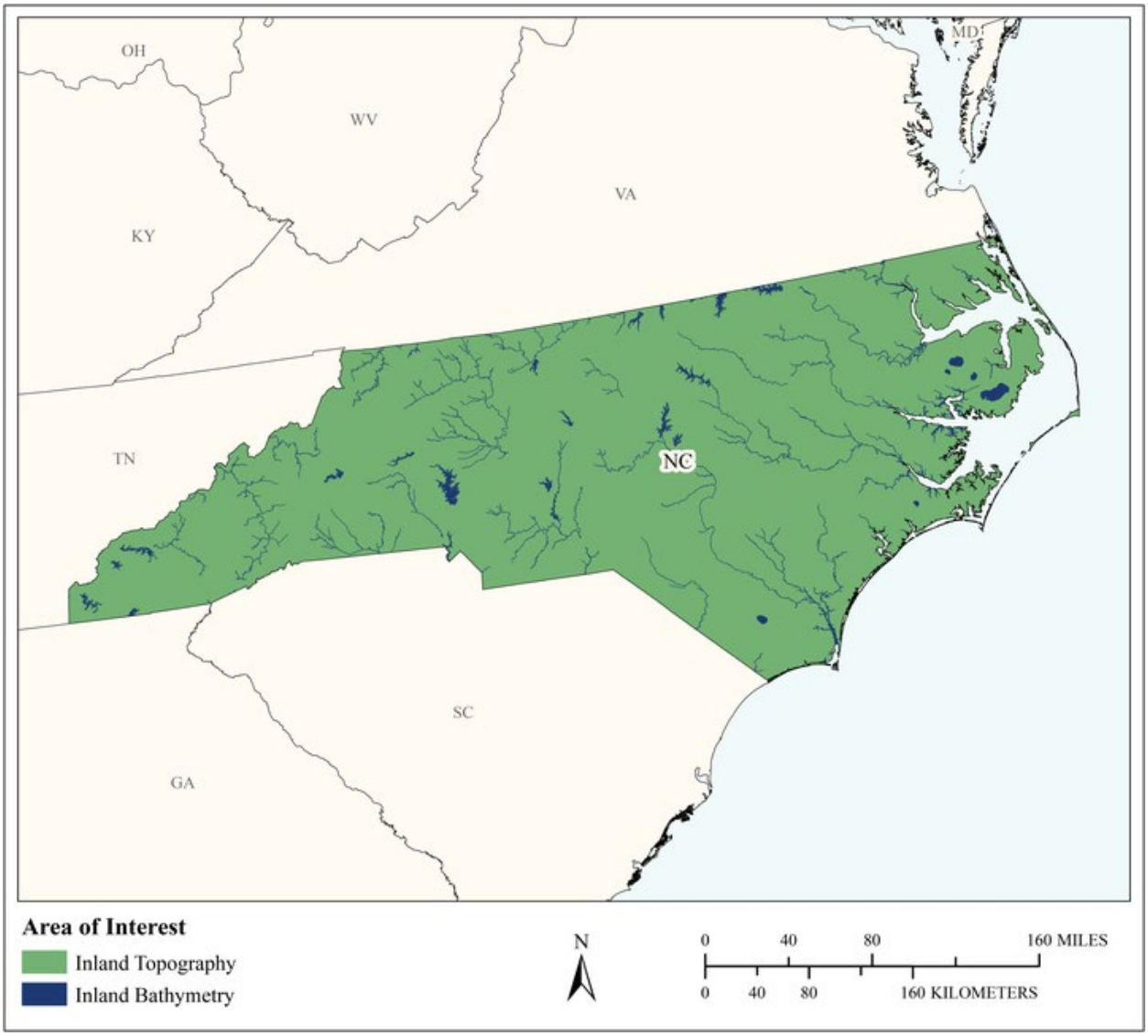
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	Minor	Minor
Improved customer experience	Major	Minor	Moderate	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major	Major	Major
Environmental	Major	Minor	Minor	Minor
Public safety, including life and property	Major	Moderate	Minor	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$500,000		Annual dollars saved/ realized	$67,844		Annual dollars saved/ realized	$28,150		Annual dollars saved/ realized	$1,204
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$620,117					Annual dollars saved/ realized	$1,110			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major			Major		
Environmental	Major			Major			Major			Minor		
Public safety, including life and property	Major			Major			Minor			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes			Yes
Aspect maps	Yes			Yes
Curvature maps	Yes			
Cross sections	Yes		Yes	Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Military



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Tactical military operations. Strategic defense. Amphibious landings and logistics over-the-shore. Operation of ships and submarines. Weapons system testing. Management of flight facilities and offshore launch or target areas.
MCA Title	Military
MCA ID	60335
Organization Type	State or U.S. Territorial government
Organization Name	State of North Carolina
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 29 - Military
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	I don't know
Tops of vegetation	I don't know
Tops of submerged structures, objects	I don't know
Tops of submerged vegetation	I don't know
Subcanopy of vegetation/understory	I don't know
River/lake bottom	Required
Nearshore elevation (<10 m deep)	I don't know
Sea surface	I don't know
Ocean/sea bottom (>10 m deep)	I don't know

General Geographic Area and Size	
Average geographic extent of day-to-day area	
Smallest 3D features needed	
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	I don't know
Rivers and Streams	
Less than 10 ft	I don't know
10 - 50 ft	I don't know
51 - 100 ft	I don't know
101 - 500 ft	I don't know
501 - 2,500 ft	I don't know
Greater than 2,500 ft	I don't know
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	I don't know
½ - 1 acre	I don't know
1.1 – 2 acres	I don't know
2.1 – 5 acres	I don't know
5.1 – 10 acres	I don't know
Greater than 10 acres	I don't know

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	I don't know	I don't know		
Acceptable Vertical Error	I don't know	I don't know		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	I don't know
Hydro-enforcement	I don't know
Hydro-conditioning	I don't know
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					I don't know	
Temporal Seamlessness						
Entire AOI in same acquisition season	I don't know	I don't know			I don't know	
Entire AOI under same environmental conditions	I don't know	I don't know			I don't know	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	I don't know	I don't know			I don't know	
DEM for entire AOI needs to be seamless	I don't know	I don't know			I don't know	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	I don't know	I don't know		
DTM	I don't know	I don't know		
DEM	I don't know	I don't know		
Raw point cloud data	I don't know	I don't know		
Classified point cloud	I don't know	I don't know		
Edited/cube XYZ		I don't know		
Full waveform	I don't know	I don't know		
Bathymetric Attributed Grid (BAG)		I don't know		
Breaklines required for standard hydro-flattening	I don't know	I don't know		
Additional breaklines for hydro-enforcement of culverts	I don't know			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	I don't know	I don't know		
Ground control/ground truthing	I don't know	I don't know		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	I don't know	I don't know		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	I don't know	I don't know		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	I don't know	I don't know		
Land use/land cover	I don't know	I don't know		
Wetlands	I don't know	I don't know		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	I don't know	I don't know		
Bridges/culverts	I don't know	I don't know		
Landmark features	I don't know	I don't know		
Cultural resources	I don't know	I don't know		
Coastal and riverine structures	I don't know	I don't know		
Overhead structures				
Lowest Floor Elevation of Buildings	I don't know			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know	I don't know		
Cost savings/cost reduction	I don't know	I don't know		
Cost avoidance	I don't know	I don't know		
Increased revenues	I don't know	I don't know		
Mission-driven performance improvements	I don't know	I don't know		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know	I don't know		

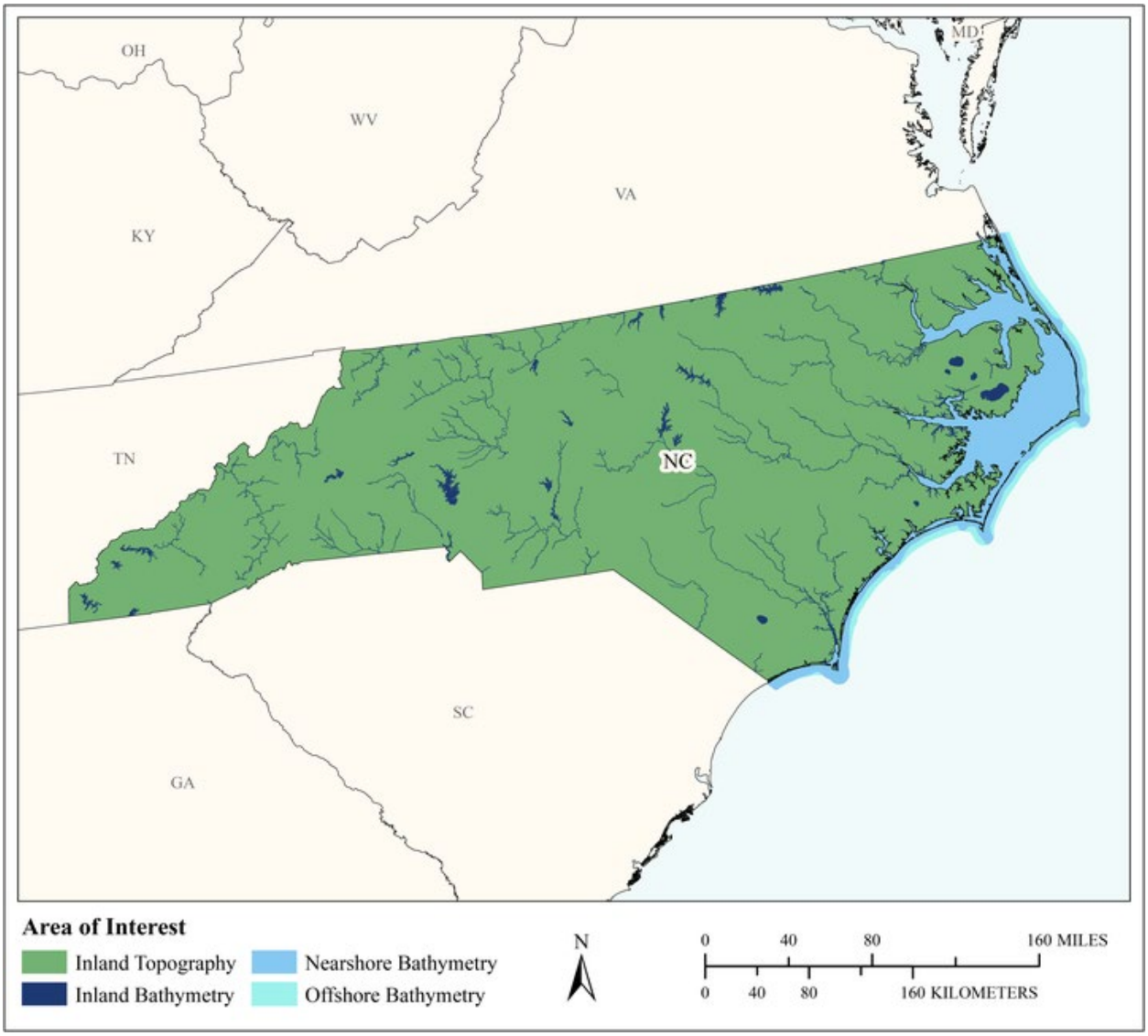
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	I don't know	I don't know		
Improved customer experience	I don't know	I don't know		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	I don't know		
Environmental	I don't know	I don't know		
Public safety, including life and property	I don't know	I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide							
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide							
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	I don't know	Unable to provide		I don't know	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$100,000									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	I don't know	Unable to provide		I don't know	Unable to provide							
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know								
Environmental	I don't know			I don't know								
Public safety, including life and property	I don't know			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Maritime and Land Boundary Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Delimitation of legal and other coastal boundaries, inland boundaries, and ordinary high water lines (OHWL).
MCA Title	Maritime and Land Boundary Management
MCA ID	60336
Organization Type	State or U.S. Territorial government
Organization Name	State of North Carolina
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 30 - Maritime and Land Boundary Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	I don't know
Update Frequency	4-5 years	4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Highly desirable	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Nice to have	Nice to have	Highly desirable	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable	Highly desirable	Required	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable	Highly desirable	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	Required
DTM	Required	Required	Required	Required
DEM	Highly desirable	Required	Required	Required
Raw point cloud data	Nice to have	Highly desirable	Required	Required
Classified point cloud	Highly desirable	Highly desirable	Required	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Not required	Nice to have
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Not required
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Nice to have	Required	Not required	Not required
Ground control/ground truthing	Highly desirable	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Required	Highly desirable	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Nice to have
Water column properties - Biological			Not required	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Highly desirable	Nice to have
Routes			Nice to have	Highly desirable
Offshore cadastral			Highly desirable	Nice to have
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Required	Required
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Nice to have
Wetlands	Required	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Highly desirable	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Minor	None	I don't know
Cost savings/cost reduction	Moderate	None	Minor	Moderate
Cost avoidance	Moderate	None	Minor	Moderate
Increased revenues	Minor	None	None	I don't know
Mission-driven performance improvements	Major	None	Moderate	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None	None	I don't know

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	None	Minor	Moderate
Improved customer experience	Major	None	Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	Moderate
Environmental	Major	Minor	Minor	Moderate
Public safety, including life and property	Moderate	None	Minor	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	Minor	Unable to provide		None			None			I don't know	Unable to provide	
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$200,000		Annual dollars saved/ realized	$200,000		Annual dollars saved/ realized	$278,000			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$212,987									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Moderate			Moderate		
Environmental	Minor			Major			Major			Major		
Public safety, including life and property	None			Moderate			Moderate			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps		Yes		
Cross sections		Yes		
Height-Above-Ground maps		Yes		
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

North Dakota

Current status of elevation data for North Dakota

North Dakota currently has complete lidar coverage across the whole state which is comprised of various collects over the last 15-20 years. Most of the state's collects are at Quality Level 3 (QL3), but approximately 20% of the state has been collected at QL2 and QL1 with a current project capturing approximately another 25% of the state at QL2. The majority of funding has been provided by the state NRCS office along with the State Water Commission providing funding or cost sharing options for local entities. FEMA has also provided a large share of the funding through their state grant to North Dakota, which the State Water Commission coordinates. Since these three entities have provided the majority of funding, there are few others who have expressed interest in providing any additional funds. The QL2 collects that have been conducted, and are currently in process, are the result of the State Water Commission and the NRCS working in unison to slowly move across the state in a piecemeal fashion to upgrade the QL3 base that was established in 2008 and completed in 2016. The State Water Commission currently houses all the lidar for the state and provides a very simple map service for download of all deliverables for every lidar project going back to the earliest collects of 20 years ago. The figure below shows the status of all lidar coverage in North Dakota, including current and in-progress projects.

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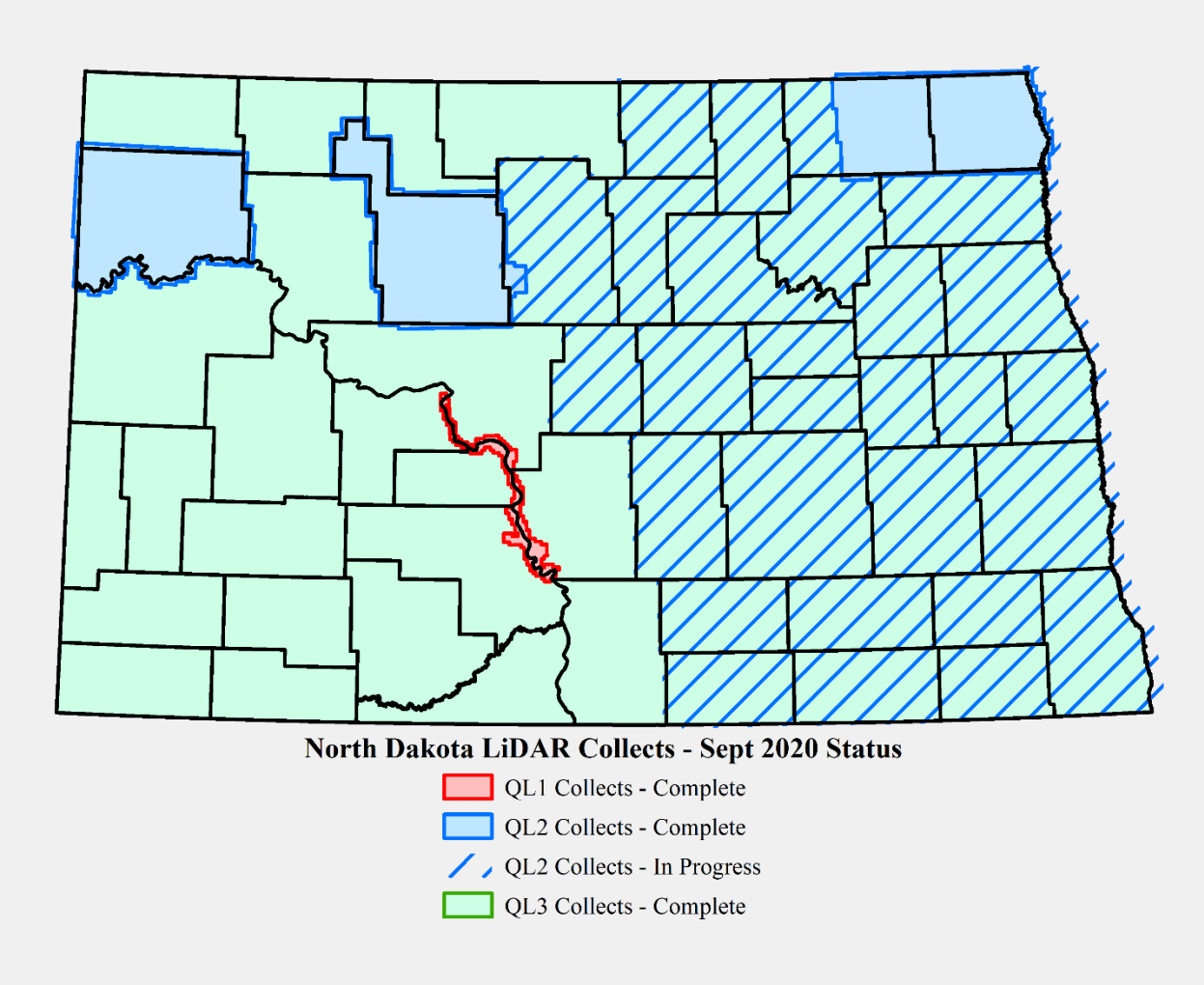


Figure 1. North Dakota Lidar Collects as of September 2020

Importance of elevation data to North Dakota

In this survey, four Mission Critical Activities (MCAs) within three primary Business Uses (BUs) were identified by participants. Water Supply and Quality was the most reported BU with MCAs for. Environmental Protection and Statewide Water Resource Management. Mine Land Reclamation was listed as an MCA under the primary BU of Geologic Resource Mining and Extraction. An MCA of Transportation and Water Resources Engineering was listed under the primary BU of Flood Risk Management. The vast majority of uses for lidar data in North Dakota is for floodplain management. Various other engineering uses can be found, such as landslide area identification by the State Geological Survey, or Department of Transportation reconnaissance for road development and maintenance issues, but not nearly to the scale of riverine/overland flood response and modeling applications.

High-level summary of elevation data requirements

As illustrated by the responses to this study, there is a pressing need for high-resolution elevation data in North Dakota. While statewide lidar coverage is complete, it should be noted that the majority of the existing lidar data is either older or of poor quality. While statewide lidar coverage is a long-term process,

a challenge for North Dakota will be to cover or recollect those areas of low-quality data with newer-quality lidar data coverage.

North Dakota recommends a future national elevation data program to revisit the areas containing QL2 or lower data and capture the data as QL1 or higher.

The data collected for two-thirds of the state is of very good and consistent quality, even if it is only QL3. For example, even though the specification for QL2 data has been for 10 centimeters or better, the RMSEz have been as high as 2.5-3.5 centimeters indicating that the data being collected is much better than the published specification. The contractor who has collected roughly 98% of the QL3 data in the state has also collected the majority of QL2 and QL1 data. North Dakota has a consistent product across the state. This level of quality data has been consistent, particularly in the last 10 years of collection. As stated earlier, the vast majority of uses for these data are for floodplain delineation and modeling. QL1 data do little to improve these types of operations when models such as HMS / HecRAS need the data resampled from 1-meter grids down to 3 to 5-meter resolution for the data to be small enough to execute the models. The QL3 data available now is a vast improvement over the National Elevation Datasets (or no data) available for many years prior. Top hydrologic modeling professionals in the state are pleased with the data available.

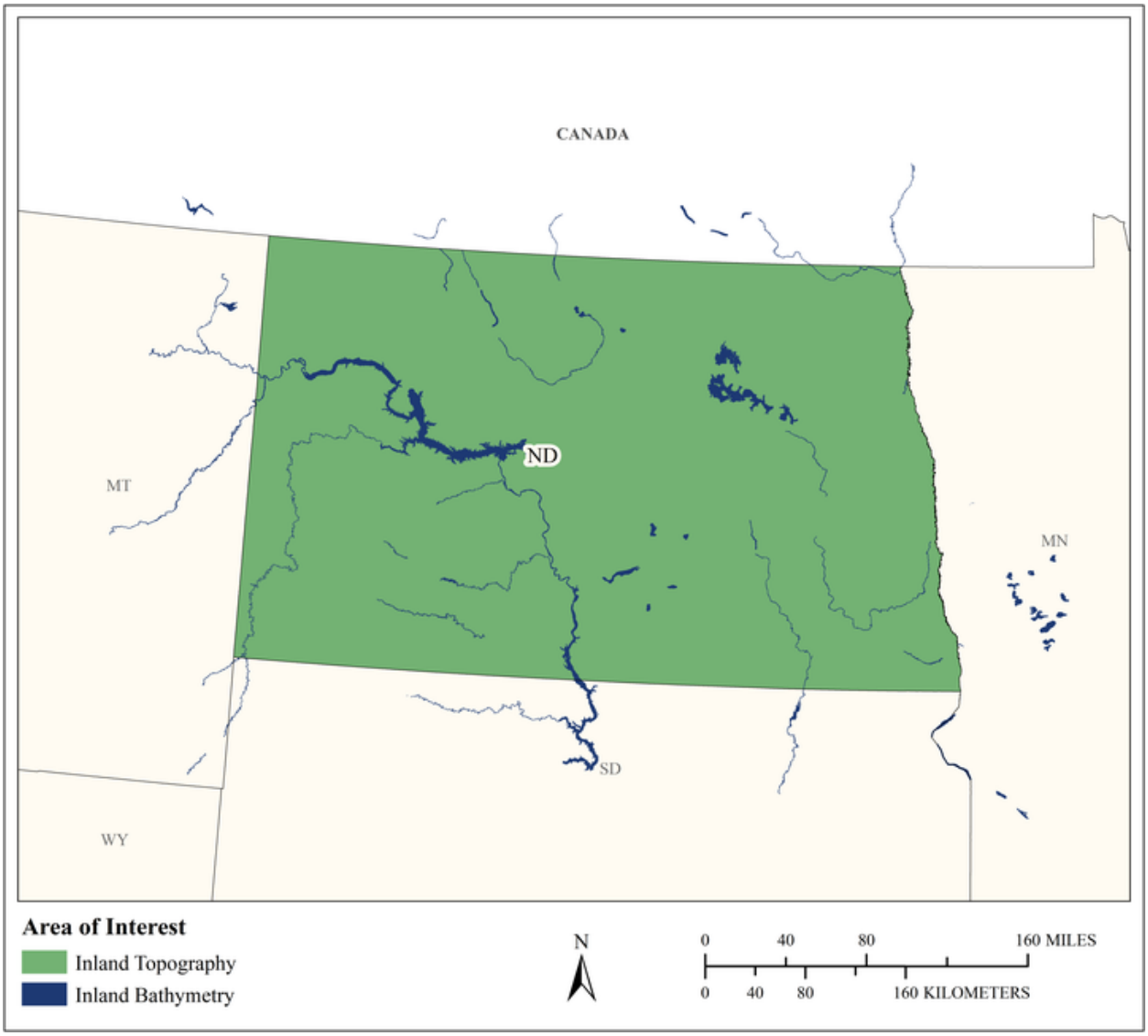
As can be seen from the earlier part of the summary, the state entities who have funded the majority of lidar collects have already initiated the collection of QL2 data to replace the QL3 data as funding continues or allows. It is currently scheduled to complete 45% of the state as early as 2023. However, spring and fall ground conditions frequently push back the anticipated completion dates. Current collects were held back on their first three collection seasons due to poor ground conditions and smoke from forest fires. The plan is that once QL2 has been completed for the state, the state will commence with collecting better data as time and funding allow. The greatest problems to date have not been a lack of funding or coordination, but the fact that North Dakota only has about a two-week period in the fall and spring to collect its data. The current climate cycle has made collections difficult due to snow and flood waters and the biggest complaint is that much of the data have been collected with the prairie pothole region bank-full. Coordination of funding and climate remain challenging. Furthermore, the environment presents challenges to collecting lidar-based inland bathymetry with current technology, as turbid and turbulent waters caused by constant wind activity prevent accurate collection as well as required depth readings.

The State of North Dakota has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	North Dakota Department of Health	1399	Environmental Protection	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Minor	Major	Moderate
				Inland Bathy	QL1B	6-10 years	Unable to quantify	Unable to quantify	Moderate	Major	I don't know
BU 01 – Water Supply and Quality	ND State Water Commission	21599	Statewide Water Resource Management, Data Collection, Distribution, and Emergency Management	Inland Topo	QL2	6-10 years	$2,500,000	$125,424	None	Moderate	Moderate
				Inland Bathy	QL3B	6-10 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 11 – Geologic Resource Extraction	State of North Dakota - Public Service Commission	1439	Mine Land Reclamation	Inland Topo	QL1	4-5 years	$7,236	$3,015	None	Minor	Minor
				Inland Bathy	QL0B	6-10 years	Unable to quantify	$1,206	None	Minor	Minor
BU 15 – Flood Risk Management	KLJ	22207	Transportation and Water Resources Engineering	Inland Topo	QL2	4-5 years	$137,034	$97,361	Major	Moderate	I don't know

MCA Title: Environmental Protection



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more Hydrologic Units (HUC8s)		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Riverine and ecosystem management; water, air and land quality regulation, disaster response; health & human services. Elevation data are needed for delineation of the Watershed Boundary Dataset (as the state WBD Steward) and surface water quality modeling to include modeling nutrients and runoff. State regulatory requirements include a requirement to determine slope for Animal Feeding Operations (AFO) and Confined Animal Feeding Operations (CAFO) permits. BU 08 – Agriculture and Precision Farming would be an additional Business Use.
MCA Title	Environmental Protection
MCA ID	1399
Organization Type	State or U.S. Territorial government
Organization Name	North Dakota Department of Health
Sub-Agency or Division	
Organization Mission	To conserve and protect the quality of North Dakota's air, land, and water resources following science and the law.
Program Name	Environmental Quality
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 02 - Riverine Ecosystem Management
Tertiary Business Use	BU 05 - Rangeland Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Large features

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Nice to have
51 - 100 ft	Not required
101 - 500 ft	Nice to have

Inland Bathy Feature Size Requirements	Response
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B		
Update Frequency	6-10 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	I don't know	Up to 1 meter		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs		Partial		
Cross section/transect requirement		I don't know		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Nice to have			Nice to have	
DEM for entire AOI needs to be seamless	Nice to have	Nice to have			Nice to have	
Other		Required				
Other description		Individual lakes and reservoirs need to be seamless				
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable		
DTM	Nice to have	Nice to have		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Classified point cloud	Required	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Highly desirable		
Land use/land cover	Highly desirable	Not required		
Wetlands	Highly desirable	Highly desirable		
Estuaries				
Inland surface water features	Highly desirable	Highly desirable		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have		
Cultural resources	Highly desirable	Nice to have		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL3 and QL2 data from NRCS/ACE and NDSWC collections across North Dakota over the years.	Using state bathymetry data from ND Game and Fish. Unknown QL and date		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes		

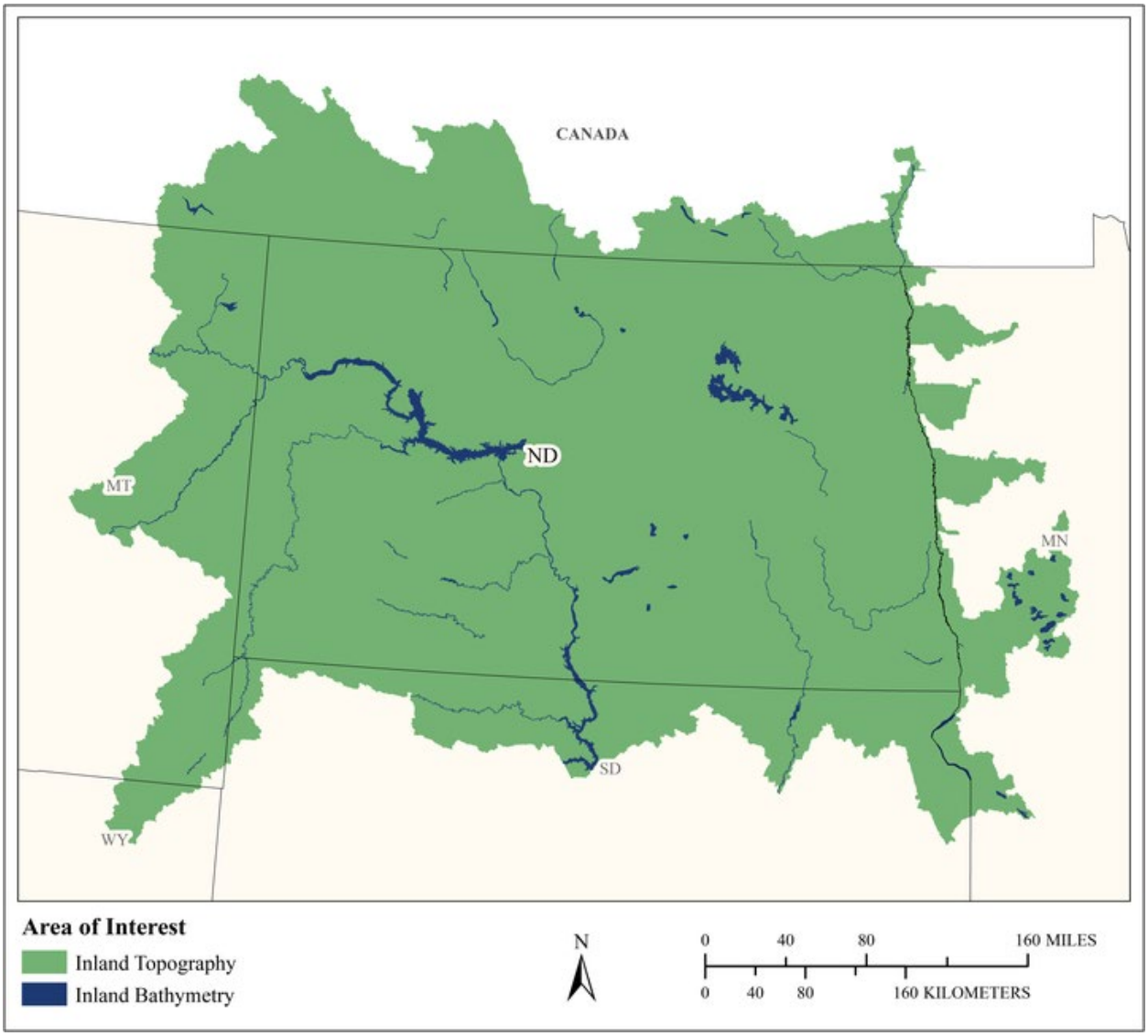
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
State repositories used	North Dakota State Water Commission Lidar Map Service (excellent source)	ND Game and Fish lake bathymetry		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Major	Moderate		
Cost avoidance	I don't know	I don't know		
Increased revenues	I don't know	I don't know		
Mission-driven performance improvements	Major	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	I don't know		
Improved response or timeliness	Major	I don't know		
Improved customer experience	Major	I don't know		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	I don't know		
Environmental	Minor	Major		
Public safety, including life and property	Moderate	I don't know		
Other Current Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other	Major			
Other description	More detailed water quality models being built with existing data; environmental benefits will follow once model is complete.			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Moderate	Unable to provide							
Time savings description				With accurate inland bathymetry, eliminate lakes from study that don't meet depth criteria (lake depth > 1m).								
Cost savings/cost reduction	Moderate	Unable to provide		I don't know	Unable to provide							
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide							
Increased revenues	None			I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness	Minor	Unable to provide		I don't know	Unable to provide							
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Moderate								
Education or outreach description	Model results can help with education and understanding of issues.			Model results can help with education and understanding of issues.								
Environmental	Major			Major								
Environmental description	These data will primarily be used in modeling results			These data will primarily be used in modeling results								
Public safety, including life and property	Moderate			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Statewide Water Resource Management, Data Collection, Distribution, and Emergency Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more Hydrologic Units (HUC8s)	One or more Hydrologic Units (HUC8s)		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Water appropriations - permitting of ground and surface water appropriations including geological studies of surface waters and ground waters for primarily agricultural and oil field operations. Regulatory - for all water related structures including permitting and safety regarding dams, dikes, drains, etc. Development - focused primarily on rural water delivery and development Investigations - focused on surface water modeling, flooding and dam break scenarios, emergency response. Atmospheric resources - focused on collection of meteorological information and management of weather modification operations. Elevation data are needed for flood risk identification, emergency operations, surface water modeling, H&H modeling, FEMA Base Level Engineering (BLE), and groundwater modeling. BU 08 – Agriculture and Precision Farming would be an additional Business Use.
MCA Title	Statewide Water Resource Management, Data Collection, Distribution, and Emergency Management
MCA ID	21599
Organization Type	State or U.S. Territorial government
Organization Name	ND State Water Commission
Sub-Agency or Division	
Organization Mission	The North Dakota State Water Commission (and Office of the State Engineer) focuses on the appropriation, use and protection of the waters of North Dakota. We have an appropriations section dedicated to permitting and protection of both ground and surface waters, regulatory functions for dams, dikes, drains and various structures, a development division for rural water delivery and systems, an atmospheric resources board to collect meteorological information and manage a weather modification project (cloud seeding), along with responding to emergency situations pertaining to flooding and dam related emergencies.
Program Name	Water Appropriations Division - permitting of ground and surface water appropriations including geological studies of surface waters and ground waters for primarily agricultural and oil field operations. Regulatory Divison - for all water related structures including permitting and safety regarding dams, dikes, drains, etc. Development Division - focused primarily on rural water delivery and development. Investigations Section - focused on surface water modeling, flooding and dam break scenarios, emergency response. Atmospheric Resources Board - focused on collection of meteorological information and management of weather modification operations
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 02 - Riverine Ecosystem Management
Tertiary Business Use	BU 15 - Flood Risk Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Not required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable

What Needs to be Measured in 3D	Response
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Most of our studies are fairly large in scope, typically covering watersheds and sub-basins. We do occasionally need highly detailed data for FEMA flood insurance mapping requirements; however, up until recently, it hasn't been a huge priority. We anticipate a greater need in the future, we aren't exactly sure of its usefulness or value as we are only currently exploring those options.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL3B		
Update Frequency	6-10 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need		
Acceptable Vertical Error	Up to 10 cm	Up to 40 cm		
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			Up to double the required TVU at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Highly desirable	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Required	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Nice to have		
Bathymetric Attributed Grid (BAG)		Required		
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required	Nice to have		
Land use/land cover	Nice to have	Nice to have		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Required	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL3 level LiDAR for about 60,000 out of the 70,000 sq mi of the state. Remaining 10,000 sq miles is primarily QL2 data along with about 200 sq mi of QL1 data. Currently have funding and in contracting process to proceed on 20,000 sq mi of QL2 collection.	None		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			

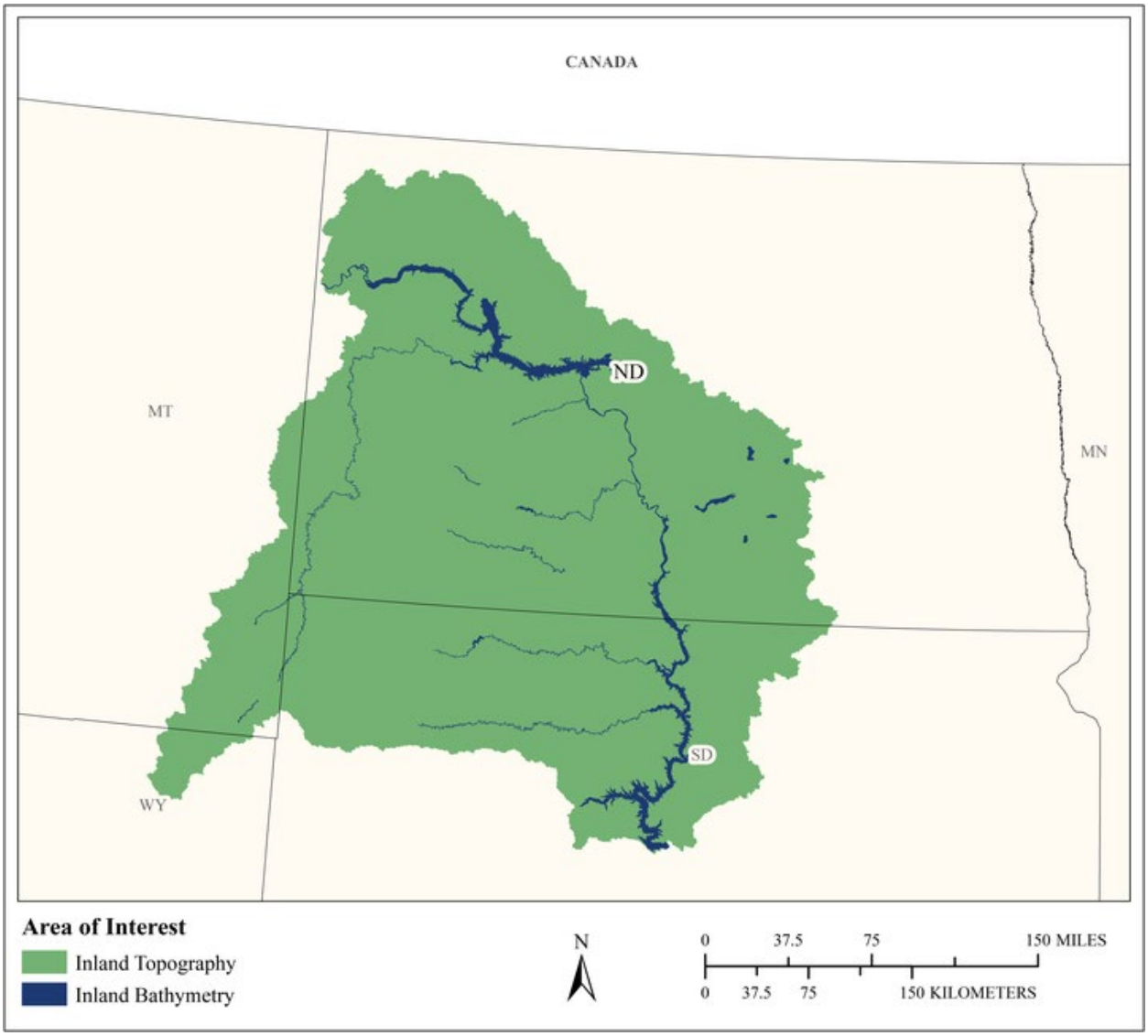
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
State repositories used	ND State Water Commission LiDAR Dissemination Map Service http://lidar.swc.nd.gov			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available		
Cost savings/cost reduction	Major	Inland bathy data not available		
Cost avoidance	Major	Inland bathy data not available		
Increased revenues	None	Inland bathy data not available		
Mission-driven performance improvements	Major	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available		
Improved response or timeliness	Major	Inland bathy data not available		
Improved customer experience	Major	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Inland bathy data not available		
Environmental	Major	Inland bathy data not available		
Public safety, including life and property	Major	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide							
Time savings description	This is almost impossible to answer as we respond to emergencies and work on projects which change from year to year and month to month.											
Cost savings/cost reduction	Major	Annual dollars saved/realized	$2,500,000	I don't know	Unable to provide							
Cost savings/cost reduction description	Many times, if we have to spend for individual projects, we use whatever is available. There is little spent on collection for individual projects. $20m is total amount spent on LiDAR for ND. Assume a 10 year lifespan.											
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide							
Increased revenues	None			I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	Major	Unable to provide		I don't know	Unable to provide							
Improved customer experience	Major	Annual dollars saved/realized	$125,424	I don't know	Unable to provide							
Improved customer experience description	This is an hour estimate for 2 people full time. We only have 2 people spending about 1/10th of their time delivering these data.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			I don't know								
Environmental	Moderate			I don't know								
Public safety, including life and property	Moderate			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Mine Land Reclamation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Highly desirable		
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)	One or more Hydrologic Units (HUC4s)		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Open mine volume computations. Stockpile analysis. Environmental impact assessment and site restoration. Slope stability and erosion control. Elevation data are used to identify surveying needs, identify pre-existing conditions and reconnaissance before site visits, see runoff, and evaluate land management capabilities. Lidar data may be merged with field survey data to fill out an Area of Interest. The data are used for remediation of abandoned coal mines as well as active reclamation of mines. BU 10 – Geologic Assessment and Hazard Mitigation, BU 12 – Renewable Energy Resources, and BU 13 – Oil and Gas Resources would be additional Business Uses.
MCA Title	Mine Land Reclamation
MCA ID	1439
Organization Type	State or U.S. Territorial government
Organization Name	State of North Dakota - Public Service Commission
Sub-Agency or Division	
Organization Mission	The mission of the Abandoned Mine Lands Division is to eliminate potential or existing hazards associated with abandoned coal mines in North Dakota for which there is no continuing liability under state or federal law. The nature of this mission is not regulatory but rather service-oriented.
Program Name	Active and abandoned mine land reclamation
Total Annual Program Budget	
Primary Business Use	BU 11 - Geologic Resource Mining and Extraction
Secondary Business Use	BU 05 - Rangeland Management
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Rocks, small erosional features

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B		
Update Frequency	4-5 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI	Our AOI could go farther into the northwest of ND, but mostly this HUC			
Acceptable Horizontal Error	Less than 20 cm	Up to 2 meters		
Acceptable Vertical Error	Less than 5 cm	Up to 20 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Not required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Not required			Not required	
Entire AOI under same environmental conditions	Highly desirable	Not required			Not required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Not required			Not required	
DEM for entire AOI needs to be seamless	Highly desirable	Not required			Not required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level				Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable		
DTM	Highly desirable	Highly desirable		
DEM	Required	Highly desirable		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Highly desirable	Highly desirable		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Not required	Not required		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Not required		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Not required		
Land use/land cover	Nice to have	Not required		
Wetlands	Nice to have	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have	Not required		
Bridges/culverts	Nice to have	Not required		
Landmark features	Not required	Not required		
Cultural resources	Nice to have	Not required		
Coastal and riverine structures	Not required	Not required		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	State of ND Lidar - QL2 2009-2018	Little existing data; some soundings for individual lakes or reservoirs, no lidar		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	North Dakota State Water Commission			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Moderate	Moderate		
Cost avoidance	Minor	Moderate		
Increased revenues	None	None		

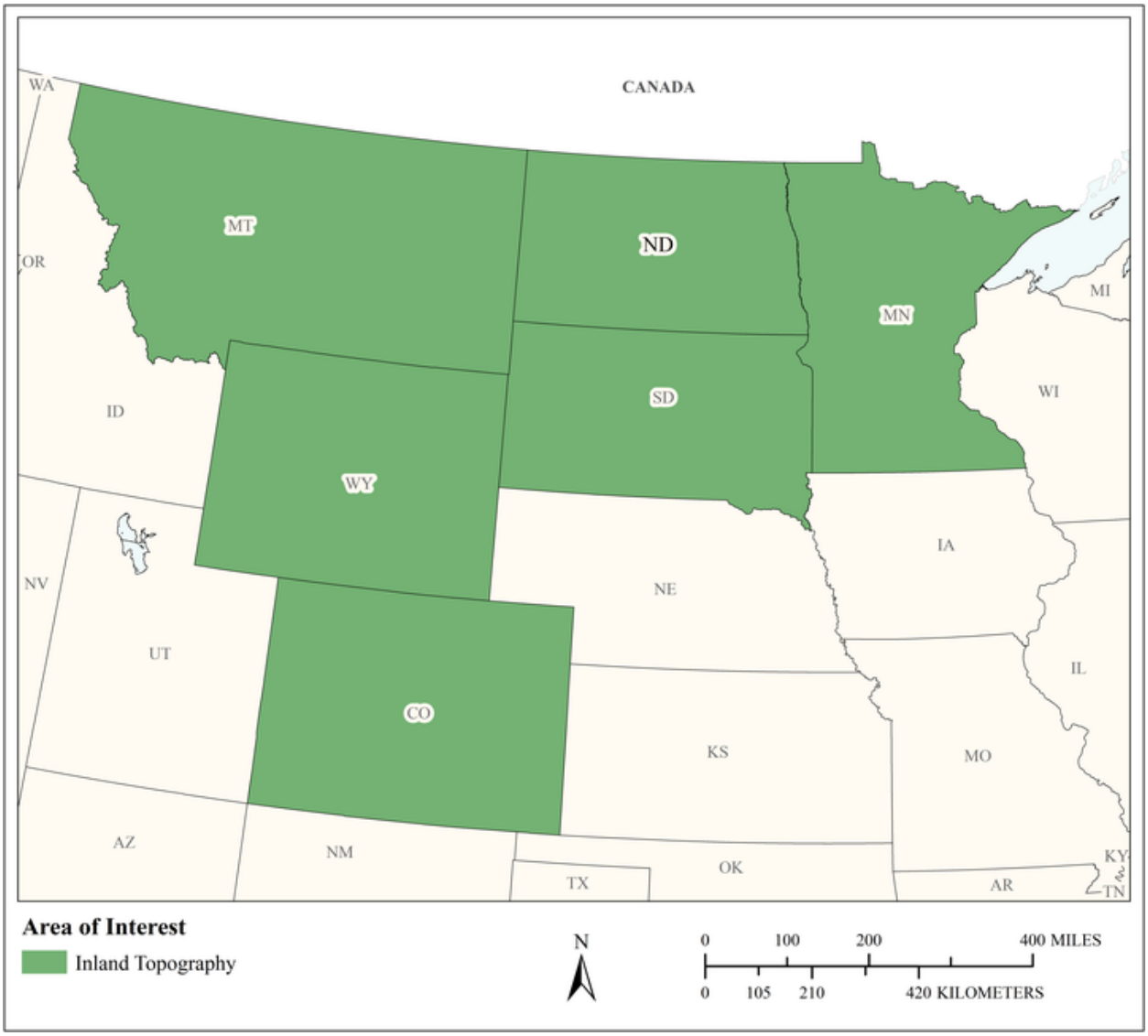
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Mission-driven performance improvements	Moderate	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	None		
Improved response or timeliness	Moderate	None		
Improved customer experience	None	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	None		
Environmental	Moderate	Minor		
Public safety, including life and property	Major	None		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$7,236	Moderate	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		Minor	Unable to provide							
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide							
Increased revenues	None			None								
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	None			None								
Improved response or timeliness	Moderate	Annual dollars saved/realized	$3,015	Minor	Annual dollars saved/realized	$603						
Improved customer experience	Minor	Unable to provide		Minor	Annual dollars saved/realized	$603						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			None								
Environmental	Minor			Minor								
Public safety, including life and property	Minor			Minor								
Other												
Other benefits	Minor											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Transportation and Water Resources Engineering



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Design of transportation systems, water systems and other civil engineering activities. Modeling of water systems including flooding, effects of levees, dam breaks, floodplains. BU 26 – Education K12 and Beyond, Basic Research would be an additional Business Use.
MCA Title	Transportation and Water Resources Engineering
MCA ID	22207
Organization Type	Private or Commercial
Organization Name	KLJ
Sub-Agency or Division	
Organization Mission	Provide engineering solutions to help our clients
Program Name	Water Resources, Transportation, Aviation (Airports)
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 19 - Land Navigation and Safety
Tertiary Business Use	BU 22 - Infrastructure and Construction Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Manholes and sandbag levees

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 10 cm			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Not required
No Treatment	Highly desirable

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL2 and QL3 Lidar when available else Survey.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	North Dakota and Minnesota.			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Moderate			
Mission-driven performance improvements	Moderate			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Moderate			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$47,034									
Time savings description	Dealing with verifying datums is a fact of life. But if all data can be verified in one go that is great. Preliminary engineering can be completed from Lidar instead of survey. Preliminary floodplain modeling can be done in 2D in minutes compared to hours of 1D survey. With continuous topo, one can set color gradations that quickly verify watershed boundaries. Same surface used through multiple teams and offices. Allow the set up of templates and work flows for watershed delineation and flow paths.											
Cost savings/cost reduction	Major	Annual dollars saved/realized	$30,000									
Cost savings/cost reduction description	Reduced survey on preliminary projects including time to gain access to areas.											
Cost avoidance	Major	Annual dollars saved/realized	$50,000									
Cost avoidance description	Interior drainage for cities with flood control rely heavily on dense data to see where water is held and where it flows on hills. Ability to quickly delineate impervious surfaces, buildings. Ability to look beyond a project site for the unforeseen but necessary to catch.											
Increased revenues	Minor	Annual dollars saved/realized	$10,000									
Increased revenues description	Ability to provide better products to clients and convey engineering solutions to the public in a way easy to understand.											
Mission-driven performance improvements	Major	Annual percent improvement	22%									
Mission-driven performance improvements description	2D models are faster than 1D to build. Better communication by seeing full surface as relates to aerial imagery. Better preliminary engineering.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide										
Improved response or timeliness	Moderate	Annual dollars saved/realized	$65,000									
Improved response or timeliness description	A major flood hit our region in 2009 a few months after receiving lidar. Planning of temporary protection measures were greatly enhanced. As both engineers and review agencies adjust to new methods, reviews will go faster. Better floodplain maps bring better decisions. Ability to consider flooding in road design and timing for evacuation. Convey complex solutions in easier to understand format at public meetings.											
Improved customer experience	Moderate	Annual dollars saved/realized	$30,854									

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Improved customer experience description	Preliminary estimates better match final estimates. Hate looking for data among several sites and many desks and agencies.											
Other customer service benefits	Moderate	Annual dollars saved/realized	$1,508									
Other customer service benefits description	Faster preliminary answers.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Education or outreach description	Survey covers limited areas. The ability to look at someone's house during a public meeting and say this is the expected result is huge.											
Environmental	Moderate											
Environmental description	Better routing decisions											
Public safety, including life and property	I don't know											
Other												
Other benefits	Major											
Other description	Elevation data will become part of our everyday experience like GPS, pick a route to jog today...											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

Northern Mariana Islands

The Commonwealth of the Northern Mariana Islands (CNMI) is an archipelago of 14 islands compromising approximately 183.5 square miles in landmass contained within an exclusive economic zone of approximately 295,000 square miles. The southernmost three islands (Saipan, Tinian, and Rota) are the most populated and the majority of the CNMI population is located on Saipan. Additionally, some of the northern islands such as Pagan, Alamagan, and Agrihan have potential to be repopulated and used for homesteads and Farallon de Medinilla (FDM) is currently used by the United States military for bombing exercises. The economy of the CNMI is largely driven by tourism as the beaches and coastlines support a variety of water sports, resorts, and fishing opportunities. Inland wetlands serve as habitat for several endangered species that are not found anywhere else in the world, and the majority of the islands contain significant historic artifacts, both for the indigenous people of the islands and from World War II. The CNMI is often subjected to typhoon events and is at high-risk for potential sea-level rise and tsunami, emphasizing the need of appropriate data for emergency preparedness and infrastructure development in order to minimize impacts from such natural disasters. Given the relatively small sizes of the islands and the population's reliance on water resources, it is essential to use the most current data to inform processes that support the islands' natural resources and the people that live there.

Current status of elevation data for the Northern Mariana Islands

The finest level inland topography data available is 0.75-meter Quality Level 3 (QL3) lidar and contours for Saipan from 2007 (U.S. Army Corps of Engineers), QL3 lidar for Tinian from 2006, and the National Elevation Dataset for Rota and Aguijan (5- to 10-meter resolution). Inland topographic data for islands north of Saipan are restricted to raster and vector data derived from USGS 7.5 by 7.5 minute and other topographic maps, where available. Bathymetry data varies in resolution across islands, with 5- to 10-meter resolution typically available (NOAA), and higher resolution (2-meter) satellite derived bathymetry for the Saipan Lagoon (NOAA NCCOS 2017). Topo-bathy data for Saipan, Tinian, Rota, Aguijan, FDM, and Pagan were collected by NOAA during April/May 2019 include terrestrial, intertidal, and shallow water zones (up to 50-meter water depth or laser extinction). Topographic data will be QL1 (RMSEz LTE 10 cm; min 8 points per square meter) with a horizontal accuracy of 1.2-meter while bathymetric data will have vertical root mean square error of QL2B.

Importance of elevation data to the Northern Mariana Islands

Elevation and bathymetric data in the Commonwealth are used by stakeholders for a variety of Business Uses and Mission Critical Activities, listed below**:**

Bureau of Environmental and Coastal Quality – Elevation data are needed for model input, generalized view of habitats, input into exposure and resilience tools, and SLOSH modeling (out to 30-50 meter depth contour). Specifically, inland and nearshore bathymetry can be analyzed for identifying potential shoreline erosion areas, informing updates to "high-hazard" regulatory boundaries, and siting coral restoration activities, while offshore bathymetry is also useful for mapping benthic habitats (coral and seagrass habitats).

Division of Fish and Wildlife – Elevation data are needed for occupancy and species distribution modeling, monitoring fluctuations of species populations, and habitat mapping for wildlife and fisheries (mostly fin fish). Inland topography and bathymetry are useful for modeling of federally endangered species by providing data on potential wetland water depth and other topographic characteristics (terrain shape index, slope derivatives, etc.). Nearshore and offshore bathymetry would provide depth and benthic structure data useful for mapping and modeling of fisheries populations, as well as planning boat ramp access and recreational boating safety.

Historic Preservation Office - Elevation data are needed for identification and inventory of historic sites. Predictive modeling of potential historic sites will rely on elevation and presumed historic elevations. Nearshore and offshore bathymetry data will be useful for identifying features that may be cultural or historic resources (World War II air- and seacraft, historic monuments, etc.).

Commonwealth Utilities Corporation – Topographic data can be used for modeling the fate and transport of contaminants, pollution risk mitigation, runoff and sedimentation analyses, and point or non-point source pollution modeling. Bathymetric data can be used for the management of contaminants and marine debris, atmospheric pollution, spills, and refuse.

Office of Homeland Security and Emergency Management – Inland topography and nearshore bathymetry can provide data for tsunami and other natural disaster preparedness through identification of areas susceptible to flooding. The CNMI Office of Planning and Development, in collaboration with CNMI Homeland Security, Bureau of Environmental and Coastal Quality, and Department of Public Works has initiated discussions with FEMA to start the process of updating FEMA FIRMs for Saipan, Tinian, and Rota. Topographic and bathymetric data will be critical in supporting this effort. Additionally, bathymetry will be useful for marine transportation safety and delineating motorized boat exclusion zones.

High-level summary of elevation data requirements

While elevation data for all islands would be beneficial; QL1 topographic data for Saipan, Tinian, Rota, Pagan, and FDM are of higher priority due to their populations, infrastructure, and military activity. Saipan, Tinian, Rota, Pagan, and Anatahan are also the only islands containing inland water bodies and therefore would be prioritized for inland bathymetry at QL2B. In general CNMI's requires QL1inland topography, QL1B inland and nearshore bathymetry, and Order 1a offshore bathymetry all updated every 4-5 years.

High-level summary of benefits that would come from higher resolution elevation data

Higher resolution elevation data would provide increased benefits to natural resource management, cultural resource preservation, transportation and utility planning, pollution mitigation, and disaster management. Additionally, these data are essential for mitigation planning of potential climate change and rising sea levels by providing high-resolution data for analysis of areas most susceptible to flooding and erosion. While elevation data was collected by NOAA in 2019, this project could provide data at higher resolution and include islands that are outside of the scope of NOAA's efforts.

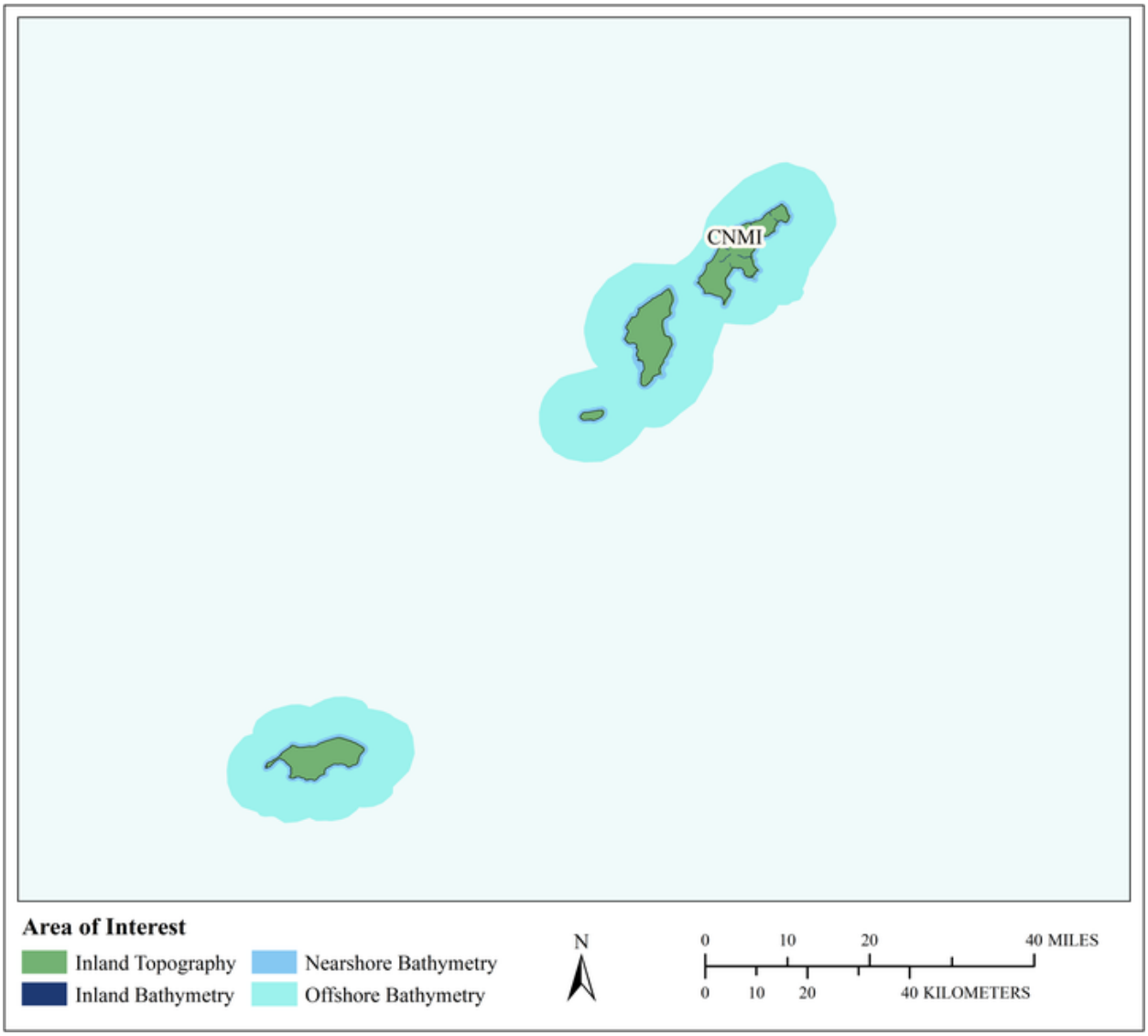
The Commonwealth of the Northern Mariana Islands has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	Commonwealth of Northern Mariana Islands	60337	Water Supply and Quality	Inland Topo	QL2	4-5 years	$2,024	$542	Moderate	Major	Moderate
				Inland Bathy	QL1B	6-10 years	$8,756	$914	Moderate	Major	Moderate
				Nearshore Bathy	QL1B	4-5 years	$624	$1,028	Moderate	Moderate	Moderate
				Offshore Bathy	Order 1a	4-5 years	$4,200	$21,004	Minor	Major	Major
BU 03 – Coastal Zone Management	Bureau of Environmental and Coastal Quality	1375	Coastal Resource Management	Inland Topo	QL1	2-3 years	$9,410	$1,645	Minor	Major	Minor
				Nearshore Bathy	QL1B	2-3 years	$2,121	$3,589	Minor	Major	Major
				Offshore Bathy	Order 1b	2-3 years	$131,546	$26,263	I don't know	Moderate	I don't know
BU 06 – Natural Resource Management	Commonwealth of Northern Mariana Islands	60338	Natural Resources Conservation	Inland Topo	QL1 HD	4-5 years	$7,159	$26,291	Major	Major	Major
BU 07 – Wildlife and Habitat Management	Commonwealth of the Northern Mariana Islands	21565	Management and Monitoring of Wildlife and Fish Populations	Inland Topo	QL1 HD	2-3 years	$142,386	$5,728	Major	Major	None
				Inland Bathy	QL2B	4-5 years	$8,427	$3,015	Major	Major	I don't know
				Nearshore Bathy	QL2B	4-5 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Major
BU 09 – Fisheries Management and Aquaculture	Commonwealth of Northern Mariana Islands	60339	Fisheries Management and Aquaculture	Nearshore Bathy	QL0B	6-10 years	$1,488	$109	Moderate	Major	Minor
				Offshore Bathy	Special Order	6-10 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Minor
BU 14 – Cultural Resource Management	CNMI Historic Preservation Office	1374	Management of Historic Resources	Inland Topo	QL1	6-10 years	$33	$29	None	None	None
				Nearshore Bathy	QL2B	>10 years	$27	Unable to quantify	None	None	None
				Offshore Bathy	Order 1a	>10 years	$4,079	Unable to quantify	None	None	None
BU 15 – Flood Risk Management	Commonwealth of Northern Mariana Islands	60340	Flood Risk Management	Inland Topo	QL2	4-5 years	$25,628	$4,484	Major	Moderate	Major
				Inland Bathy	QL1B	4-5 years	$1,780	$1,998	Moderate	Moderate	Major
				Nearshore Bathy	QL2B	4-5 years	$1,793	$1,329	Major	Moderate	Major
				Offshore Bathy	Special Order	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 16 – Sea Level Rise and Subsidence	Commonwealth of Northern Mariana Islands	60341	Sea Level Rise and Subsidence	Inland Topo	QL1 HD	4-5 years	$9,609	Unable to quantify	Moderate	Moderate	Moderate
				Nearshore Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Minor

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 20 – Marine and Riverine Navigation	Commonwealth of Northern Mariana Islands	60342	Marine and Riverine Navigation and Safety	Nearshore Bathy	QL0B	2-3 years	$7,261	$245	Minor	Major	Major
				Offshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 22 – Infrastructure Management	Commonwealth Utilities Corporation	21757	Power, Water, and Waste Water Services	Inland Topo	I don't know	Event driven	$5,861	$17,251	Moderate	Major	Major
				Nearshore Bathy	I don't know	Event driven	$83	$11	Moderate	Major	Major

MCA Title: Water Supply and Quality



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Fate and transport of contaminants. Pollution risk mitigation. Runoff and sedimentation analyses. Point- or non-point source pollution modeling. Management of contaminants and marine debris - point, non-point, vessel, and atmospheric pollution; spills; trash.
MCA Title	Water Supply and Quality
MCA ID	60337
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Northern Mariana Islands
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL1B	Order 1a
Update Frequency	4-5 years	6-10 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Nice to have	Highly desirable	Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable	Required	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Nice to have	Required
DTM	Required	Highly desirable	Nice to have	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Nice to have	Nice to have	Nice to have	Nice to have
Classified point cloud	Highly desirable	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Nice to have
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Nice to have	Required
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Required
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Highly desirable
Bottom type			Nice to have	Highly desirable
Submerged features			Nice to have	Highly desirable
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Nice to have	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Not required
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Highly desirable
Floating observation/navigation systems			Nice to have	Highly desirable
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Nice to have
Wetlands	Highly desirable	Highly desirable	Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Moderate	Moderate
Cost savings/cost reduction	Major	Minor	Moderate	Moderate
Cost avoidance	Major	Minor	Minor	Moderate
Increased revenues	Minor	None	Minor	Minor
Mission-driven performance improvements	Major	Minor	Minor	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Moderate	Minor

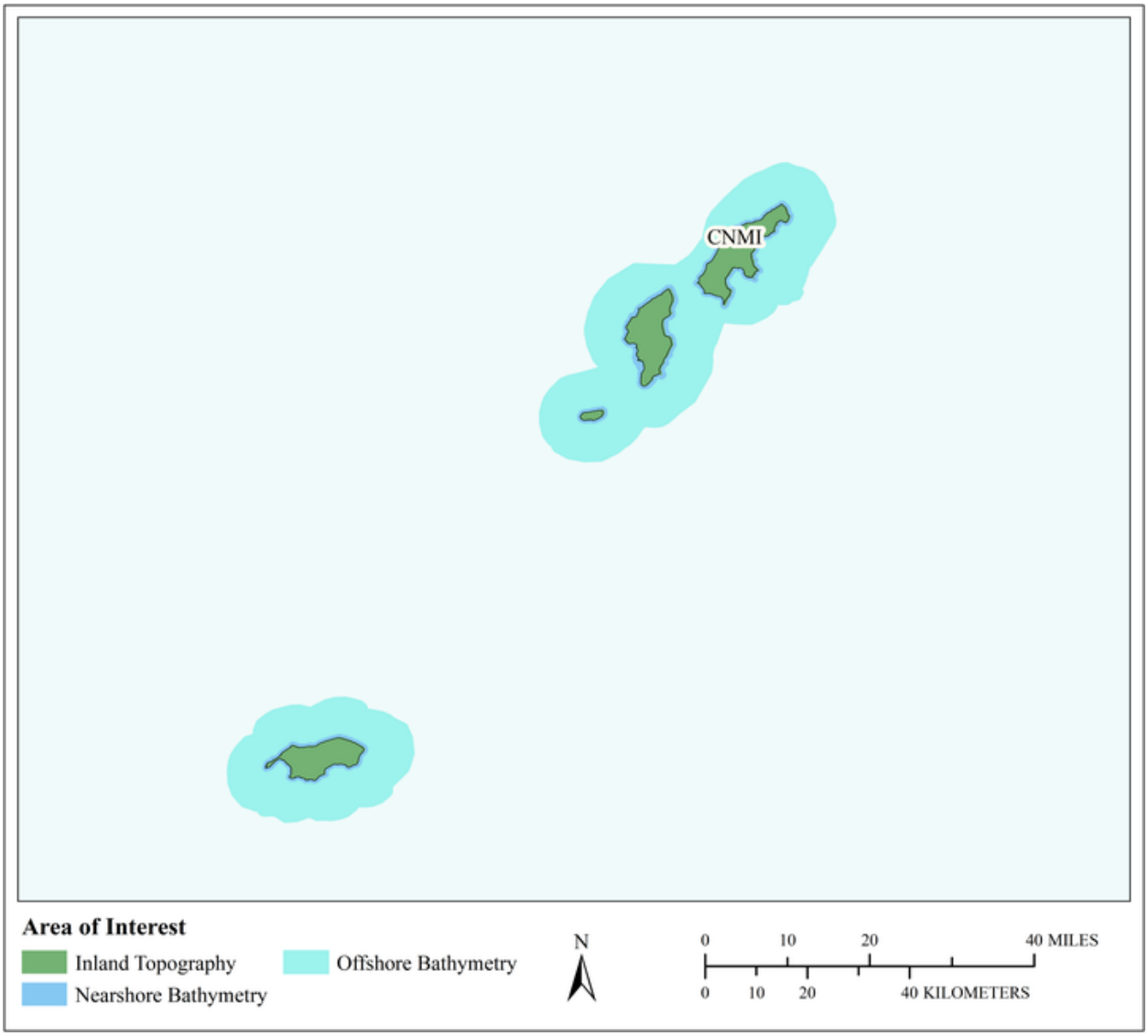
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	Moderate	Moderate
Improved customer experience	Major	Minor	Moderate	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	Minor
Environmental	Major	Moderate	Moderate	Minor
Public safety, including life and property	Major	Minor	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide		None		
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		None		
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,024		Annual dollars saved/ realized	$8,756		Annual dollars saved/ realized	$624		Annual dollars saved/ realized	$4,200
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$542		Annual dollars saved/ realized	$914		Annual dollars saved/ realized	$1,028		Annual dollars saved/ realized	$21,004
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate			Minor		
Environmental	Major			Major			Moderate			Major		
Public safety, including life and property	Moderate			Moderate			Moderate			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes		Yes	Yes
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes	Yes	
Hydrologic Flow Accumulation Grids	Yes	Yes	Yes	
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Coastal Resource Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	Required
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Coastal erosion and inundation, characterization and mapping of wetlands, sea level modeling and mapping, conservation of coral and seagrass habitats. Elevation data are needed for model input, generalized view of habitats, identification of preferred areas, input into exposure and resilience tools, and SLOSH modeling (out to 30-50 meter depth contour).
MCA Title	Coastal Resource Management
MCA ID	1375
Organization Type	State or U.S. Territorial government
Organization Name	Bureau of Environmental and Coastal Quality
Sub-Agency or Division	
Organization Mission	To maintain each resident's constitutional right to a clean and healthful environment by providing effective interagency collaboration, permitting and enforcement, monitoring, outreach and education, and restoration.
Program Name	Coastal Resource Management
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 06 - Natural Resources Conservation
Tertiary Business Use	BU 07 - Wildlife and Habitat Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Houses, underwater wrecks, large coral heads

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1		QL1B	Order 1b
Update Frequency	2-3 years		2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI	Three main and Pagan, FDM are most important			
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need		Up to 1 meter	Up to 1 meter

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Vertical Error	Up to 20 cm		Up to 30 cm	Less than 1 meter
How far onshore needed			To the fall line	
How far down the beach profile needed	Below MLLW		To MLLW	
Tide correction requirement			MHW	MHW
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required		Highly desirable	Highly desirable		Highly desirable
Entire AOI under same environmental conditions	Highly desirable		Highly desirable	Highly desirable		Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Required	Highly desirable		Highly desirable
DEM for entire AOI needs to be seamless	Required		Required	Highly desirable		Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required		Required	Required
DTM	Required		Required	Required
DEM	Required		Required	Required
Raw point cloud data	Nice to have		Nice to have	Nice to have
Classified point cloud	Nice to have		Highly desirable	
Edited/cube XYZ			Nice to have	Nice to have
Full waveform	Nice to have		Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)			Highly desirable	Highly desirable

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Highly desirable	Required
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Highly desirable
Intensity imagery/sidescan imagery	Highly desirable		Nice to have	Highly desirable
Ground control/ground truthing	Highly desirable		Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Required
Acoustic imagery of the seafloor			Required	Required
Aerial and/or satellite imagery	Required		Required	Highly desirable
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Required	Required
Subbottom characteristics			Nice to have	Required
Geologic and seismic data	Highly desirable		Nice to have	Nice to have
Water column properties - Physical			Highly desirable	Highly desirable
Water column properties - Chemical			Highly desirable	Highly desirable
Water column properties - Biological			Required	Highly desirable
Currents			Required	Required
Tide/wave heights			Required	Required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Required
Boundaries			Required	Highly desirable
Routes			Required	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Highly desirable
Fixed obstructions			Highly desirable	Required
Floating observation/navigation systems			Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Required		Required	
Land use/land cover	Required		Required	Highly desirable
Wetlands	Required		Required	Required
Estuaries			Required	Required
Inland surface water features	Required		Required	
Bridges/culverts	Required			
Landmark features	Highly desirable		Highly desirable	
Cultural resources	Highly desirable		Required	
Coastal and riverine structures	Required		Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Lidar and contours, 2007, QL3, 1.7 meter post spacing Saipan, Tinian 2005-2006		Bathymetry data currently used is from a report by Kendall et al. 2017	NOAA Data Access Viewer
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes			Yes
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes		Yes	
Other description	Local repository		File obtained from Kendall et al. 2017	

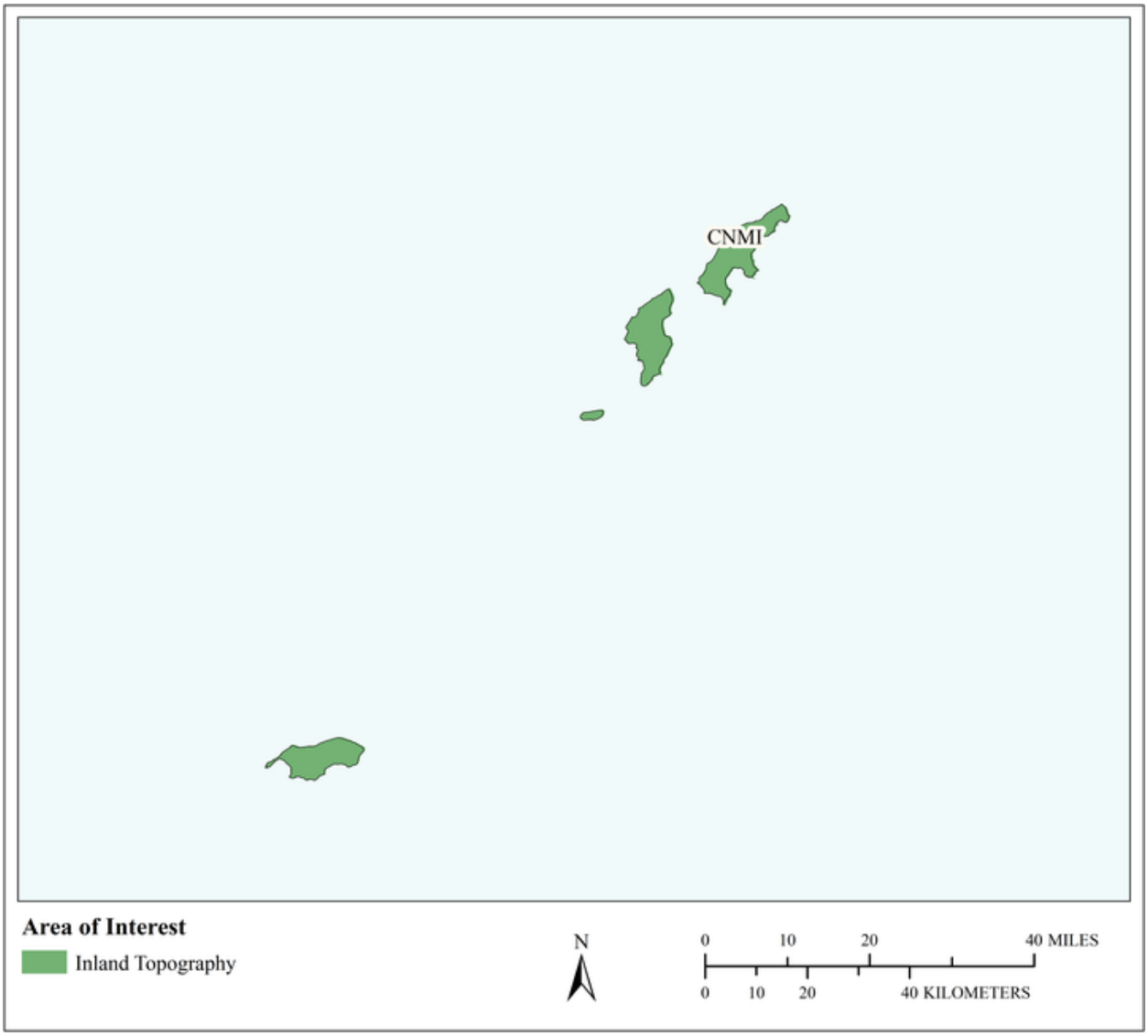
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Major	Major
Cost savings/cost reduction	Major		Major	Moderate
Cost avoidance	Major		Moderate	Moderate
Increased revenues	I don't know		I don't know	I don't know
Mission-driven performance improvements	Major		Major	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		Major	Moderate
Improved response or timeliness	Major		Major	Moderate
Improved customer experience	I don't know		Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate		Minor	Minor
Environmental	Major		Major	Moderate
Public safety, including life and property	I don't know		Major	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					Moderate	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Cost avoidance	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Increased revenues	I don't know	Unable to provide					Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$9,410					Annual dollars saved/ realized	$2,121		Annual dollars saved/ realized	$131,546
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide					Moderate	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,645					Annual dollars saved/ realized	$3,589		Annual dollars saved/ realized	$26,263
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor						Minor			I don't know		
Education or outreach description	Provide high quality data to educate the public on watersheds						Show how our shorelines have changed over time			Unknown		
Environmental	Major						Major			Moderate		
Environmental description	High resolution watershed delineation						Make quicker decision on permit applications			More detailed mapping for better decision making		
Public safety, including life and property	Minor						Major			I don't know		
Public safety, including life and property description	High quality data for flooding, sea level rise scenarios, etc...						Provide the public on why the area is not ideal for activity			Unknown		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	Yes
Contours	Yes		Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes		Yes	Yes
Aspect maps	Yes		Yes	
Curvature maps	Yes			
Cross sections			Yes	
Height-Above-Ground maps	Yes		Yes	
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes		Yes	
Hydrologic Flow Accumulation Grids	Yes		Yes	
Hydrologic networks (e.g. streams, lakes)			Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes		Yes	
Building footprints	Yes		Yes	
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness			Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Natural Resources Conservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation engineering. Soils and wetlands mapping and characterization. Modeling of biological and ecological systems. Erosion control. Rainfall penetration studies, impervious surfaces. Assessment of blue carbon stocks.
MCA Title	Natural Resources Conservation
MCA ID	60338
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Northern Mariana Islands
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	BU 04 - Forest Resources Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

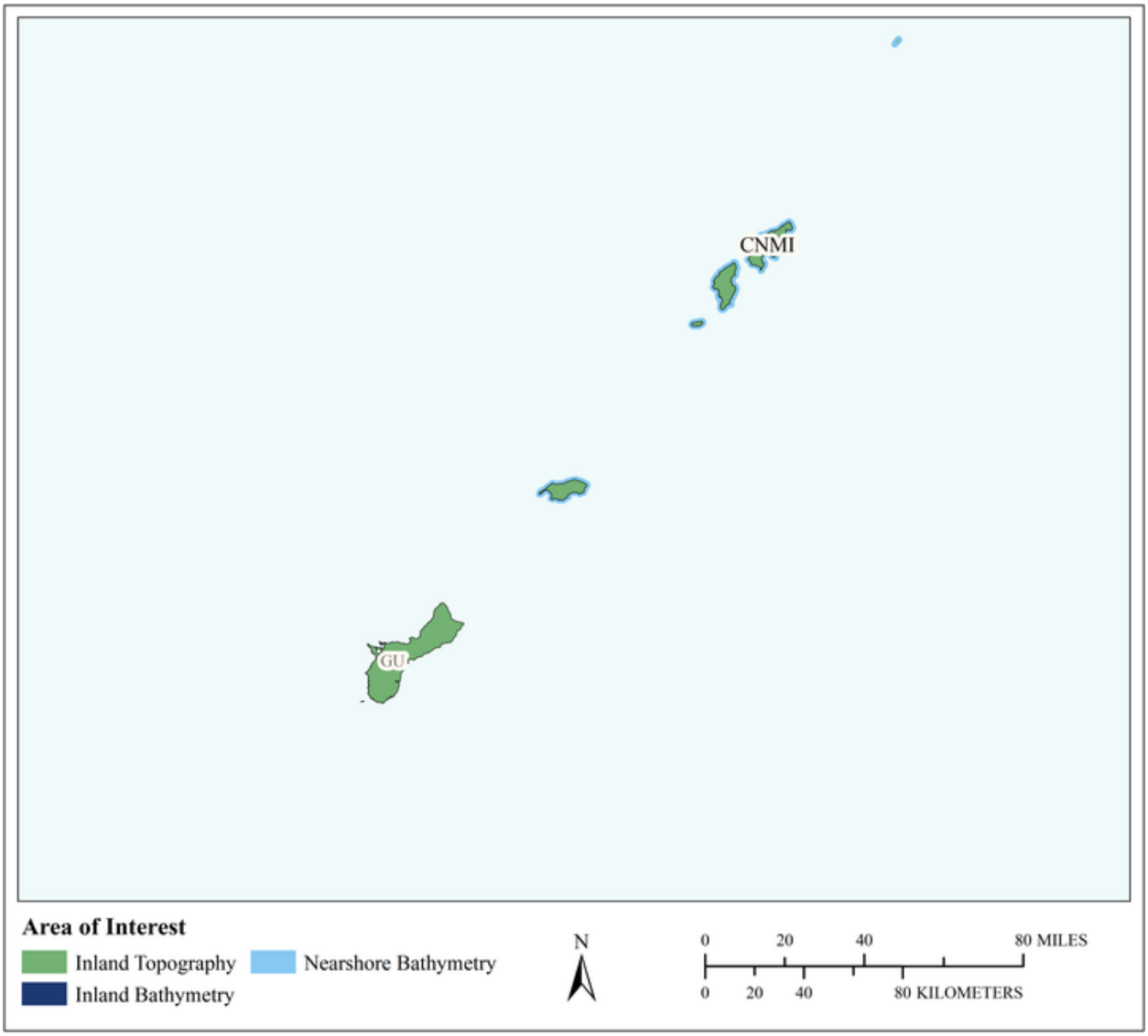
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$7,159									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$26,291									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Management and Monitoring of Wildlife and Fish Populations



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Management and monitoring of wildlife and fish populations. Elevation data are needed for occupancy and species distribution modeling, monitoring fluctuation of populations, and habitat mapping for wildlife and fisheries (mostly fin fish).
MCA Title	Management and Monitoring of Wildlife and Fish Populations
MCA ID	21565
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of the Northern Mariana Islands
Sub-Agency or Division	
Organization Mission	To ensure the long-term survival and sustainability of natural resources for present and future generations.
Program Name	Division of Fish and Wildlife
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	BU 09 - Fisheries Management and Aquaculture
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Individual trees, benthic habitat types

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL2B	QL2B	
Update Frequency	2-3 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 30 cm	Up to 1 meter	Up to 1 meter	
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 40 cm	
How far onshore needed			To Mean Higher High Water (MHHW)	
How far down the beach profile needed	To MLLW		Below MLLW	
Tide correction requirement			MSL	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Required		Highly desirable	Required
Entire AOI under same environmental conditions	Required	Highly desirable	Required		Highly desirable	Highly desirable
Other		Required			Required	
Other description		Each island collected seamlessly, less important between islands			Each island collected seamlessly, less important between islands	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Required
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Required	
DTM	Required	Highly desirable	Required	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Nice to have	Not required	
Classified point cloud	Highly desirable	Highly desirable	Nice to have	
Edited/cube XYZ		Not required	Not required	
Full waveform	Highly desirable	Nice to have	Not required	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Bathymetric Attributed Grid (BAG)		Not required	Not required	
Breaklines required for standard hydro-flattening	Nice to have	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)			Not required	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Highly desirable	Not required	Not required	
Ground control/ground truthing	Required	Highly desirable	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Required	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Not required	Not required	Not required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Highly desirable	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Required	Highly desirable	Nice to have	
Wetlands	Required	Required	Nice to have	
Estuaries			Not required	
Inland surface water features	Required	Required	Nice to have	
Bridges/culverts	Not required	Not required		
Landmark features	Nice to have	Not required	Not required	
Cultural resources	Not required	Not required	Not required	
Coastal and riverine structures	Highly desirable	Nice to have	Highly desirable	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	DEM from NOAA at 5-meter resolution and National Elevation Dataset DEM at 10-meter resolution. Both are very coarse for our applications.	I currently do not have inland bathymetric data available, we may acquire a drone to make some line of sight estimates.	Mixed resolution NOAA Bathymetry	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI	Yes		Yes	
Open Topography				
NOAA nautical charts		Yes	Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other	Yes			
Other description	USDA/NRCS Data Gateway			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Inland bathy data not available	None	
Cost savings/cost reduction	Major	Inland bathy data not available	None	
Cost avoidance	None	Inland bathy data not available	Moderate	
Increased revenues	None	Inland bathy data not available	None	
Mission-driven performance improvements	Major	Inland bathy data not available	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Inland bathy data not available	Minor	
Improved response or timeliness	Minor	Inland bathy data not available	Moderate	
Improved customer experience	None	Inland bathy data not available	None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Inland bathy data not available	Major	
Environmental	Moderate	Inland bathy data not available	Moderate	
Public safety, including life and property	None	Inland bathy data not available	Major	

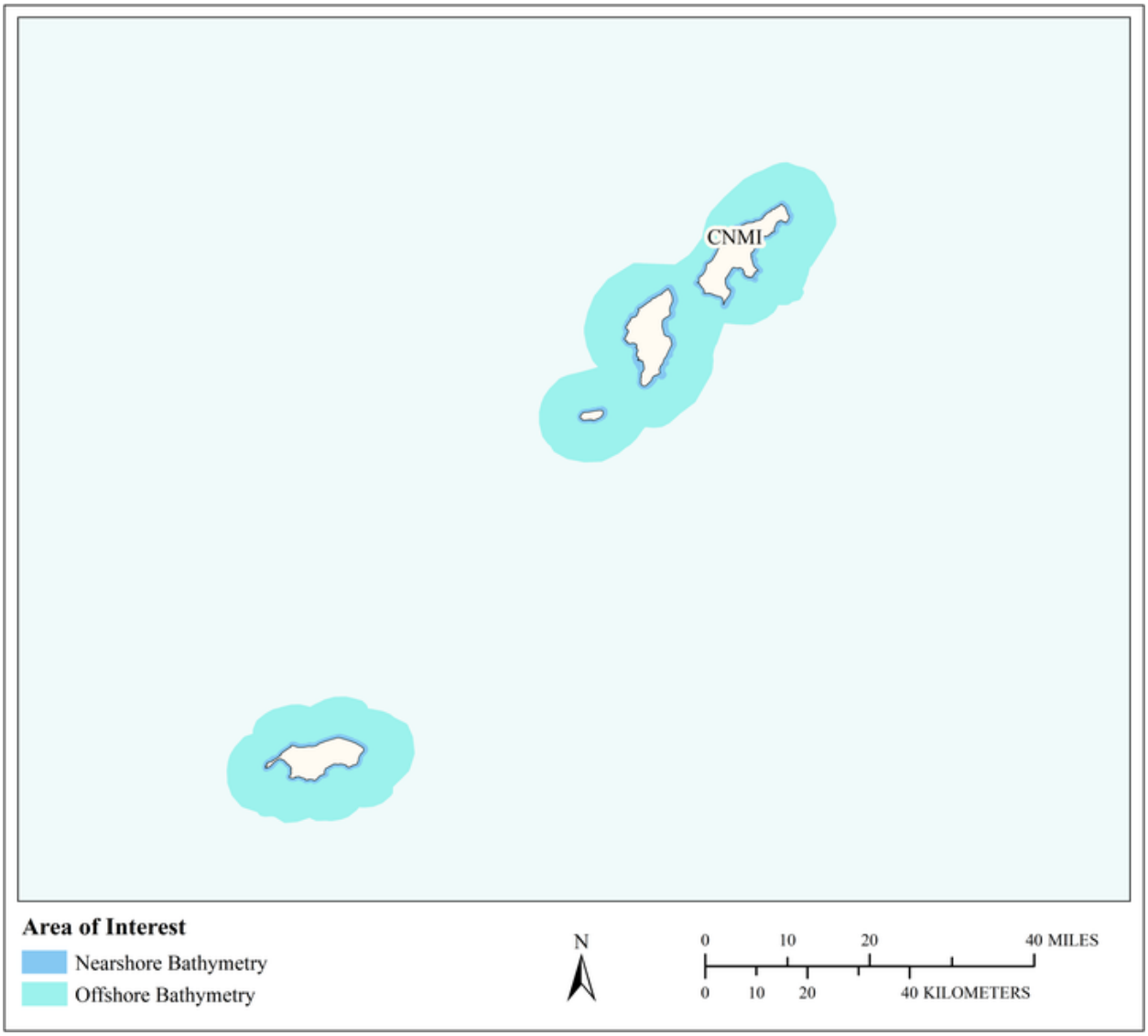
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$37,386	Moderate	Annual dollars saved/realized	$5,427	Moderate	Unable to provide				
Time savings description	We plan trips to uninhabited islands where we fly reconnaissance surveys to determine survey transects. This data would allow better planning of site visits and landing areas for reconnaissance. We could provide better surveys with some canopy and topographic data better known. 2-2.5 (80-100 hours) weeks of analyst time per year. Saved time for remapping existing wetland boundaries on islands, based on two week time for GIS technician (80 hours). We collect field data for tree canopy heights and cover as well as wetland structure characteristics for modeling species distributions. We also plan trips to uninhabited islands where we fly reconnaissance surveys to determine survey transects. We could use the 3D topographic data to fill these gaps. Hours are estimated at 1 hour per vegetation plot for 3 technicians for 250 plots per year. More complete coverage of data would be available, improving modeling and mapping efforts which would eventually inform management recommendations. Reduction in error in modeling distributions and extrapolation. Based on one week (40 hours) for analyst. Provide better mapping for permitting processes for potential conflicts (wetlands, etc.). Few conflicts occur per year but estimated 1-2 hours for field delineation of wetlands, etc. for 10 sites per year.			Reduction in error in modeling distributions and extrapolation. Based on one week for analyst time (40 hours). We collect data on structural characteristics of wetlands (including area and depth) for species management and monitoring. Fewer field visits would be needed so we would save work hours. 2 hours per wetland site for 50 sites/year = approximately 100 hours. More complete coverage of data would be available, improving modeling and mapping efforts which would eventually inform management recommendations. Approximately one week (40 hours) improvement in modeling and mapping.			More complete coverage of data would be available, improving modeling and mapping efforts which would eventually inform management recommendations. Improvement to fishery data collection and analysis.					
Cost savings/cost reduction	Minor	Annual dollars saved/realized	$103,000	Minor	Annual dollars saved/realized	$2,500	None					
Cost savings/cost reduction description	Upcoming need for LiDAR for lower CNMI islands. Data acquisition estimate is an educated guess based on flying LiDAR or using drone - split difference of cost estimate 200,000 (fly LiDAR) vs. 6,000 (drone cost and time to fly).			Estimate based on UAV/drone, operating time, and processing costs.								
Cost avoidance	Moderate	Annual dollars saved/realized	$2,000	Moderate	Annual dollars saved/realized	$500	Major	Unable to provide				
Cost avoidance description	Estimated time to process UAV line of sight data,.			Eliminates guesswork out of wetland volumes and depths. Cost estimated at 20 hours of analyst time.			Potential for data error avoidance in fishery models. Avoided crashes or collisions would be a large benefit.					
Increased revenues	None			None			Moderate	Unable to provide				
Increased revenues description							Improvement in data for fishery models would allow better harvest of fish.					
Mission-driven performance improvements	Major	Annual percent improvement	33%	Moderate	Annual percent improvement	30%	Major	Unable to provide				
Mission-driven performance improvements description	Improved data for modeling rare and endangered species and guiding field surveys, which provide better information for recovery efforts and management across all islands.			Improved data for modeling rare and endangered species and guiding field surveys, which provide better information for recovery efforts and management across all islands,.			Improvement in data for fishery models would allow better management of fish populations.					

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Other operational benefits	Moderate	Unable to provide										
Other operational benefits description	Improved data for management of species. Unable to estimate but this data greatly helps guide surveys and understanding of endangered and endemic species on the islands.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$1,508	None			Moderate	Unable to provide				
Value added to products or services description	Better information for GPS navigation and reconnaissance for northern islands which are uninhabited. Better information for reconnaissance for northern islands which are uninhabited.						Better maps for boat navigation and fishing.					
Improved response or timeliness	Major	Annual dollars saved/realized	$4,221	Minor	Annual dollars saved/realized	$3,015	Moderate	Unable to provide				
Improved response or timeliness description	More accurate data for habitat data for rare species recovery and management. Up to date information for reconnaissance for northern islands which are uninhabited to guide species surveys. Availability of data allows for increased dissemination of joint-agency surveys and efforts.			More accurate data for habitat data for rare species recovery and management.,.			Potential for tsunami or typhoon planning of program assets. Increased accuracy and update of nautical and navigation charts.					
Improved customer experience	Major	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Improved customer experience description	Currently used topographic data is coarse and collected from several years ago. Potential for improved tools for public outreach regarding rare species and their habitat needs.			Potential for improved tools for public outreach regarding rare species and their habitat needs.			Easier availability of bathymetry data.					
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate					
Education or outreach description	Potential for improved tools for public outreach regarding rare species and their habitat needs			Potential for improved tools for public outreach regarding rare species and their habitat needs.			Better data for inclusion into fishery models to help management of species					
Environmental	Major			Major			Moderate					
Environmental description	Better data to use in habitat-species associations to preserve native forests and provide sustainability			Better data to use in habitat-species associations to preserve native forests and provide sustainability.			Better data for inclusion into fishery models to help management of species					
Public safety, including life and property	None			I don't know			Major					
Public safety, including life and property description							Better information for boat fisherman for planning					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes	Yes	Yes	
Curvature maps	Yes			
Cross sections				
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Fisheries Management and Aquaculture



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type			Required	Required
Geographic Area Requirements			Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Management of fisheries. Sustainable aquaculture.
MCA Title	Fisheries Management and Aquaculture
MCA ID	60339
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Northern Mariana Islands
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Nice to have
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order			QL0B	Special Order
Update Frequency			6-10 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error			Up to 2 meters	Up to 2 meters
Acceptable Vertical Error			Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season			Nice to have	Nice to have		Nice to have
Entire AOI under same environmental conditions			Highly desirable	Highly desirable		Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless			Highly desirable	Highly desirable		Highly desirable
DEM for entire AOI needs to be seamless			Highly desirable	Highly desirable		Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM			Highly desirable	Required
DTM			Highly desirable	Nice to have
DEM			Required	Required
Raw point cloud data			Highly desirable	Nice to have
Classified point cloud			Highly desirable	
Edited/cube XYZ			Nice to have	Nice to have
Full waveform			Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)			Highly desirable	Nice to have
Breaklines required for standard hydro-flattening				
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Nice to have
Tide Predictions			Not required	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery			Highly desirable	Required
Ground control/ground truthing			Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Nice to have	Required
Acoustic imagery of the seafloor			Highly desirable	Required
Aerial and/or satellite imagery			Highly desirable	Required
Underwater videography			Nice to have	Highly desirable
Bottom texture			Nice to have	Required
Bottom type			Highly desirable	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data			Nice to have	Nice to have
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Required
Floating observation/navigation systems			Nice to have	Required
Shorelines – current, historic, change rates			Highly desirable	
Land use/land cover			Nice to have	Nice to have
Wetlands			Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Highly desirable
Inland surface water features			Nice to have	
Bridges/culverts				
Landmark features			Nice to have	
Cultural resources			Not required	
Coastal and riverine structures			Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings			Moderate	Moderate
Cost savings/cost reduction			Major	Minor
Cost avoidance			Minor	Minor
Increased revenues			Minor	None
Mission-driven performance improvements			Moderate	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services			Minor	Moderate

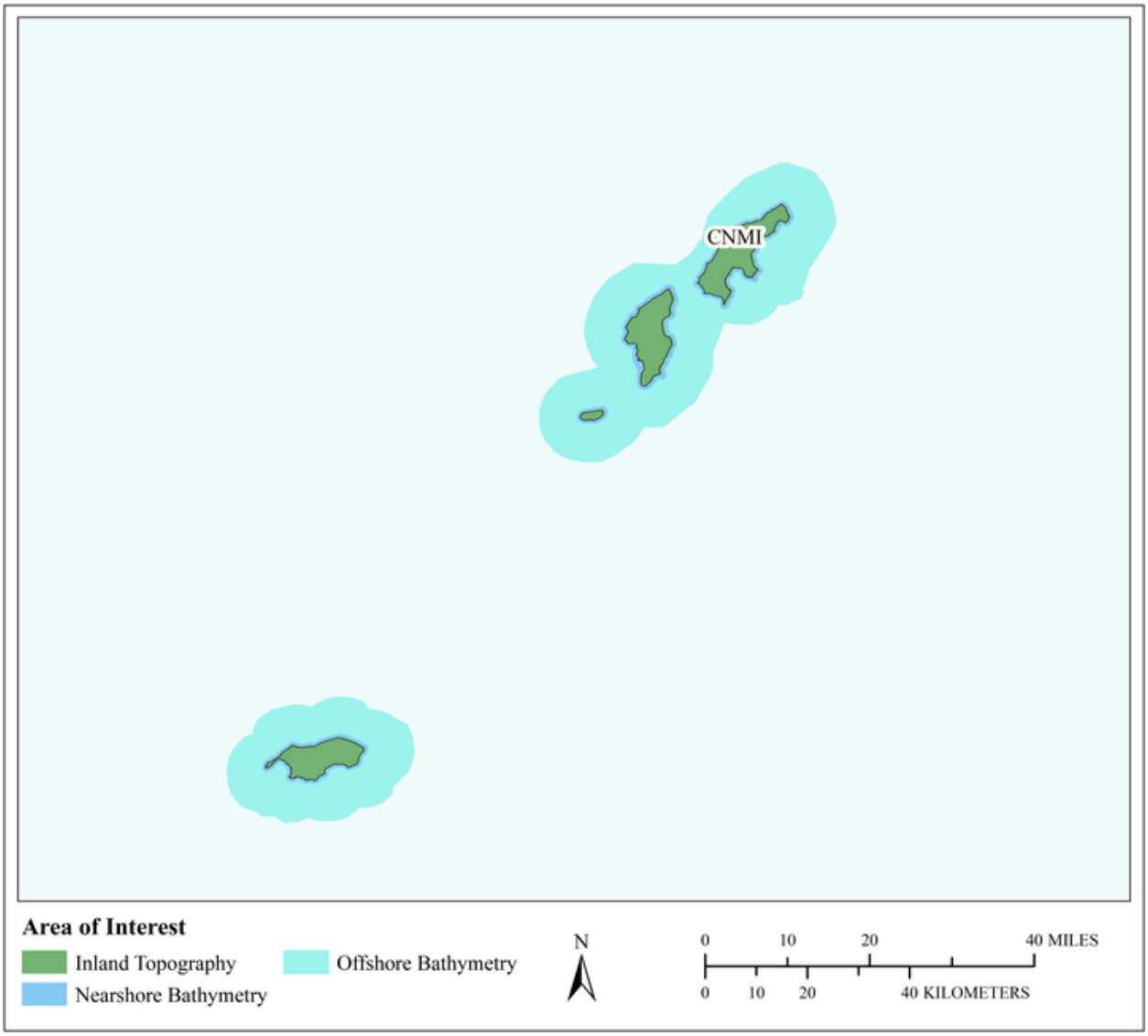
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness			Moderate	Minor
Improved customer experience			Minor	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach			Moderate	Moderate
Environmental			Moderate	Minor
Public safety, including life and property			Minor	None

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings							Major	Unable to provide		Minor	Unable to provide	
Cost savings/cost reduction							Moderate	Unable to provide		None		
Cost avoidance							Moderate	Unable to provide		None		
Increased revenues							Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements							Major	Unable to provide		Minor	Unable to provide	
Future annual operational benefits added during validation								Annual dollars saved/ realized	$1,488			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services							Minor	Unable to provide		Minor	Unable to provide	
Improved response or timeliness							Major	Unable to provide		Minor	Unable to provide	
Improved customer experience							Moderate	Unable to provide		Minor	Unable to provide	
Future annual customer service benefits added during validation								Annual dollars saved/ realized	$109			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach							Moderate			Moderate		
Environmental							Major			Moderate		
Public safety, including life and property							Minor			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours			Yes	Yes
Hillshades			Yes	Yes
Slope maps			Yes	Yes
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Management of Historic Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	Required
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Survey and inventory of terrestrial and underwater archaeological, cultural, and historical resources. Management and protection of resources with regards to public and private development and planning. Elevation data are needed for identification and inventory of historic sites, to include those from WWII. Future predictive modelling is based on elevation and presumed historic elevations, resulting in identification of potential historic sites.
MCA Title	Management of Historic Resources
MCA ID	1374
Organization Type	State or U.S. Territorial government
Organization Name	CNMI Historic Preservation Office
Sub-Agency or Division	
Organization Mission	The Historic Preservation Office (HPO) was established by the passage of the CNMI Historic Preservation Act of 1982 (Public Law 3-39). The intent of Public Law 3-39 is to (1). Ensure the identification and protection of significant archaeological, historic, and cultural resources in the Commonwealth; (2). Educate the public concerning matters relating to local history, archaeology, culture and historic preservation; and (3). Develop historic and cultural properties to allow them to contribute to the cultural, social, and economic growth of our citizens. The CNMI contains a wealth of historic and cultural properties whose preservation, study and interpretation is vital to the development of self-understanding and self-pride on the part of our people, and to the interest of the international science in understanding the history and cultures of the people and environment of the Pacific Islands. These historic and cultural properties are subject to damage and destruction by uncontrolled land-use development and once destroyed, the historical and/or archaeological value they possess will be gone forever. For this reason, it is the duty of the Historic Preservation Office to ensure the protection, preservation and regulation of historic and cultural sites pursuant to Public Law 3-39 P.L. 3-33, as amended by P.L. 10-71 to address violation matters.
Program Name	Survey and Inventory, Review and Compliance
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)

General Geographic Area and Size	
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Small features, including underwater features (aircraft wreck parts, lost anchors, etc.) as well as terrestrial features (prehistoric megalithic ruins, turn of the century building foundations, cisterns, etc.) can provide vital information regarding the possibility of the existence and characteristic of archaeological and historical resources in yet-unsurveyed sites.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1		QL2B	Order 1a
Update Frequency	6-10 years		>10 years	>10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI	All islands are needed for future uses. The three main islands and Pagan are most important.		All islands are needed for future uses. The three main islands and Pagan are most important.	All islands are needed for future uses. The three main islands and Pagan are most important.
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need		Up to 5 meters	Up to 5 meters
Acceptable Vertical Error	Up to 50 cm		Up to 40 cm	Less than 1 meter
How far onshore needed			To Mean Higher High Water (MHHW)	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			No requirement for tide correction	No requirement for tide correction
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have		Nice to have	Nice to have		Nice to have
Entire AOI under same environmental conditions	Nice to have		Nice to have	Nice to have		Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have		Nice to have	Nice to have		Nice to have
DEM for entire AOI needs to be seamless	Nice to have		Nice to have	Nice to have		Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required		Highly desirable	Highly desirable
DTM	Highly desirable		Not required	Not required
DEM	Highly desirable		Highly desirable	Highly desirable
Raw point cloud data	Not required		Not required	Not required
Classified point cloud	Nice to have		Not required	
Edited/cube XYZ			Nice to have	Nice to have
Full waveform	Not required		Not required	Not required
Bathymetric Attributed Grid (BAG)			Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery	Nice to have		Highly desirable	Highly desirable
Ground control/ground truthing	Highly desirable		Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Required	Required
Aerial and/or satellite imagery	Required		Highly desirable	Not required
Underwater videography			Not required	Not required
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Required	Required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Highly desirable		Highly desirable	Highly desirable
Water column properties - Physical			Not required	Highly desirable
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Highly desirable	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Highly desirable	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Not required	Not required
Lease areas			Nice to have	Nice to have
Fixed obstructions			Required	Required
Floating observation/navigation systems			Required	Required
Shorelines – current, historic, change rates	Highly desirable		Highly desirable	
Land use/land cover	Nice to have		Not required	Not required
Wetlands	Not required		Not required	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Not required
Inland surface water features	Not required		Not required	
Bridges/culverts	Not required			
Landmark features	Required		Nice to have	
Cultural resources	Required		Required	
Coastal and riverine structures	Nice to have		Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Currently use DEM to assess potential for prehistoric coastal sites.		Not currently using, QL2 topobathy collection to come in 2019-2020	Not currently using
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes			
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None		None	None
Cost savings/cost reduction	None		None	None
Cost avoidance	None		None	None
Increased revenues	None		None	None
Mission-driven performance improvements	Moderate		None	None

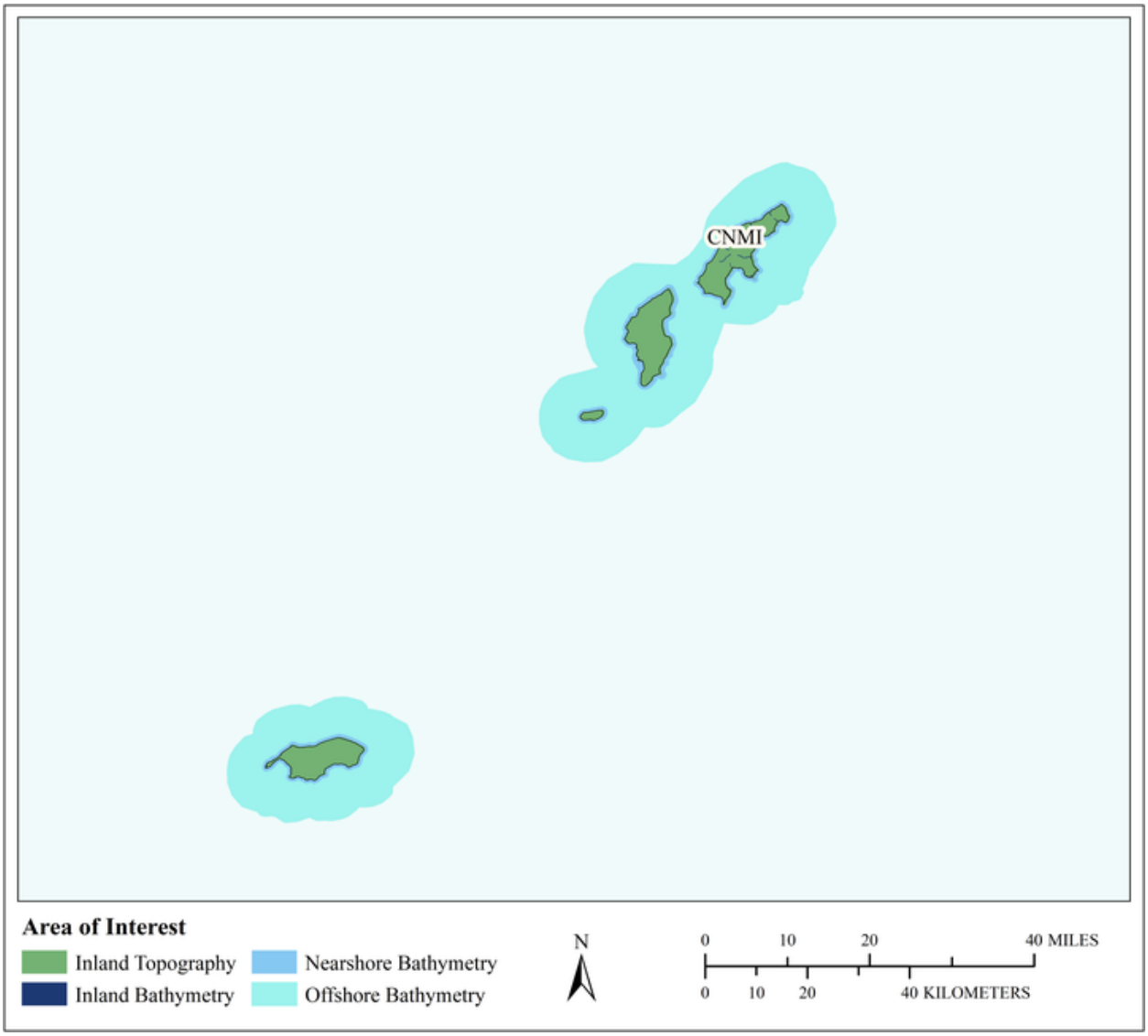
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None		None	None
Improved response or timeliness	None		None	None
Improved customer experience	None		None	None
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None		None	None
Environmental	None		None	None
Public safety, including life and property	None		None	None

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide					Moderate	Unable to provide		Moderate	Unable to provide	
Time savings description	Feature-level 3D mapping would allow field inspections to center on known targets rather than entire lots or plats. Future goal is to create probability model for prehistoric sites, based on known sites, soil types, and elevation. Accurate topographic information will allow for better model. When used to create a probability model, could be used for huge time savings during permitting applications.						Future goal is to create probability model for prehistoric sites, based on known sites, soil types, and elevation. Accurate topographic information will allow for better model. Feature-level 3D mapping would allow field inspections to center on known targets rather than entire lots or plats. When used to create a probability model, could be used for huge time savings during permitting applications.			Feature-level 3D mapping would allow field inspections to center on known targets rather than entire lots or plats. Future goal is to create probability model for prehistoric sites, based on known sites, soil types, and elevation. Accurate topographic information will allow for better model. When used to create a probability model, could be used for huge time savings during permitting applications.		
Cost savings/cost reduction	None						None			None		
Cost avoidance	I don't know	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues	I don't know	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Mission-driven performance improvements description	Accurate feature-level data will contribute to a useful probability model that can be used to more effectively evaluate permits. Better data will allow for more accurate permitting decisions, survey priorities, etc. More effective permit evaluation will allow for improved ability to conduct permit reviews.						Accurate feature-level data will contribute to a useful probability model that can be used to more effectively evaluate permits. Better data will allow for more accurate permitting decisions, survey priorities, etc. More effective permit evaluation will allow for improved ability to conduct permit reviews.			Accurate feature-level data will contribute to a useful probability model that can be used to more effectively evaluate permits. Better data will allow for more accurate permitting decisions, survey priorities, etc. More effective permit evaluation will allow for improved ability to conduct permit reviews.		
Future annual operational benefits added during validation		Annual dollars saved/ realized	$33					Annual dollars saved/ realized	$27		Annual dollars saved/ realized	$4,079
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	None						None			None		
Improved response or timeliness	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness description	More accurate data will contribute to a probability model that can result in faster permitting approval.						More accurate data will contribute to a probability model that can result in faster permitting approval.			More accurate data will contribute to a probability model that can result in faster permitting approval.		
Improved customer experience	None						None			None		
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$29									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None						None			None		
Environmental	None						None			None		
Public safety, including life and property	None						None			None		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes		Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes		Yes	Yes
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes		Yes	Yes
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes		Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Flood Risk Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Flood risk modeling and mapping of riverine and coastal areas. Dam/dike/levee safety analysis. Emergency management. Flood forecasts.
MCA Title	Flood Risk Management
MCA ID	60340
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Northern Mariana Islands
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL2B	Special Order
Update Frequency	4-5 years	4-5 years	4-5 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Required	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable	Required	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Required	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Required	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	Nice to have
Classified point cloud	Required	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Highly desirable
Ground control/ground truthing	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Highly desirable
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Nice to have	Highly desirable
Submerged features			Nice to have	Highly desirable
Subbottom characteristics			Not required	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Not required	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Not required	Nice to have
Water column properties - Biological			Not required	Nice to have
Currents			Nice to have	Highly desirable
Tide/wave heights			Highly desirable	Required
Sea ice conditions			Not required	Nice to have
Habitat distribution and classification			Nice to have	Required
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Not required	Nice to have
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Nice to have
Wetlands	Highly desirable	Highly desirable	Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Required
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Minor	Minor
Cost savings/cost reduction	Major	Minor	Minor	Minor
Cost avoidance	Major	Moderate	Minor	Moderate
Increased revenues	Minor	Minor	None	Minor
Mission-driven performance improvements	Major	Minor	Minor	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Minor	Moderate

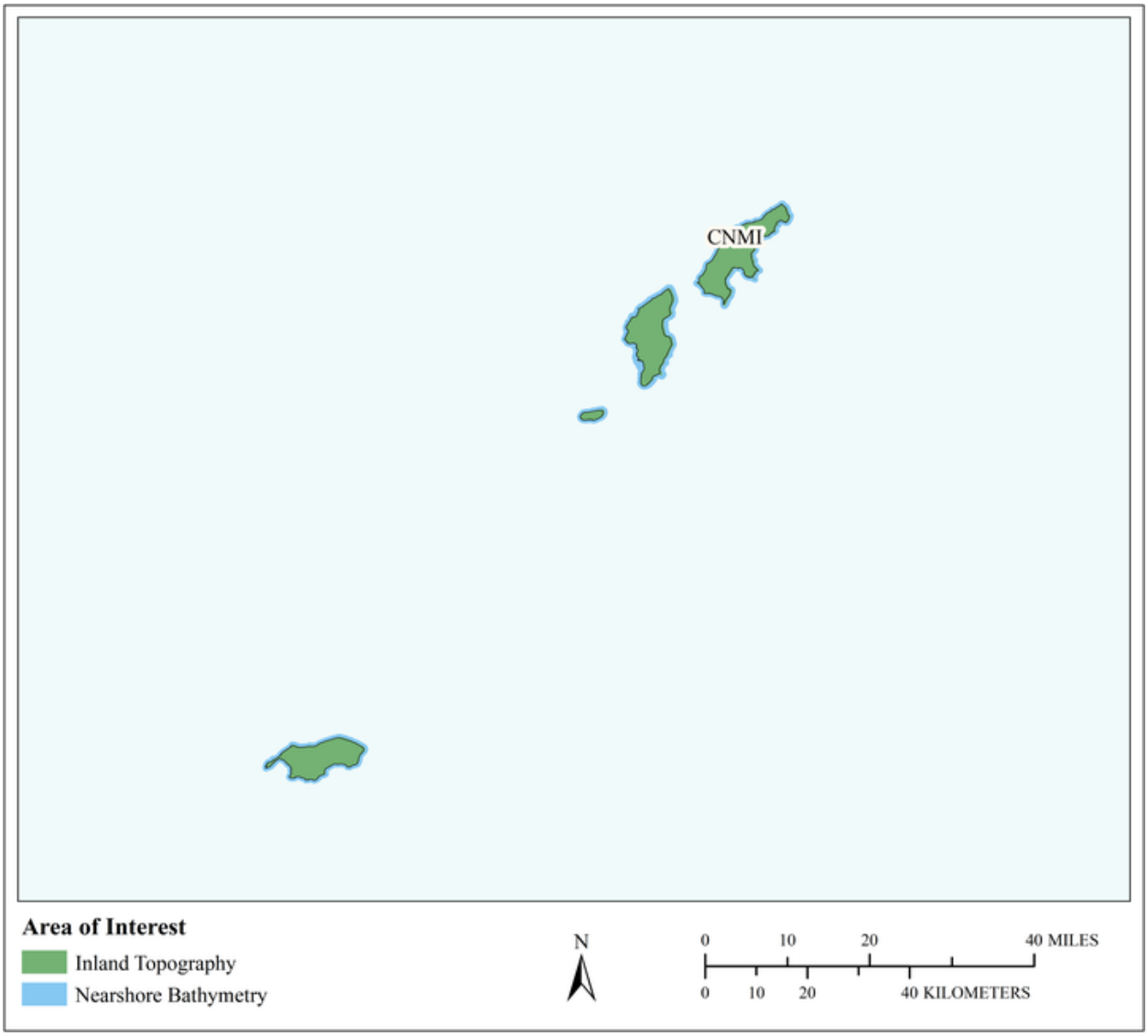
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	Minor	Major
Improved customer experience	Major	Moderate	Minor	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor	Minor	Minor
Environmental	Major	Moderate	Moderate	Moderate
Public safety, including life and property	Major	Moderate	Minor	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		None			Minor	Unable to provide		Moderate	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$25,628		Annual dollars saved/ realized	$1,780		Annual dollars saved/ realized	$1,793			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$4,484		Annual dollars saved/ realized	$1,998		Annual dollars saved/ realized	$1,329			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate			Major			Major		
Environmental	Moderate			Moderate			Moderate			Major		
Public safety, including life and property	Major			Major			Major			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			Yes
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		Yes
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Sea Level Rise and Subsidence



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Modeling and mapping the effects of sea level rise or subsidence. Population and economic vulnerability assessments. Coastal inundation and infrastructure assessment.
MCA Title	Sea Level Rise and Subsidence
MCA ID	60341
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Northern Mariana Islands
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 16 - Sea Level Rise and Subsidence
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD		QL2B	
Update Frequency	4-5 years		2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter		Up to 5 meters	
Acceptable Vertical Error	Up to 20 cm		Up to 40 cm	
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have		Required			Required
Entire AOI under same environmental conditions	Highly desirable		Required			Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Required			Required
DEM for entire AOI needs to be seamless	Required		Required			Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable		Highly desirable	
DTM	Required		Highly desirable	
DEM	Required		Required	
Raw point cloud data	Highly desirable		Nice to have	
Classified point cloud	Required		Highly desirable	
Edited/cube XYZ			Not required	
Full waveform	Not required		Not required	
Bathymetric Attributed Grid (BAG)			Not required	
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable		Highly desirable	
Ground control/ground truthing	Required		Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required		Required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have		Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Required	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Required		Highly desirable	
Land use/land cover	Required		Highly desirable	
Wetlands	Required		Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required		Required	
Bridges/culverts	Required			
Landmark features	Highly desirable		Nice to have	
Cultural resources	Nice to have		Nice to have	
Coastal and riverine structures	Required		Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes		Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Major	
Cost savings/cost reduction	Major		Major	
Cost avoidance	Major		Major	
Increased revenues	None		Minor	
Mission-driven performance improvements	Major		Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		Major	

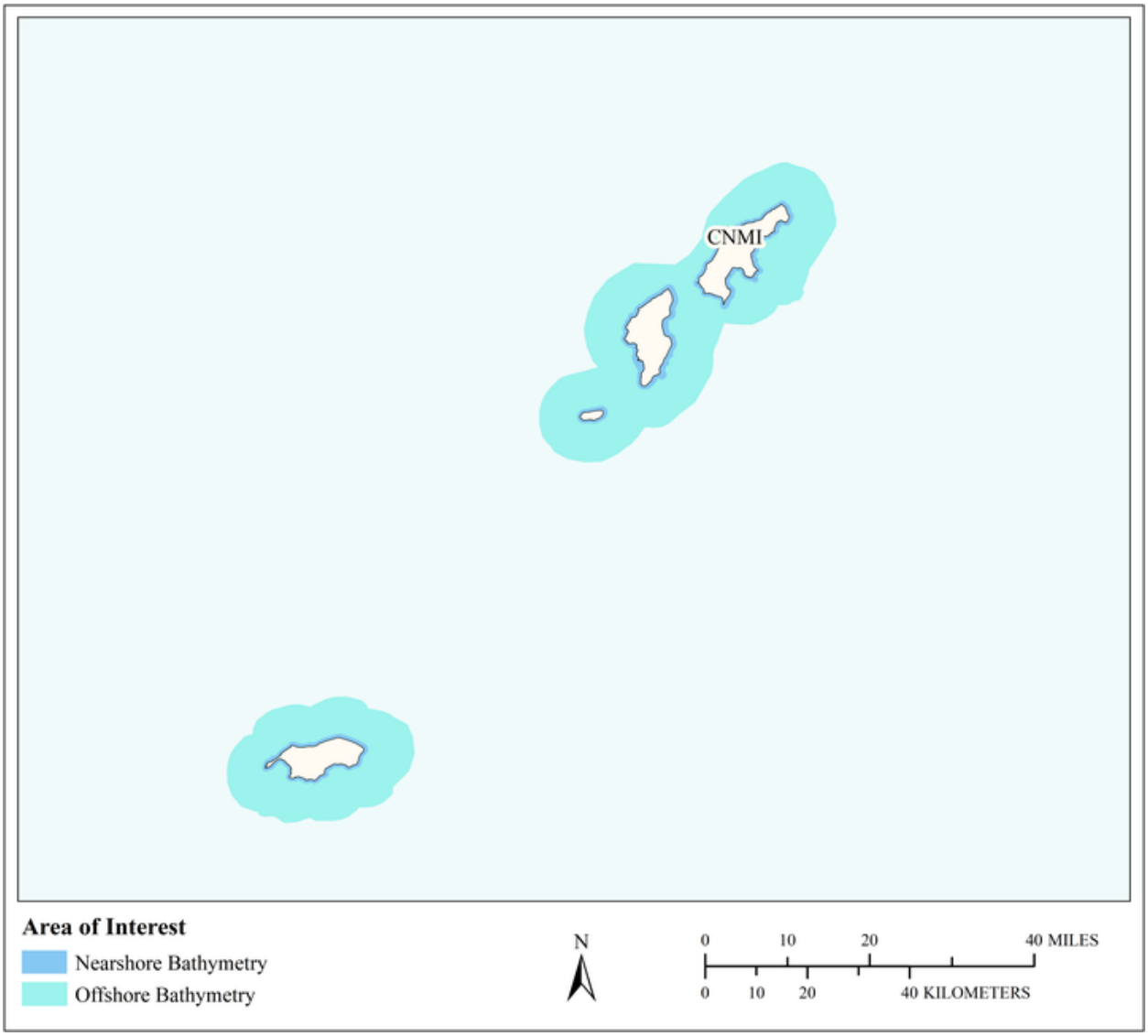
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate		Major	
Improved customer experience	Moderate		Major	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major		Major	
Environmental	Moderate		Major	
Public safety, including life and property	Major		Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide					Major	Unable to provide				
Cost avoidance	Major	Unable to provide					Moderate	Unable to provide				
Increased revenues	Moderate	Unable to provide					Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide					Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$9,609									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide					Major	Unable to provide				
Improved customer experience	Major	Unable to provide					Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate						Major					
Environmental	Moderate						Major					
Public safety, including life and property	Moderate						Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	
Contours	Yes		Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections			Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Marine and Riverine Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type			Required	Required
Geographic Area Requirements			Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Nautical charting. Bathymetric measurements of nearshore submerged coastal topography. Identification of hazards to navigation. Sediment management at coastal navigation projects. Precision marine navigation. Movement of goods and fishing vessels.
MCA Title	Marine and Riverine Navigation and Safety
MCA ID	60342
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Northern Mariana Islands
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order			QL0B	I don't know
Update Frequency			2-3 years	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error			Up to 2 meters	I don't know
Acceptable Vertical Error			Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season			Nice to have	I don't know		Nice to have
Entire AOI under same environmental conditions			Nice to have	I don't know		Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless			Required	I don't know		Highly desirable
DEM for entire AOI needs to be seamless			Required	I don't know		Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM			Required	I don't know
DTM			Required	I don't know
DEM			Required	I don't know
Raw point cloud data			Required	I don't know
Classified point cloud			Nice to have	
Edited/cube XYZ			Highly desirable	I don't know
Full waveform			Not required	I don't know
Bathymetric Attributed Grid (BAG)			Highly desirable	I don't know
Breaklines required for standard hydro-flattening				
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	I don't know
Tide Predictions			Required	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	I don't know
Intensity imagery/sidescan imagery			Highly desirable	I don't know
Ground control/ground truthing			Highly desirable	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	I don't know
Nautical and/or navigation charts			Highly desirable	I don't know
Acoustic imagery of the seafloor			Highly desirable	I don't know
Aerial and/or satellite imagery			Highly desirable	I don't know
Underwater videography			Nice to have	I don't know
Bottom texture			Highly desirable	I don't know
Bottom type			Highly desirable	I don't know
Submerged features			Highly desirable	I don't know
Subbottom characteristics			Nice to have	I don't know
Geologic and seismic data			Nice to have	I don't know
Water column properties - Physical			Nice to have	I don't know
Water column properties - Chemical			Nice to have	I don't know
Water column properties - Biological			Nice to have	I don't know
Currents			Highly desirable	I don't know
Tide/wave heights			Highly desirable	I don't know
Sea ice conditions			Nice to have	I don't know
Habitat distribution and classification			Highly desirable	I don't know
Boundaries			Nice to have	I don't know
Routes			Required	I don't know
Offshore cadastral			Nice to have	I don't know
Lease areas			Nice to have	I don't know
Fixed obstructions			Required	I don't know
Floating observation/navigation systems			Required	I don't know
Shorelines – current, historic, change rates			Required	
Land use/land cover			Nice to have	I don't know
Wetlands			Highly desirable	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	I don't know
Inland surface water features			Highly desirable	
Bridges/culverts				
Landmark features			Nice to have	
Cultural resources			Nice to have	
Coastal and riverine structures			Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings			Minor	I don't know
Cost savings/cost reduction			Minor	I don't know
Cost avoidance			Minor	I don't know
Increased revenues			Minor	I don't know
Mission-driven performance improvements			Minor	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services			Minor	I don't know

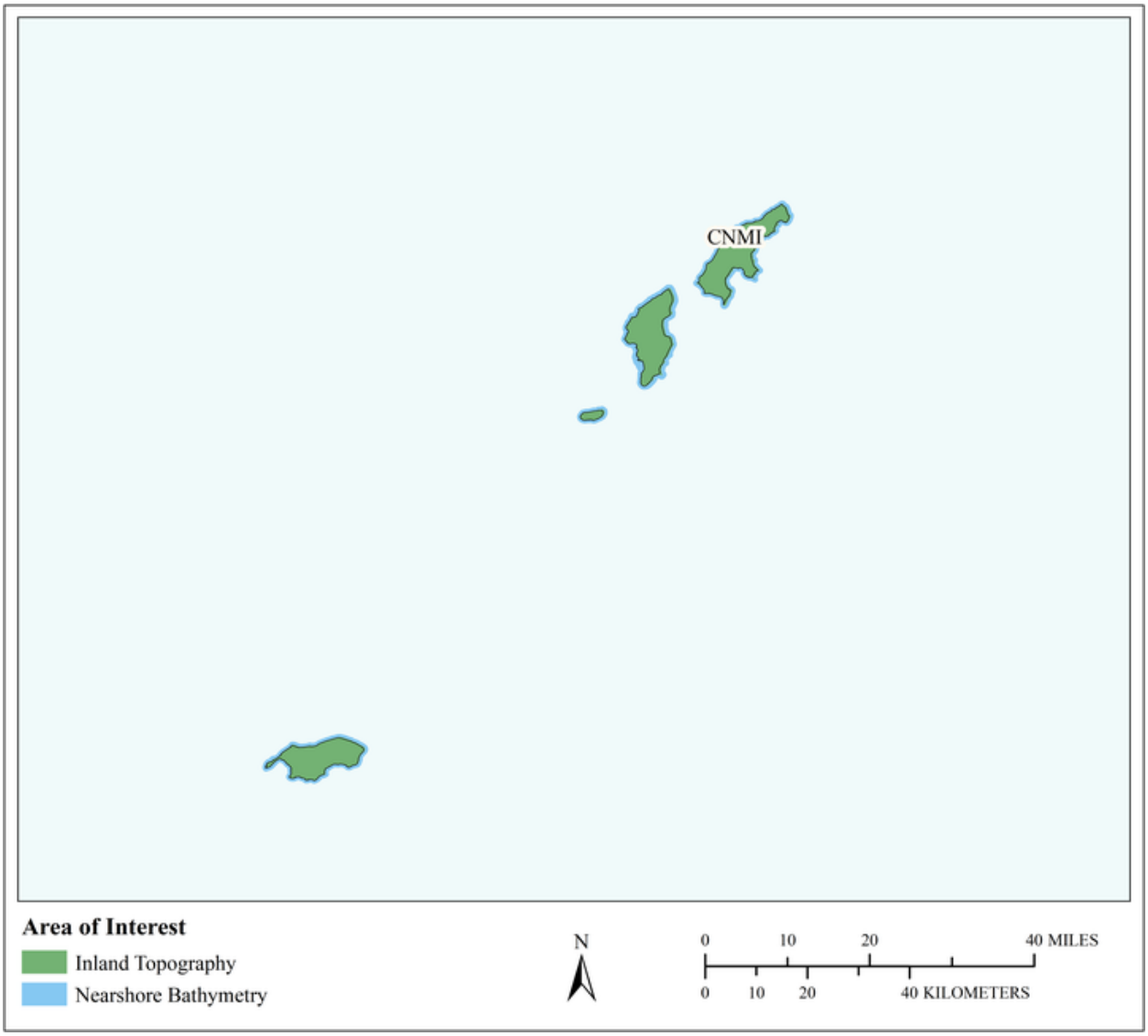
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness			Minor	I don't know
Improved customer experience			Minor	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach			Minor	I don't know
Environmental			Minor	I don't know
Public safety, including life and property			Major	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings							Moderate	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction							Moderate	Unable to provide		I don't know	Unable to provide	
Cost avoidance							Major	Unable to provide		I don't know	Unable to provide	
Increased revenues							Major	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements							Major	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation								Annual dollars saved/ realized	$7,261			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services							Moderate	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness							Major	Unable to provide		I don't know	Unable to provide	
Improved customer experience							Major	Unable to provide		I don't know	Unable to provide	
Future annual customer service benefits added during validation								Annual dollars saved/ realized	$245			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach							Minor			I don't know		
Environmental							Major			I don't know		
Public safety, including life and property							Major			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	
Contours			Yes	Yes
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections			Yes	
Height-Above-Ground maps				Yes
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)			Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				Yes

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Power, Water, and Waste Water Services



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	Custom description		Custom description	
Sub Area Requirements	Saipan, Tinian, and Rota of the Northern Mariana Islands		Saipan, Tinian, and Rota of the Northern Mariana Islands	

MCA Description	Response
Mission Critical Activity	Fate and transport of contaminants. Pollution risk mitigation. Runoff and sedimentation analyses. Point - or non -point source pollution modeling. Management of contaminants and marine debris - point, non- point, vessel, and atmospheric pollution; spills; trash. EXAMPLE of possible contaminants are the fuel, chlorine, transformer storage and transportations.
MCA Title	Power, Water, and Waste Water Services
MCA ID	21757
Organization Type	Regional, County, City, or other local government
Organization Name	Commonwealth Utilities Corporation
Sub-Agency or Division	
Organization Mission	To provide safe and reliable Power, Water, and Waste Water services.
Program Name	AUTOCAD/GIS SYSTEM INVENTORY DATABASE
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 01 - Water Supply and Quality
Tertiary Business Use	BU 23 - Urban and Regional Planning

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Power Poles, outfall pipes

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	I don't know		I don't know	
Update Frequency	Event driven only – Data need to coincide with a specific event.		Event driven only – Data need to coincide with a specific event.	
Event type(s)	Event driven only		Event driven only	
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm		Less than 50 cm	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Vertical Error	Less than 5 cm		Less than 10 cm	
How far onshore needed			>1 kilometer inland	
How far down the beach profile needed	To MHW		To MHW	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable		Nice to have			Nice to have
Entire AOI under same environmental conditions	Highly desirable		Nice to have			Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable		Nice to have			Nice to have
DEM for entire AOI needs to be seamless	Highly desirable		Nice to have			Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have		Nice to have	
DTM	Required		Nice to have	
DEM	Required		Required	
Raw point cloud data	Nice to have		Nice to have	
Classified point cloud	Nice to have		Nice to have	
Edited/cube XYZ			Nice to have	
Full waveform	Nice to have		Nice to have	
Bathymetric Attributed Grid (BAG)			Nice to have	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Highly desirable		Nice to have	
Ground control/ground truthing	Highly desirable		Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required		Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Highly desirable		Highly desirable	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Highly desirable	
Routes			Highly desirable	
Offshore cadastral			Highly desirable	
Lease areas			Highly desirable	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable		Highly desirable	
Land use/land cover	Highly desirable		Required	
Wetlands	Required		Required	
Estuaries			Required	
Inland surface water features	Required		Required	
Bridges/culverts	Required			
Landmark features	Highly desirable		Required	
Cultural resources	Highly desirable		Required	
Coastal and riverine structures	Required		Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	CADD data from Lands and Survey		NOAA nautical charts	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Minor	
Cost savings/cost reduction	Moderate		Minor	
Cost avoidance	Moderate		Minor	

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Increased revenues	Minor		Minor	
Mission-driven performance improvements	Major		Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate		Minor	
Improved response or timeliness	Moderate		Minor	
Improved customer experience	Moderate		Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate		Moderate	
Environmental	Moderate		Moderate	
Public safety, including life and property	Moderate		Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide					Major	Unable to provide				
Cost avoidance	Major	Unable to provide					Major	Unable to provide				
Increased revenues	None						Moderate	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide					Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$5,861					Annual dollars saved/ realized	$83			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide					Major	Unable to provide				
Improved customer experience	Major	Unable to provide					Major	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$17,251					Annual dollars saved/ realized	$11			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate						Moderate					
Environmental	Major						Major					
Public safety, including life and property	Major						Major					
Other												
Other benefits							Major					
Other description							Identify potential waste water lift stations					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	
Contours	Yes		Yes	
Hillshades	Yes		Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes		Yes	
Curvature maps	Yes		Yes	
Cross sections				
Height-Above-Ground maps	Yes		Yes	
Viewshed maps				
Hydrologic Flow Direction Grids	Yes		Yes	
Hydrologic Flow Accumulation Grids	Yes		Yes	
Hydrologic networks (e.g. streams, lakes)	Yes		Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes		Yes	
Building footprints	Yes		Yes	
Breaklines for road edge-of-pavement	Yes		Yes	
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

Ohio

The State of Ohio has been very progressive in the coordination, development, and use of framework spatial data, including lidar-based elevation data. Through the Ohio Statewide Imagery and Elevation Program or OSIP, Ohio was one of the first states to achieve statewide coverage with lidar more than 10 years ago.

Most recently Ohio has begun a three-year effort to update and improve statewide lidar-based elevation data taking advantage of the 3D-Elevation Program (3DEP) and standards for high-resolution Quality Level 1 (QL1) data.

This new lidar effort is led by the Ohio Department of Administrative Services and the Ohio Geographically Referenced Information Program (OGRIP). State funding support and requirements are being provided by multiple agencies, including the Ohio Department of Natural Resources, Ohio Department of Transportation, Ohio Environmental Protection Agency, and Ohio Department of Public Safety. Federal funds through 3DEP are provided by FEMA, NRCS, and USGS.

The first year (2019) of the three-year effort will focus on northern Ohio. This data will help assess the impact and mitigation of multiple runoff issues in the Lake Erie watershed, including non-point source pollution of lakes, rivers, and wetlands.

New QL1 lidar-based elevation data will also support topographic analysis, contouring, preliminary engineering studies and transportation infrastructure planning, archaeological site identification, flood risk mapping, conservation planning, forest and wildlife management, precision farming, coastal zone management issues, geologic hazard assessment, and extraction of planimetric features including landcover, hydrography, buildings, trails, and orphan gas and oil wells. State agency discussions about requirements, while planning for the new lidar effort, resulted in support for higher resolution QL1 data exceeding the current QL2 base level for 3DEP.

City, county, regional, and private sector groups in Ohio have many of the same requirements for elevation data and have been strong supporters and beneficiaries of Ohio lidar efforts.

The City of Columbus, Department of Public Utilities, with additional support from USGS, is obtaining QL0 high-resolution data through 3DEP and OSIP for their entire multi-county service area. This higher resolution and more accurate data for the entire metro area is needed to support infrastructure mapping for their hydraulic models related to stormwater improvements, correct street gutter flow paths, surface flooding and ponding, and pollution loads.

Ohio is also active with the National States Geographic Information Council or NSGIC as one of the nine pilot states in the 3DEP for the Nation Project to develop and share statewide lidar acquisition plans and supporting applications.

Ohio looks forward to having the results of this 3D Nation Elevation Study to help identify new and future requirements for elevation data, including more bathymetric and topobathy data for inland waterbodies and Lake Erie coastal areas. Respondents in general have indicated a need for QL1 HD inland topography, QL1B inland and nearshore bathymetry, and Order 1b offshore bathymetry. All data types should be updated every 4-5 years.

The State of Ohio has identified the following Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

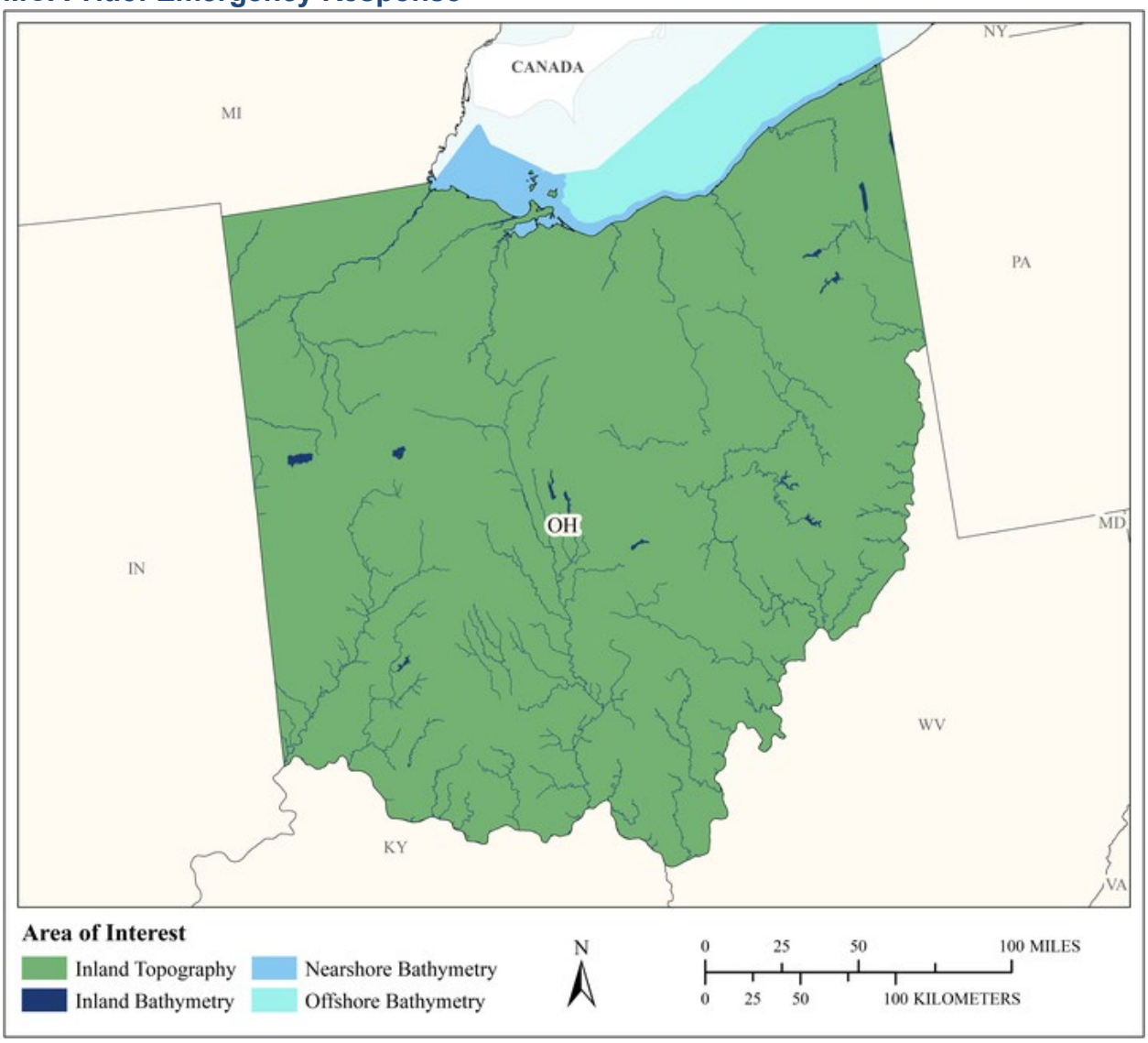
Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	Ohio EPA	1157	Emergency Response	Inland Topo	QL0 HD	4-5 years	Unable to quantify	Unable to quantify	I don't know	Major	Major
				Inland Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Offshore Bathy	Order 1	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 03 – Coastal Zone Management	Ohio Department of Natural Resources	22117	Lake Erie Coastal Zone Management	Inland Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	Minor	Minor	Minor
				Nearshore Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	Minor	Major	Major
				Offshore Bathy	Order 1a	6-10 years	Unable to quantify	Unable to quantify	Minor	Moderate	Minor
BU 07 – Wildlife and Habitat Management	Ohio Department of Natural Resources (ODNR)	1241	Natural Resources Support	Inland Topo	QL1	4-5 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Major
				Inland Bathy	Cross sections and/or transects meet needs	4-5 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Major
				Nearshore Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	Minor	Moderate	Moderate
				Offshore Bathy	Order 1a	4-5 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
BU 08 – Agriculture	Ohio Dept of Agriculture, Division of Soil and Water	22225	Agricultural Conservation	Inland Topo	QL1 HD	2-3 years	Unable to quantify	Unable to quantify	Minor	Moderate	Minor
BU 09 – Fisheries Management and Aquaculture	Ohio DNR Division of Wildlife	32882	Lake Erie Fisheries Management	Nearshore Bathy	QL1B	>10 years	Unable to quantify	Unable to quantify	Minor	None	None
				Offshore Bathy	Order 2	>10 years	Unable to quantify	Unable to quantify	Minor	None	None
BU 10 – Geologic Assessment	Ohio Department of Natural Resources, Division of Geological Survey	1448	Geologic Mapping	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Minor	Moderate	Moderate
				Nearshore Bathy	QL0B	6-10 years	Unable to quantify	Unable to quantify	Moderate	Minor	Moderate
BU 11 – Geologic Resource Extraction	Ohio Department of Natural Resources	1441	Mine Permitting and Mine Environmental Remediation	Inland Topo	QL0	2-3 years	Unable to quantify	Unable to quantify	Minor	Major	Major

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 12 – Renewable Energy Resources	State of Ohio	60343	Renewable Energy Resources	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	None
				Nearshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Offshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 13 – Oil and Gas Resources	Ohio Department of Natural Resources-Office of Information Technology	1300	Oil and Gas Regulatory Management	Inland Topo	QL0	Annually	Unable to quantify	Unable to quantify	None	Major	Major
BU 14 – Cultural Resource Management	State of Ohio	60344	Cultural Resources Preservation and Management	Inland Topo	QL1	4-5 years	$7,562	$6,611	Minor	Minor	Minor
				Inland Bathy	QL0B	6-10 years	$18,134	Unable to quantify	Moderate	Minor	Minor
				Nearshore Bathy	QL0B	4-5 years	$2,563	Unable to quantify	Minor	Moderate	Minor
				Offshore Bathy	Order 1a	6-10 years	$6,343	Unable to quantify	Minor	Moderate	Minor
BU 15 – Flood Risk Management	Muskingum Watershed Conservancy District	1230	Flood Reduction and Conservation	Inland Topo	QL2	4-5 years	$111,908	$22,914	None	Moderate	Major
				Inland Bathy	QL1B	6-10 years	$57,723	$13,266	Minor	Major	Major
BU 15 – Flood Risk Management	Ohio Department of Natural Resources	1297	Dam Break Modeling and Inundation Mapping	Inland Topo	QL1	4-5 years	$22,281	Unable to quantify	Minor	None	Moderate
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	Moderate
				Nearshore Bathy	QL4B	>10 years	Unable to quantify	Unable to quantify	I don't know	None	I don't know
BU 15 – Flood Risk Management	Ohio Department of Administrative Services	21568	State of Ohio GIS Support	Inland Topo	QL2	Event driven	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
BU 16 – Sea Level Rise and Subsidence	State of Ohio	60345	Sea Level Rise and Subsidence	Inland Topo	QL1 HD	4-5 years	$2,172,064	Unable to quantify	Moderate	Moderate	Moderate
				Nearshore Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Minor
				Offshore Bathy	Order 2	6-10 years	Unable to quantify	Unable to quantify	Major	Major	Moderate

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 18 – Homeland Security	Ohio Emergency Management Agency	21605	Statewide Emergency Management and Response	Inland Topo	QL1	4-5 years	$2,532	Unable to quantify	I don't know	I don't know	Moderate
				Inland Bathy	QL4B	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	Coarser bathymetric data satisfies my needs	4-5 years	Unable to quantify	Unable to quantify	None	None	Minor
				Offshore Bathy	Coarser bathymetric data satisfies my needs	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	Minor
BU 20 – Marine and Riverine Navigation	State of Ohio	60346	Marine and Riverine Navigation and Safety	Inland Bathy	QL0B	2-3 years	$752,558	$99,045	Moderate	Moderate	Moderate
				Nearshore Bathy	QL0B	2-3 years	$686,633	$23,247	Minor	Major	Major
				Offshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 21 – Aviation Navigation	State of Ohio	60347	Aviation Navigation and Safety	Inland Topo	QL1 HD	Annually	$139,470	$173,705	Minor	Moderate	Moderate
BU 22 – Infrastructure Management	Ohio Department of Transportation	1277	Transportation Infrastructure Planning, Design, and Maintenance	Inland Topo	QL0	Event driven	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Inland Bathy	Cross sections and/or transects meet needs	Event driven	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	QL1B	Event driven	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 30 – Maritime and Land Boundary Management	State of Ohio	60348	Maritime and Land Boundary Management	Inland Topo	QL1	6-10 years	$46,424	$177,995	Moderate	Minor	None
				Inland Bathy	QL2B	6-10 years	$34,840	Unable to quantify	Major	Major	Moderate
				Nearshore Bathy	QL0B	2-3 years	$205,754	Unable to quantify	Moderate	Major	Moderate
				Offshore Bathy	I don't know	2-3 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate

MCA Title: Emergency Response



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Emergency Response, also sediment migration, offshore disposal sites
MCA Title	Emergency Response
MCA ID	1157
Organization Type	State or U.S. Territorial government
Organization Name	Ohio EPA
Sub-Agency or Division	
Organization Mission	Environmental Protection
Program Name	Emergency Response and Hazard Remediation
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 02 - Riverine Ecosystem Management
Tertiary Business Use	BU 07 - Wildlife and Habitat Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Lowhead dams on small streams.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL2B	QL2B	Order 1
Update Frequency	4-5 years	2-3 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 30 cm	Up to 5 meters	Up to 5 meters	Up to 1 meter
Acceptable Vertical Error	Up to 10 cm	Up to 20 cm	Up to 40 cm	Less than 1 meter
How far onshore needed			To cover the coastal wetlands	
How far down the beach profile needed	To MLLW		To MLLW	
Tide correction requirement			MHW	MHW
Cross sections and/or transects meet needs		Partial		
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Required	Required	Required	Required	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Required	Required	Required
DTM	Required	Required	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	Nice to have
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Highly desirable	Nice to have
Full waveform		Not required	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Nice to have	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Not required
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	Nice to have
Ground control/ground truthing	Required	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Nice to have	Required
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Required	Highly desirable	Highly desirable
Underwater videography			Nice to have	Nice to have
Bottom texture			Nice to have	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Highly desirable	Highly desirable	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Nice to have	Nice to have
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Not required	Not required
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Required	Required	Highly desirable	Not required
Wetlands	Required	Required	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Nice to have	
Cultural resources	Highly desirable	Highly desirable	Nice to have	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	LiDAR data and DEM Derived from the Ohio Statewide Imagery Project http://www.ogrip.oit.ohio.gov/ProjectsInitiatives/StatewideImagery.aspx	Ohio Department of Natural Resources bathymetric data for inland lakes and reservoirs.	Ohio Department of Natural Resources bathymetric data for inland lakes and reservoirs	Best available from NOAA
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				Yes
NCEI				Yes
Open Topography				
NOAA nautical charts				Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes	Yes	
State repositories used	Ohio Statewide Imagery project http://www.ogrip.oit.ohio.gov/ProjectsInitiatives/StatewideImagery.aspx	Ohio Department of Natural Resources	Ohio Department of Natural Resources	
Data that meet my needs are not available				

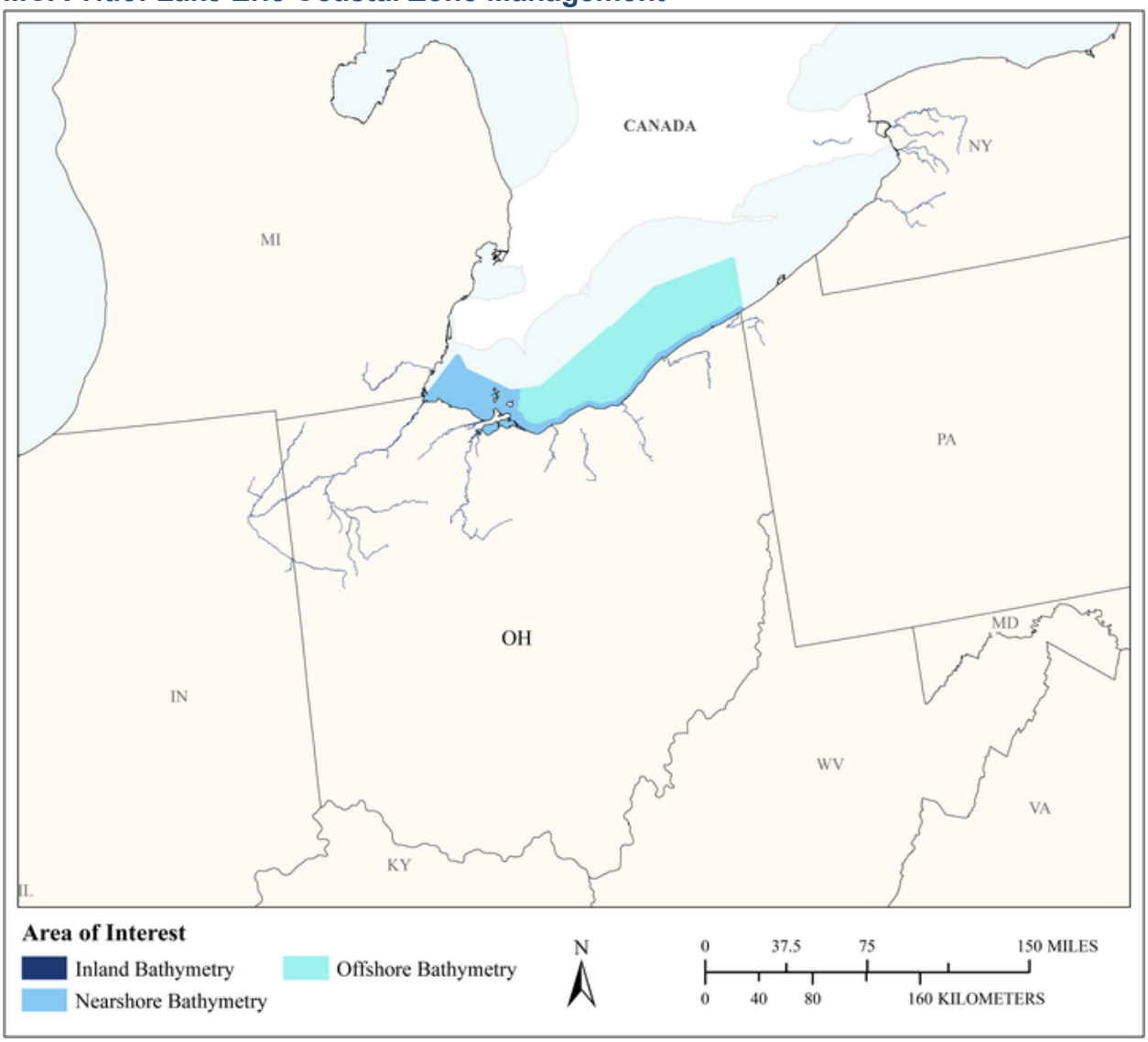
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Moderate	Moderate
Cost savings/cost reduction	Major	Moderate	Moderate	Moderate
Cost avoidance	Major	Moderate	Moderate	Moderate
Increased revenues	None	None	Moderate	None
Mission-driven performance improvements	Major	Moderate	Moderate	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Moderate	Minor
Improved response or timeliness	Major	Moderate	Moderate	Minor
Improved customer experience	Major	Moderate	Moderate	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Moderate	Minor
Environmental	Major	Moderate	Moderate	Minor
Public safety, including life and property	Major	Moderate	Moderate	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	I don't know	Unable to provide		Major	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Cost avoidance	I don't know	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	I don't know	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience	I don't know	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know			I don't know			I don't know		
Environmental	Major			I don't know			I don't know			I don't know		
Public safety, including life and property	Major			I don't know			I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes			Yes
Aspect maps	Yes			
Curvature maps		Yes	Yes	Yes
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Lake Erie Coastal Zone Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type		Required	Required	Required
Geographic Area Requirements		One or more Hydrologic Units (HUC4s)	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Coastal Zone Management including Coastal Hazard Mitigation, Protection and Management of State Lake Erie Public Trust Lands, Coastal Resilience and Adaptation Planning, Beneficial Use and Management of Dredge Material, and Sustainable Economic Development. Natural Resources Conservation including the Protection, Enhancement, and Restoration of Coastal Wetland and Nearshore Habitats, Fisheries, Wildlife, and Waterfowl.
MCA Title	Lake Erie Coastal Zone Management
MCA ID	22117
Organization Type	State or U.S. Territorial government
Organization Name	Ohio Department of Natural Resources
Sub-Agency or Division	Office of Coastal Management
Organization Mission	To protect and manage the natural resources of the State of Ohio for the benefit of the people of the State of Ohio.
Program Name	Ohio Coastal Management Program
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 06 - Natural Resources Conservation
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Not required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Individual shore protection (erosion control) structures, docks, piers, narrow beaches (width, lateral extent), small tributary mouths, storm water outfalls

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required

Inland Bathy Feature Size Requirements	Response
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order		QL0B	QL0B	Order 1a
Update Frequency		4-5 years	4-5 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error		The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need
Acceptable Vertical Error		Up to 20 cm	Up to 20 cm	Less than 1 meter
How far onshore needed			500 meters inland	
How far down the beach profile needed			Below MLLW	
Tide correction requirement			IGLD 1985 (no tides in Great Lakes)	IGLD 1985 (no tides in Great Lakes)
Cross sections and/or transects meet needs			Partial	
Cross section/transect requirement			We currently measure and map coastal recession at 30 m spaced digital transects along the entire Ohio Lake Erie shoreline. Would request that 3D digital transects align with historical 30 m-spaced digital transects. Minimum vertical accuracy 20 cm. Prefer <10 cm vertical accuracy if possible.	

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season		Nice to have	Required	Highly desirable		Highly desirable
Entire AOI under same environmental conditions		Nice to have	Highly desirable	Nice to have		Nice to have
Other						Required
Other description						Synoptic seamless nearshore, beach, coastal upland bathy-topo data
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless		Highly desirable	Highly desirable	Highly desirable		Highly desirable
DEM for entire AOI needs to be seamless		Highly desirable	Required	Required		Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM		Nice to have	Highly desirable	Highly desirable
DTM		Nice to have	Highly desirable	Highly desirable
DEM		Highly desirable	Required	Required

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Raw point cloud data		Highly desirable	Nice to have	Highly desirable
Classified point cloud		Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Highly desirable	Highly desirable
Full waveform		Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening		Highly desirable		
Additional breaklines for hydro-enforcement of culverts				
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Not required
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery		Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing		Nice to have	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Nice to have	Nice to have
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery		Highly desirable	Highly desirable	Not required
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data		Not required	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Nice to have	Nice to have
Tide/wave heights			Not required	Not required
Sea ice conditions			Not required	Nice to have
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Not required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Routes			Not required	Nice to have
Offshore cadastral			Not required	Not required
Lease areas			Not required	Nice to have
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates		Required	Required	
Land use/land cover		Nice to have	Highly desirable	Not required
Wetlands		Highly desirable	Required	Not required
Estuaries			Required	Not required
Inland surface water features		Highly desirable	Nice to have	
Bridges/culverts		Not required		
Landmark features		Nice to have	Highly desirable	
Cultural resources		Nice to have	Nice to have	
Coastal and riverine structures		Required	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used		Historic maps and charts. Multiple dates with varying quality depending on location. Have collected bathymetric data (1 m horizontal / 20 cm vertical) at selected sites. Have collected high resolution sidescan sonar data in the Maumee and Sandusky Rivers. Kleinmarine System 3000 dual frequency (100 kHz, 500 kHz) for fish habitat surveys.	NOAA digital navigation charts, NOAA 1 meter Great Lakes bathymetry, Have high-resolution bathymetric surveys on a property-by-property basis as required for permit review and analyses of proposed shore protection (erosion control) structures at many locations along the Ohio Lake Erie coastline.	NOAA digital nautical charts, NOAA 1 meter bathymetry.

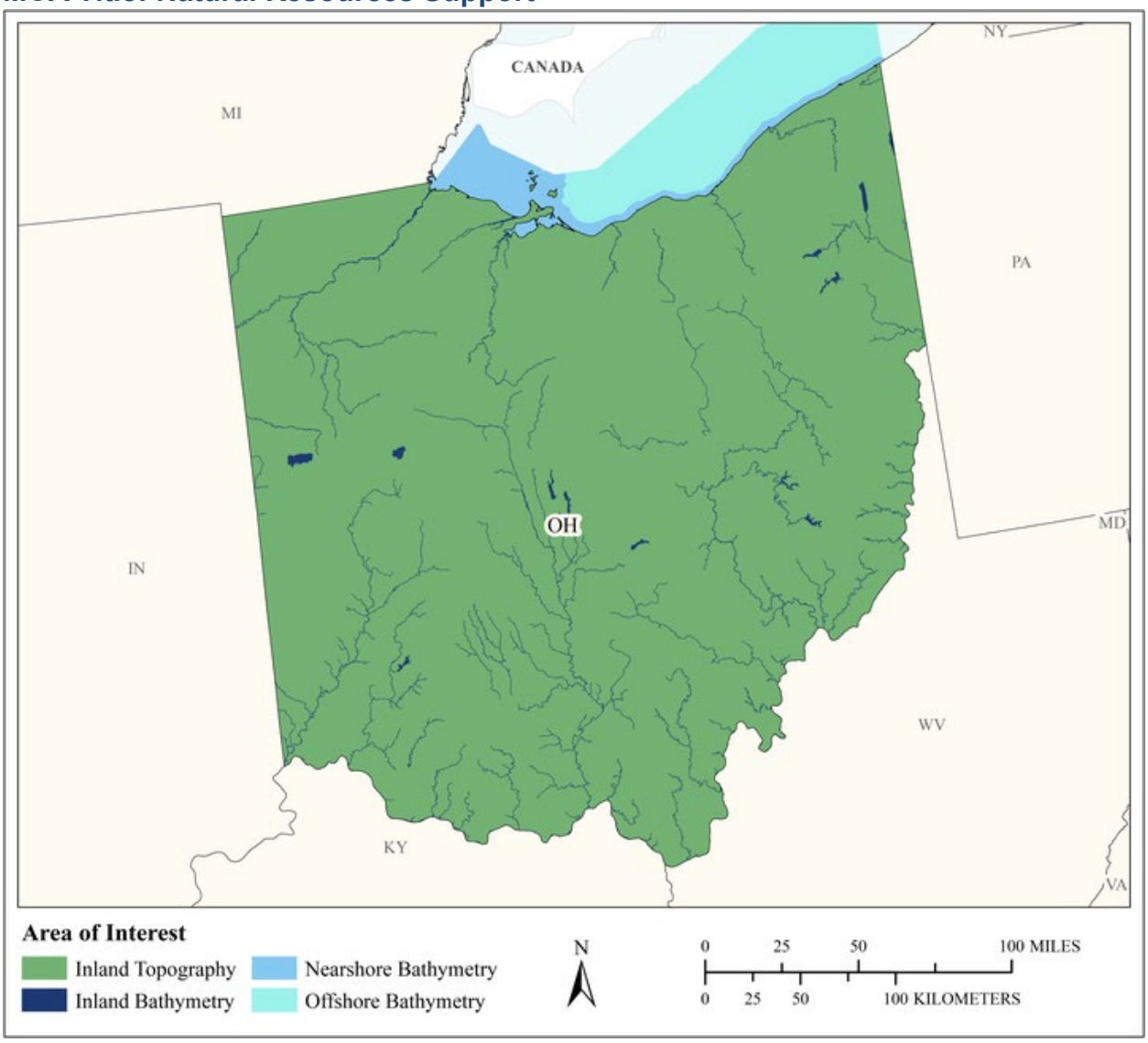
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast		Yes	Yes	Yes
NCEI				
Open Topography				
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts		Yes	Yes	
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other		Yes	Yes	
Other description		Historic maps and charts held by the Ohio Division of Geological Survey originally copied from the Library of Congress	Property-by-property surveys, Historic maps and charts held by Ohio Division of Geological Survey.	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings		Minor	None	None
Cost savings/cost reduction		None	None	None
Cost avoidance		None	None	None
Increased revenues		None	None	None
Mission-driven performance improvements		Moderate	None	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services		Minor	Minor	Minor
Improved response or timeliness		Minor	Moderate	Minor
Improved customer experience		I don't know	Major	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach		Minor	Minor	Minor
Environmental		Moderate	Major	Moderate
Public safety, including life and property		I don't know	Major	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings				I don't know	Unable to provide		Moderate	Unable to provide		None		
Cost savings/cost reduction				Minor	Unable to provide		None			None		
Cost avoidance				Moderate	Unable to provide		Major	Unable to provide		None		
Increased revenues				None			I don't know	Unable to provide		Moderate	Unable to provide	
Increased revenues description										Offshore Habitat Assessment.		
Mission-driven performance improvements				Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Mission-driven performance improvements description							Sand Resource Management.			Managing State Public Trust Lands.		
Other operational benefits				Minor	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Other operational benefits description												
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services				Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Value added to products or services description							Sand Resource Management.					
Improved response or timeliness				Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience				Minor	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Other customer service benefits				Minor	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Other customer service benefits description												
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach				Minor			Minor			Minor		
Environmental				Minor			Major			Moderate		
Public safety, including life and property				Minor			Major			Minor		
Other							Identification of cultural artifacts, shipwrecks					
Other benefits				Minor			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes	Yes	Yes
Contours		Yes	Yes	Yes
Hillshades			Yes	
Slope maps			Yes	Yes
Aspect maps				
Curvature maps				
Cross sections		Yes	Yes	Yes
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness			Yes	Yes
Other (please specify)			Yes	
Other description	Shoreline Structures			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Natural Resources Support



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Oil and Gas Permitting, well emergency response, Geologic Hazard mapping, watershed modeling, mine hazard mitigation, timber harvesting/health, coastal erosion, flood modeling, dam safety, geologic formation mapping, habitat delineation, park recreation, fisheries management.
MCA Title	Natural Resources Support
MCA ID	1241
Organization Type	State or U.S. Territorial government
Organization Name	Ohio Department of Natural Resources (ODNR)
Sub-Agency or Division	
Organization Mission	ODNR will ensure the balance between the wise use and protection of our natural resources for the benefit of all.
Program Name	We have multiple programs within DNR that are mission critical. The 3 listed above are within the following programs: BU07: Division of Wildlife BU10: Division of Geological Survey BU13: Division of Oil and Gas - Emergency Response
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Tertiary Business Use	BU 13 - Oil and Gas Resources

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	200,000 sq mi - 2 million sq mi (e.g. large state, large multi-state region such as the Great Basin, standard Federal region, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Small mine shaft openings, small karst depressions and voids, submerged trees/rocks.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required

Inland Bathy Feature Size Requirements	Response
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	Cross sections and/or transects meet needs	QL0B	Order 1a
Update Frequency	4-5 years	4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	Less than 50 cm	Less than 50 cm
Acceptable Vertical Error	Up to 20 cm	Up to 20 cm	Up to 20 cm	Less than 1 meter
How far onshore needed			To cover the beach slope	
How far down the beach profile needed	To MLLW		To MLLW	
Tide correction requirement			I don't know	MLLW
Cross sections and/or transects meet needs	Partial	Yes	Partial	Partial
Cross section/transect requirement	QL1	About 1 ft of vertical accuracy error is acceptable for inland bathymetric data.	1 ft	I'd defer to Dr. Scudder Mackey's response for this question.

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Highly desirable
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have	Required	Highly desirable	Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Nice to have	Highly desirable	Highly desirable	Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Nice to have	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	Up to double the required TVU at the 95% confidence level	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Required	Required
DTM	Required	Required	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Required	Required	Required	Highly desirable
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Highly desirable	Highly desirable
Full waveform	Highly desirable	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Nice to have	Highly desirable
Ground control/ground truthing	Nice to have	Highly desirable	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	Highly desirable
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Required
Underwater videography			Not required	Nice to have
Bottom texture			Nice to have	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Required
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Nice to have	Highly desirable	Nice to have	Highly desirable
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Nice to have	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Highly desirable	Nice to have
Routes			Highly desirable	Highly desirable
Offshore cadastral			Highly desirable	Nice to have
Lease areas			Nice to have	Highly desirable
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Required	Highly desirable
Wetlands	Highly desirable	Highly desirable	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Highly desirable
Inland surface water features	Highly desirable	Required	Required	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Nice to have	Highly desirable	
Cultural resources	Not required	Not required	Nice to have	
Coastal and riverine structures	Nice to have	Highly desirable	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Ohio statewide imagery and LiDAR from 2006 OSIP project. Lower quality than QL2.	Ohio DNR's Wildlife staff ran transects of sonar. Data was interpolated and used for various mapping purposes. I cannot attest to the quality level. Navigation charts are available for larger rivers.	Unknown QL	Unknown QL. Environment Canada 1m bathy, sidescan or multibeam also used and needed
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI			Yes	
Open Topography				
NOAA nautical charts				Yes
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	Ohio OGRIP	Ohio DNR, Division of Wildlife.		

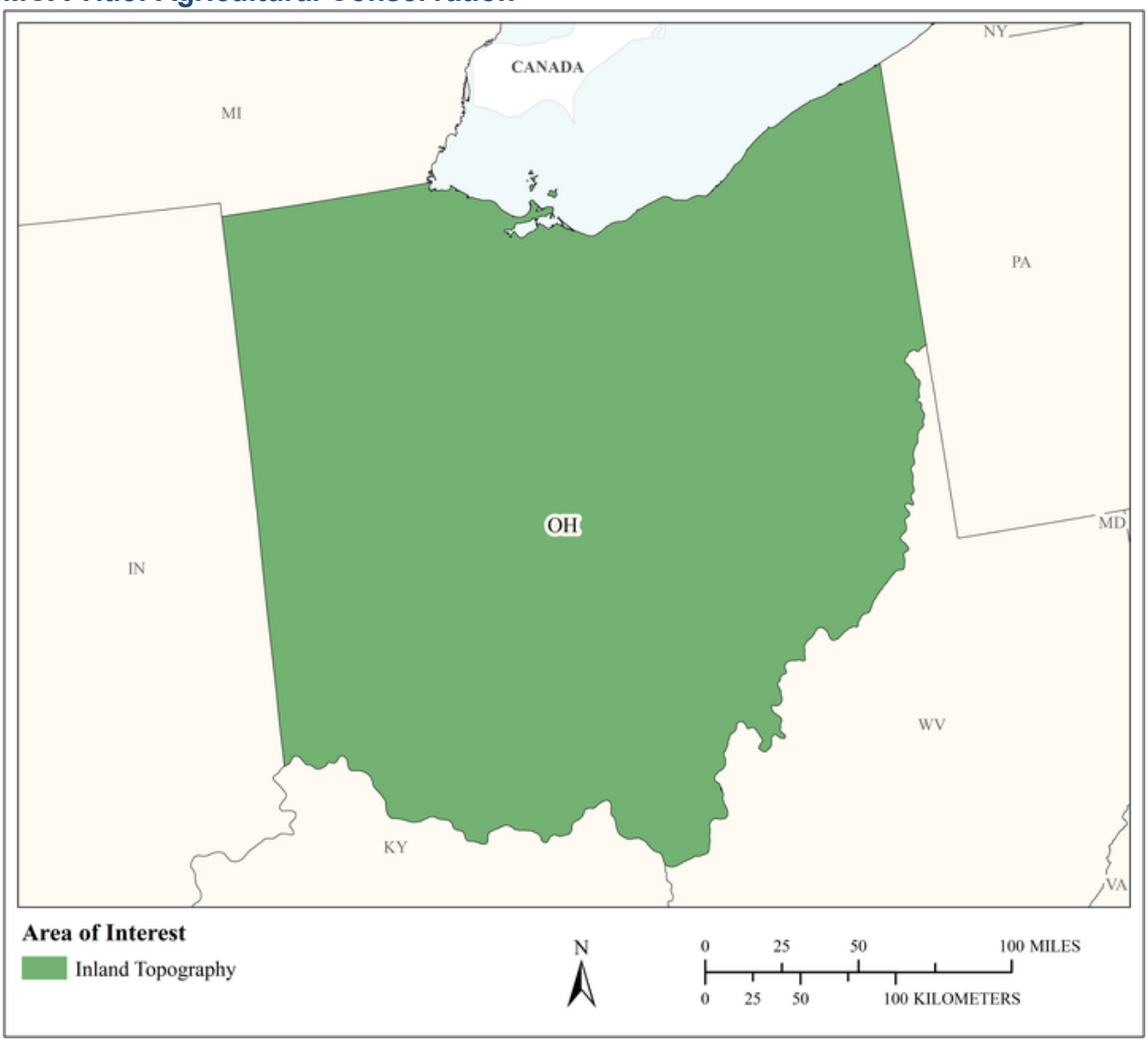
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other				Yes
Other description				Some data are in a state repository...some NOAA, Also Environment Canada 1m bathy, Sidescan or multibeam also used
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Moderate	Moderate
Cost savings/cost reduction	Moderate	I don't know	Moderate	Major
Cost avoidance	Moderate	Minor	Moderate	Major
Increased revenues	Minor	I don't know	I don't know	None
Mission-driven performance improvements	Moderate	Moderate	Moderate	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Major	Moderate	Moderate
Improved response or timeliness	Moderate	I don't know	Moderate	Minor
Improved customer experience	Moderate	Major	Minor	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	I don't know	Minor	Minor
Environmental	Minor	Moderate	Moderate	Major
Public safety, including life and property	Minor	Moderate	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	I don't know	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Increased revenues	Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Minor			Moderate		
Environmental	Moderate			Moderate			Moderate			Major		
Public safety, including life and property	Major			Major			Moderate			Major		
Other												
Other benefits							Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes	Yes	Yes	Yes
Curvature maps				
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps	Yes	Yes	Yes	Yes
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Agricultural Conservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Runoff, and sedimentation analyses, Non-point source pollution, precision agriculture, conservation engineering, Farm pond design. Irrigation system design. Detailed site analysis to support precision farming. Analysis of farm sedimentation and runoff. Calibration of fertilizer application, fertilizer management,
MCA Title	Agricultural Conservation
MCA ID	22225
Organization Type	State or U.S. Territorial government
Organization Name	Ohio Dept of Agriculture, Division of Soil and Water
Sub-Agency or Division	
Organization Mission	The agency fulfills several important roles for Ohioans including supporting agriculture, protecting consumers, safeguarding plants and animals, and conserving natural resources.
Program Name	The Division of Soil and Water Conservation (DSWC) provides leadership and services that enable Ohioans to conserve, protect, and enhance soil, water, and land resources.
Total Annual Program Budget	
Primary Business Use	BU 08 - Agriculture and Precision Farming
Secondary Business Use	BU 01 - Water Supply and Quality
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	1-meter size

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Vertical Error	Less than 5 cm			
How far onshore needed				
How far down the beach profile needed	To MHW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Nice to have			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Highly desirable			
Landmark features	Not required			
Cultural resources	Not required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL3 2006			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Ohio Geographically Referenced Information Program (OGRIP)			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor			
Cost savings/cost reduction	Minor			
Cost avoidance	Minor			
Increased revenues	None			
Mission-driven performance improvements	Moderate			

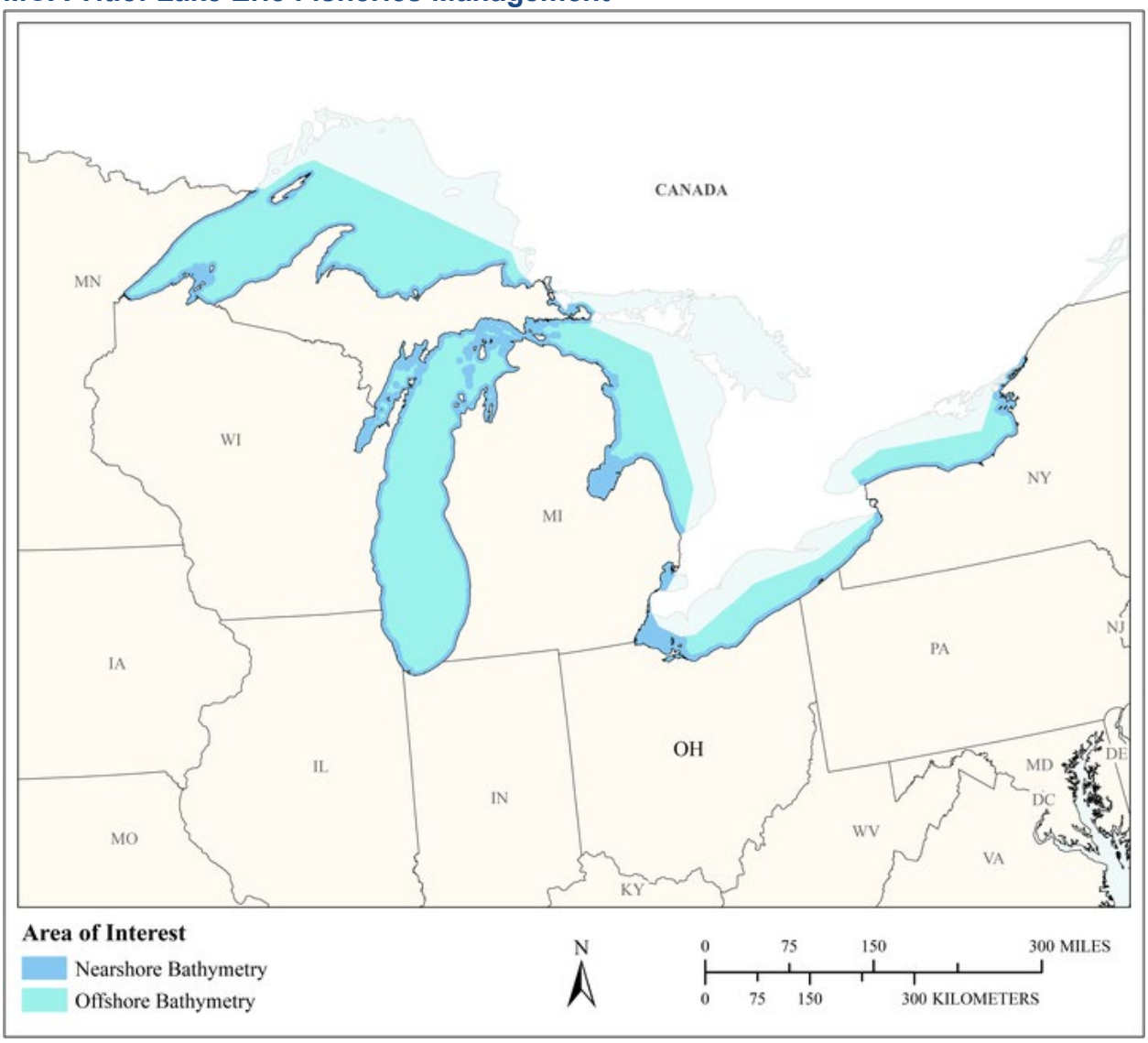
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Minor			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Time savings description	Field visits and surveys avoided.											
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Minor	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Minor	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	None											
Improved customer experience	Minor	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Moderate											
Public safety, including life and property	Minor											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Lake Erie Fisheries Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type			Required	Required
Geographic Area Requirements			Custom description	Custom description
Sub Area Requirements			Great Lakes	Great Lakes

MCA Description	Response
Mission Critical Activity	Managing Lake Erie's fisheries resources for the benefit of all Ohio's residents and tourists.
MCA Title	Lake Erie Fisheries Management
MCA ID	32882
Organization Type	State or U.S. Territorial government
Organization Name	Ohio DNR Division of Wildlife
Sub-Agency or Division	
Organization Mission	To conserve and improve fish and wildlife resources and their habitats for sustainable use and appreciation by all.
Program Name	ODNR-Division of Wildlife, Fish Management and Research
Total Annual Program Budget	
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	BU 27 - Recreation
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Nice to have
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Underwater reefs or other habitat features critical for fish life stages.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order			QL1B	Order 2
Update Frequency			>10 years	>10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error			Up to 2 meters	Less than 50 cm
Acceptable Vertical Error			Up to 50 cm	Up to 2 meters
How far onshore needed			To cover the beach slope	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed			To MHW	
Tide correction requirement			No requirement for tide correction	No requirement for tide correction
Cross sections and/or transects meet needs			Partial	Partial
Cross section/transect requirement			As many transects as resources allow.	As many as feasible.

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season			Nice to have	Nice to have		Nice to have
Entire AOI under same environmental conditions			Highly desirable	Highly desirable		Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless			Highly desirable	Nice to have		Nice to have
DEM for entire AOI needs to be seamless			Highly desirable	Nice to have		Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness			I don't know	I don't know		I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM			Highly desirable	Highly desirable
DTM			Highly desirable	Nice to have
DEM			Highly desirable	Highly desirable
Raw point cloud data			Highly desirable	Nice to have
Classified point cloud			Highly desirable	
Edited/cube XYZ			Nice to have	Not required
Full waveform			Nice to have	Not required
Bathymetric Attributed Grid (BAG)			Nice to have	Not required
Breaklines required for standard hydro-flattening				
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Not required
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery			Highly desirable	Highly desirable
Ground control/ground truthing			Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	Highly desirable
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery			Highly desirable	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Not required	Not required
Geologic and seismic data			Not required	Not required
Water column properties - Physical			Highly desirable	Nice to have
Water column properties - Chemical			Highly desirable	Nice to have
Water column properties - Biological			Highly desirable	Nice to have
Currents			Nice to have	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Nice to have	Not required
Habitat distribution and classification			Highly desirable	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Not required	Not required
Lease areas			Not required	Not required
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates			Highly desirable	
Land use/land cover			Nice to have	Nice to have
Wetlands			Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Nice to have
Inland surface water features			Highly desirable	
Bridges/culverts				
Landmark features			Not required	
Cultural resources			Not required	
Coastal and riverine structures			Nice to have	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used			NOAA charts, low water datum	NOAA low water datum, Great Lakes
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings			None	Minor
Cost savings/cost reduction			None	Minor
Cost avoidance			None	Minor
Increased revenues			None	None
Mission-driven performance improvements			None	Minor

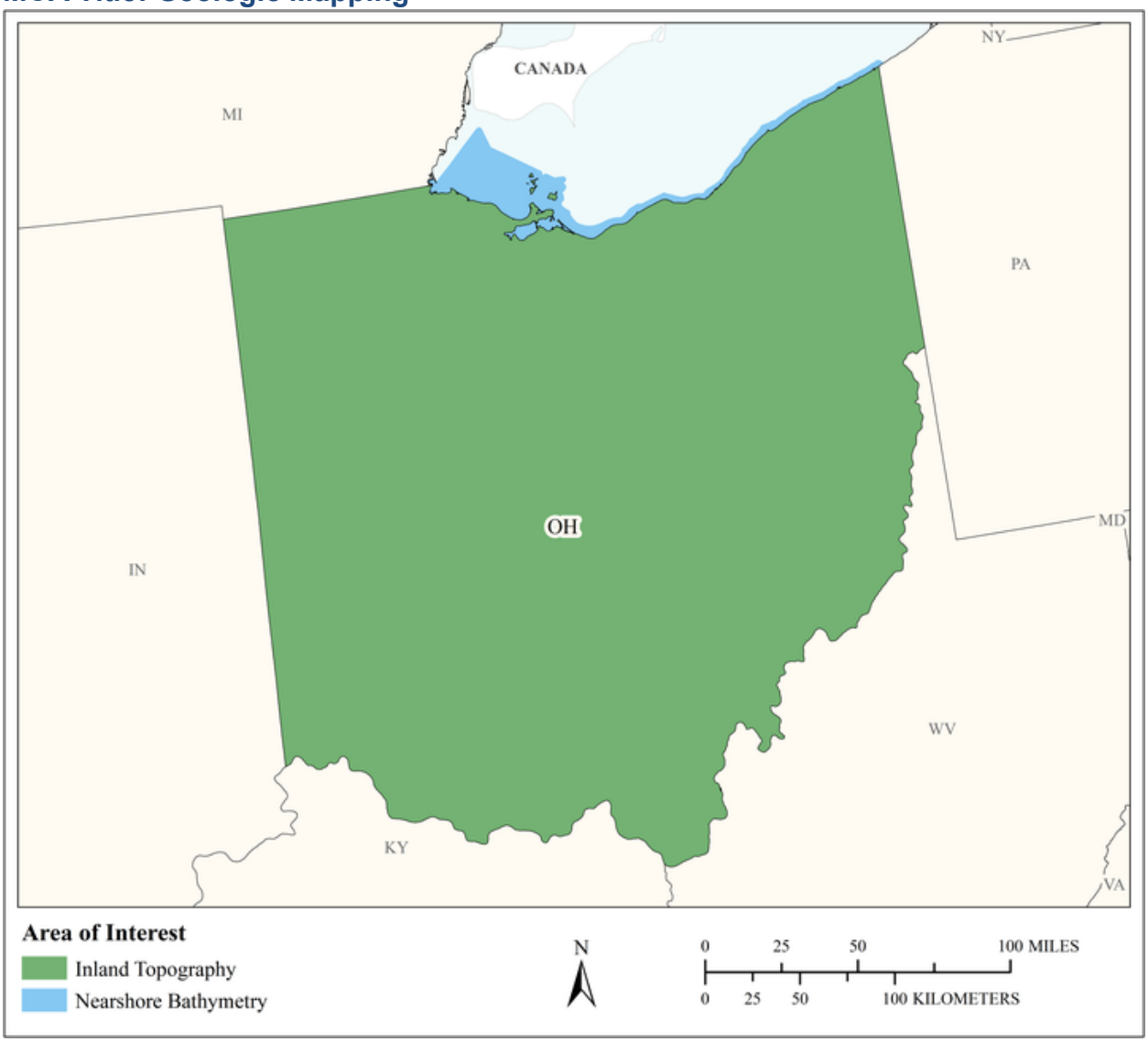
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services			Minor	Minor
Improved response or timeliness			None	None
Improved customer experience			Minor	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach			Minor	Minor
Environmental			None	None
Public safety, including life and property			Minor	None

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings							Minor	Unable to provide		Minor	Unable to provide	
Cost savings/cost reduction							None			Minor	Unable to provide	
Cost avoidance							Minor	Unable to provide		Minor	Unable to provide	
Increased revenues							Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements							Minor	Annual percent improvement	10%	Minor	Annual percent improvement	10%
Other operational benefits							Minor	Unable to provide		Minor	Unable to provide	
Other operational benefits description												
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services							Minor	Unable to provide		Minor	Unable to provide	
Improved response or timeliness							Minor	Unable to provide		Minor	Unable to provide	
Improved customer experience							Minor	Unable to provide		Minor	Unable to provide	
Other customer service benefits							Minor	Unable to provide		Minor	Unable to provide	
Other customer service benefits description												
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach							Minor			Minor		
Education or outreach description							Fishing maps, fish abundance related to bathymetry, etc.			Fishing maps		
Environmental							None			None		
Public safety, including life and property							None			None		
Other												
Other benefits							Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours			Yes	Yes
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Geologic Mapping



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Bedrock mapping, glacial deposit mapping, coastal erosion, karst mapping, hydrologic modeling, subsurface mapping, educational outreach
MCA Title	Geologic Mapping
MCA ID	1448
Organization Type	State or U.S. Territorial government
Organization Name	Ohio Department of Natural Resources, Division of Geological Survey
Sub-Agency or Division	
Organization Mission	To provide geologic information and services needed for responsible management of Ohio's natural resources
Program Name	Lake Erie Geology Group, Geologic Mapping Group, Ground Water Resources Group, Energy Resources Group
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 03 - Coastal Zone Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Sinkhole, well head, rock, outcrop, benchmark, shore structures (e.g. piers, docks, breakwalls, jetties)

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2		QL0B	
Update Frequency	6-10 years		6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need		The best horizontal accuracy achievable for the vertical accuracy I need	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Vertical Error	Up to 30 cm		Up to 20 cm	
How far onshore needed			500 meters inland	
How far down the beach profile needed	To MLW		Below MLLW	
Tide correction requirement			No requirement for tide correction	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable		Highly desirable			Highly desirable
Entire AOI under same environmental conditions	Required		Required			Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Required			Required
DEM for entire AOI needs to be seamless	Required		Required			Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required		Nice to have	
DTM	Nice to have		Nice to have	
DEM	Required		Required	
Raw point cloud data	Nice to have		Highly desirable	
Classified point cloud	Nice to have		Highly desirable	
Edited/cube XYZ			Not required	
Full waveform	Nice to have		Not required	
Bathymetric Attributed Grid (BAG)			Not required	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)			Not required	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Nice to have		Highly desirable	
Ground control/ground truthing	Highly desirable		Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Highly desirable		Highly desirable	
Underwater videography			Highly desirable	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Nice to have	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Highly desirable		Highly desirable	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Not required	
Boundaries			Nice to have	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable		Not required	
Land use/land cover	Not required		Nice to have	
Wetlands	Not required		Nice to have	
Estuaries			Nice to have	
Inland surface water features	Highly desirable		Nice to have	
Bridges/culverts	Nice to have			
Landmark features	Not required		Not required	
Cultural resources	Not required		Not required	
Coastal and riverine structures	Highly desirable		Highly desirable	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Statewide DEM QL2 2006-2012 2.5ft x 2.5ft, vertical accuracy 0.5ft		August 2017, Nov. 2017, June 2018 Data not dense enough	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Ohio Geographically Referenced Imagery Program (OGRIP)			
Other			Yes	
Other description			Self-collected via Lowrance Echo Sounder	

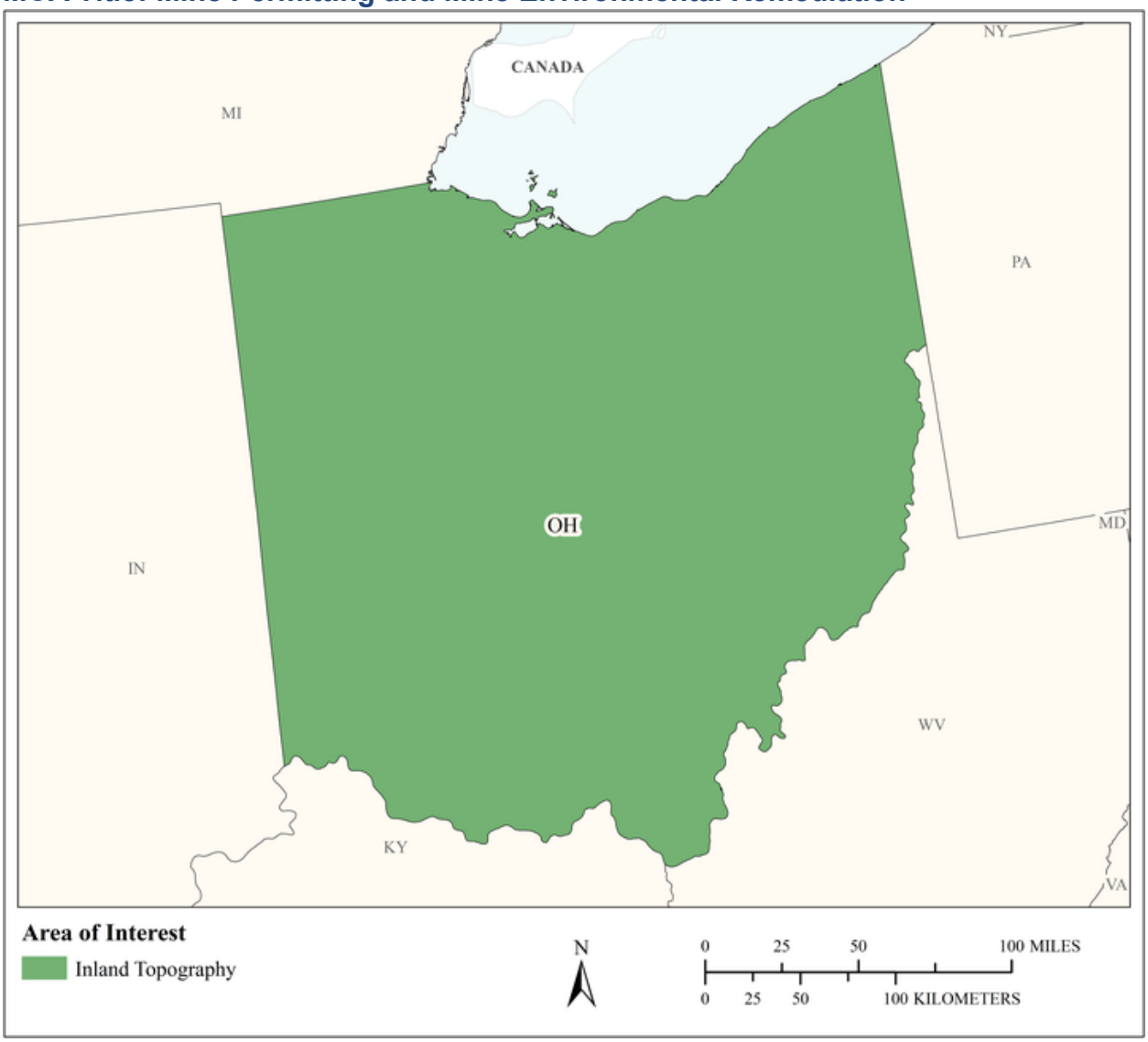
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Moderate	
Cost savings/cost reduction	Moderate		Moderate	
Cost avoidance	Moderate		Moderate	
Increased revenues	None		Moderate	
Mission-driven performance improvements	Major		Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		Major	
Improved response or timeliness	Major		Major	
Improved customer experience	Major		Major	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major		Minor	
Environmental	Moderate		Minor	
Public safety, including life and property	Major		Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide					Major	Unable to provide				
Cost savings/cost reduction	Minor	Unable to provide					Moderate	Unable to provide				
Cost avoidance	Minor	Unable to provide					Major	Unable to provide				
Increased revenues	None						Moderate	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide					Major	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide					Major	Unable to provide				
Improved customer experience	Major	Unable to provide					Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor						Moderate					
Environmental	Moderate						Minor					
Public safety, including life and property	Moderate						Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	
Contours	Yes		Yes	
Hillshades	Yes			
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes		Yes	
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Mine Permitting and Mine Environmental Remediation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Mine permitting and mine environmental remediation.
MCA Title	Mine Permitting and Mine Environmental Remediation
MCA ID	1441
Organization Type	State or U.S. Territorial government
Organization Name	Ohio Department of Natural Resources
Sub-Agency or Division	
Organization Mission	Mission Statement: To ensure a balance between wise use and protection of our natural resources for the benefit of all.
Program Name	Division of Mineral Resources Management
Total Annual Program Budget	
Primary Business Use	BU 11 - Geologic Resource Mining and Extraction
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Mine shafts, ~1 meter size features

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 30 cm			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Nice to have			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Not required			
Cultural resources	Not required			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Ohio Geographically Referenced Information Program (OGRIP) OSIP 1 Dataset, QL3, 2006			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Ohio Geographically Referenced Information Program (OGRIP)			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	None			
Cost avoidance	None			

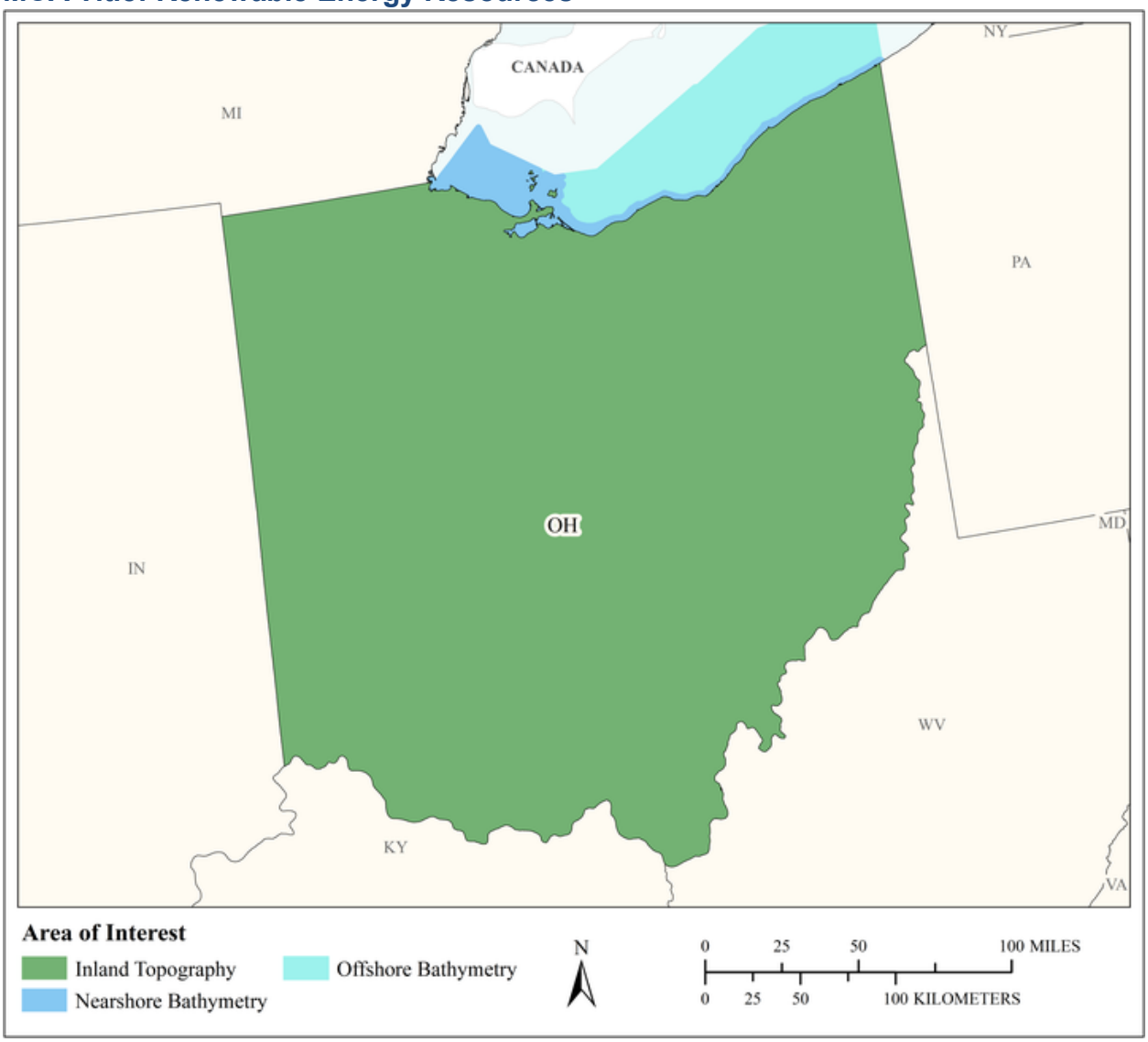
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	None			
Mission-driven performance improvements	Minor			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know			
Improved response or timeliness	Moderate			
Improved customer experience	I don't know			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Minor	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	None											
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Renewable Energy Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	Required
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Alternate energy development – solar, tidal, wind, wave, and ocean current. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Low head power potential for hydropower.
MCA Title	Renewable Energy Resources
MCA ID	60343
Organization Type	State or U.S. Territorial government
Organization Name	State of Ohio
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2		I don't know	I don't know
Update Frequency	6-10 years		I don't know	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter		I don't know	I don't know
Acceptable Vertical Error	Up to 20 cm		I don't know	I don't know
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable		I don't know	I don't know		I don't know
Entire AOI under same environmental conditions	Highly desirable		I don't know	I don't know		I don't know
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable		I don't know	I don't know		I don't know
DEM for entire AOI needs to be seamless	Highly desirable		I don't know	I don't know		I don't know
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		I don't know	I don't know		I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required		I don't know	I don't know
DTM	Required		I don't know	I don't know
DEM	Required		I don't know	I don't know
Raw point cloud data	Highly desirable		I don't know	I don't know
Classified point cloud	Highly desirable		I don't know	
Edited/cube XYZ			I don't know	I don't know
Full waveform	Nice to have		I don't know	I don't know
Bathymetric Attributed Grid (BAG)			I don't know	I don't know
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			I don't know	I don't know
Tide Predictions			I don't know	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			I don't know	I don't know
Intensity imagery/sidescan imagery	Not required		I don't know	I don't know
Ground control/ground truthing	Highly desirable		I don't know	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			I don't know	I don't know
Nautical and/or navigation charts			I don't know	I don't know
Acoustic imagery of the seafloor			I don't know	I don't know
Aerial and/or satellite imagery	Highly desirable		I don't know	I don't know
Underwater videography			I don't know	I don't know
Bottom texture			I don't know	I don't know
Bottom type			I don't know	I don't know
Submerged features			I don't know	I don't know
Subbottom characteristics			I don't know	I don't know
Geologic and seismic data	Not required		I don't know	I don't know
Water column properties - Physical			I don't know	I don't know
Water column properties - Chemical			I don't know	I don't know
Water column properties - Biological			I don't know	I don't know
Currents			I don't know	I don't know
Tide/wave heights			I don't know	I don't know
Sea ice conditions			I don't know	I don't know
Habitat distribution and classification			I don't know	I don't know
Boundaries			I don't know	I don't know
Routes			I don't know	I don't know
Offshore cadastral			I don't know	I don't know
Lease areas			I don't know	I don't know
Fixed obstructions			I don't know	I don't know
Floating observation/navigation systems			I don't know	I don't know
Shorelines – current, historic, change rates	Nice to have		I don't know	
Land use/land cover	Highly desirable		I don't know	I don't know
Wetlands	Nice to have		I don't know	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			I don't know	I don't know
Inland surface water features	Nice to have		I don't know	
Bridges/culverts	Nice to have			
Landmark features	Nice to have		I don't know	
Cultural resources	Not required		I don't know	
Coastal and riverine structures	Nice to have		I don't know	
Overhead structures			I don't know	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate		I don't know	I don't know
Cost savings/cost reduction	Moderate		I don't know	I don't know
Cost avoidance	Moderate		I don't know	I don't know
Increased revenues	None		I don't know	I don't know
Mission-driven performance improvements	Minor		I don't know	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor		I don't know	I don't know

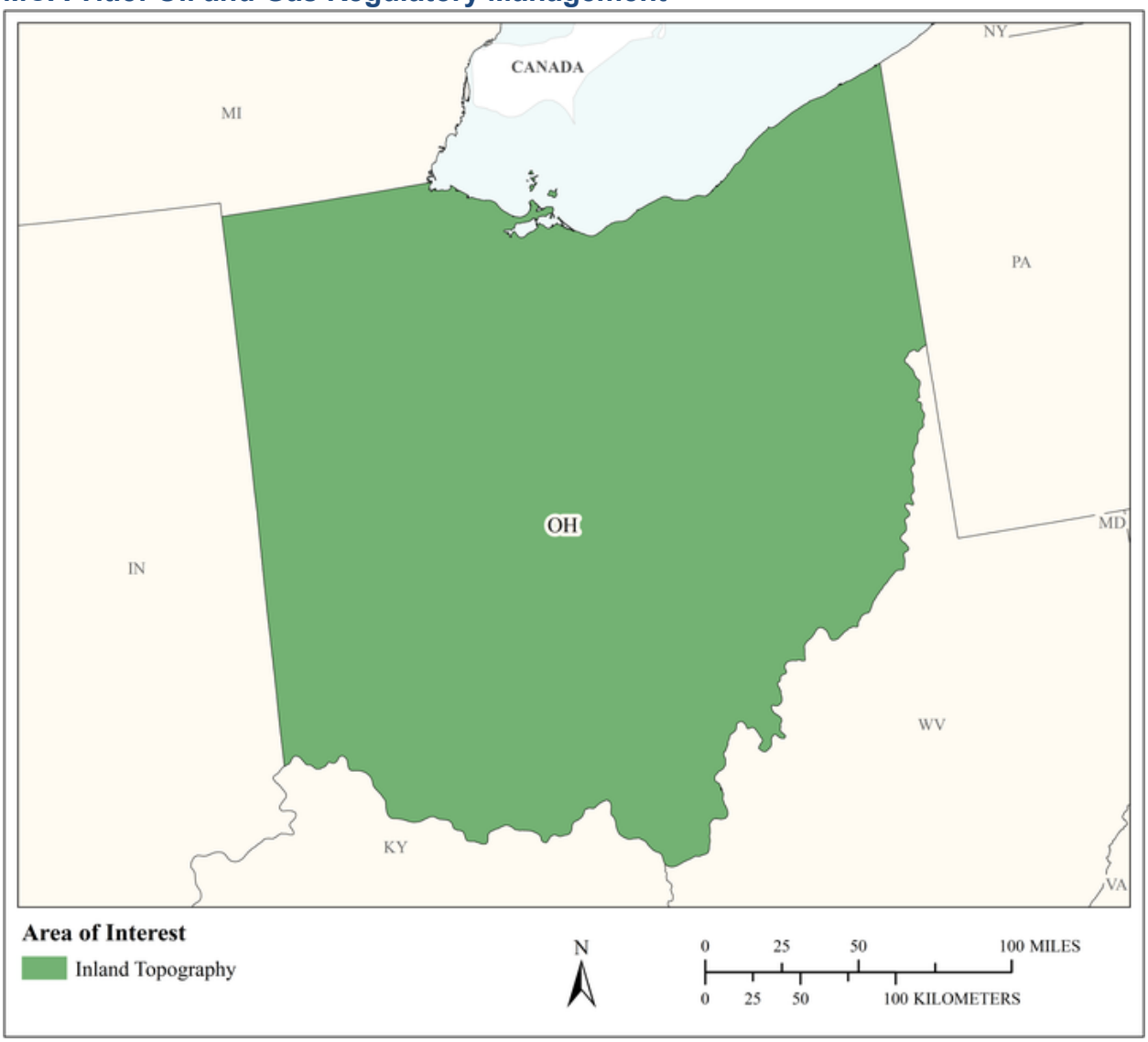
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor		I don't know	I don't know
Improved customer experience	Minor		I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor		I don't know	I don't know
Environmental	Minor		I don't know	I don't know
Public safety, including life and property	Minor		I don't know	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues	Moderate	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Minor	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor						I don't know			I don't know		
Environmental	Minor						I don't know			I don't know		
Public safety, including life and property	None						I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Oil and Gas Regulatory Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Oil and gas regulatory management
MCA Title	Oil and Gas Regulatory Management
MCA ID	1300
Organization Type	State or U.S. Territorial government
Organization Name	Ohio Department of Natural Resources-Office of Information Technology
Sub-Agency or Division	
Organization Mission	Mission Statement: To ensure a balance between wise use and protection of our natural resources for the benefit of all.
Program Name	Oil and Gas Resources Management
Total Annual Program Budget	
Primary Business Use	BU 13 - Oil and Gas Resources
Secondary Business Use	BU 11 - Geologic Resource Mining and Extraction
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Buildings, roads, fence lines, streams, other small structures associated with oil and gas well pads.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0			
Update Frequency	Annually			
Event type(s)				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI	Each well pad needs to have updated elevation data, prior to the permit being issued and after the building of the well pad. In addition, areas in eastern Ohio need more frequent updates than areas in central and western Ohio.			
Acceptable Horizontal Error	Less than 20 cm			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Nice to have					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Not required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We are currently using the Ohio OSIP 1 lidar and DEM data from 2006. The dataset is QL3.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Ohio OGRIP repository			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor			
Cost savings/cost reduction	Minor			
Cost avoidance	Minor			
Increased revenues	None			

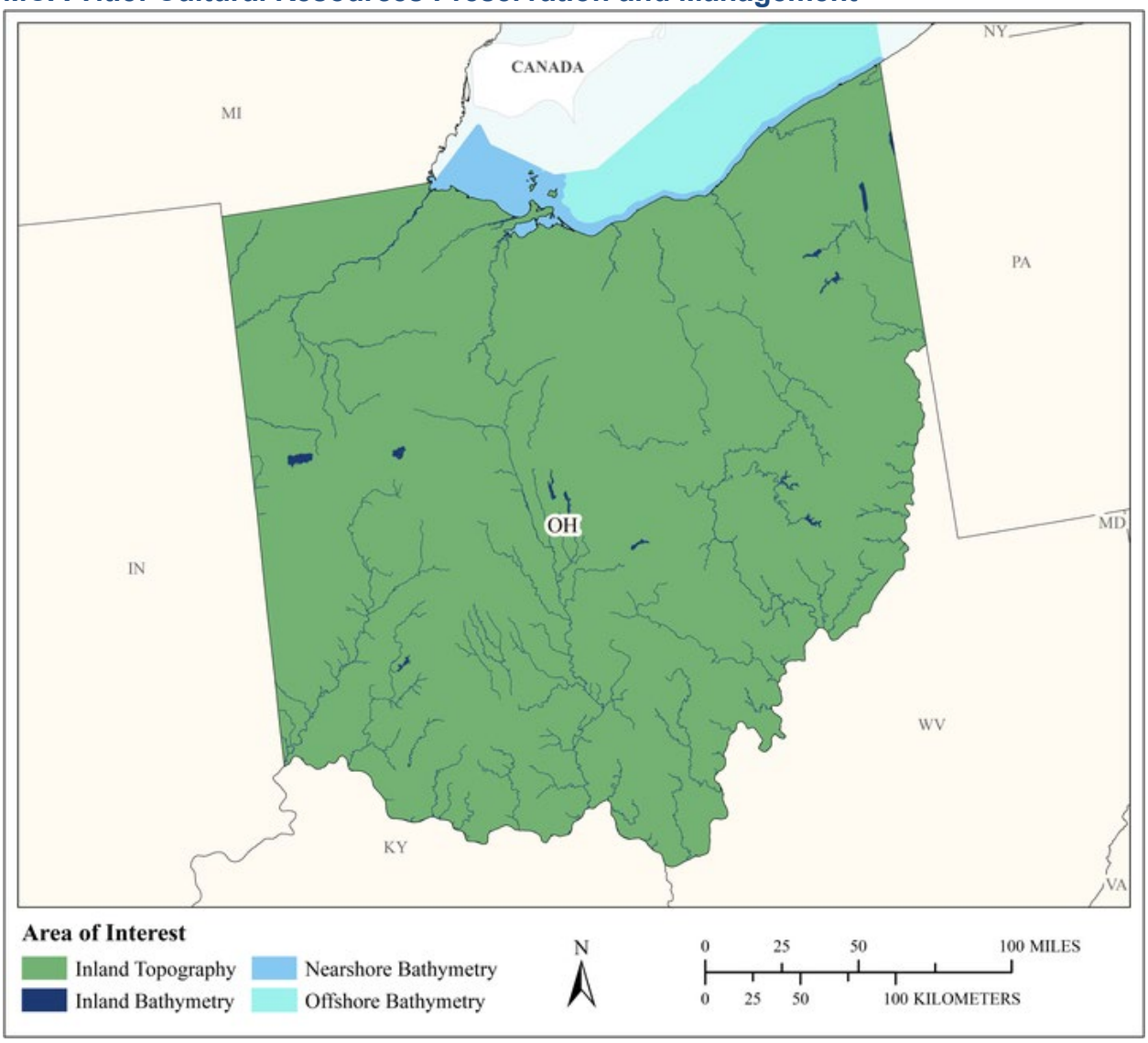
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Mission-driven performance improvements	Minor			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			
Improved response or timeliness	Moderate			
Improved customer experience	None			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	Moderate			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	1
Update frequency	3

MCA Title: Cultural Resources Preservation and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Discovery and analysis of underwater archaeological and historical cultural sites. Site protection and preservation planning. Discovery and analysis of Native American and other historical cultural sites and subsistence activities.
MCA Title	Cultural Resources Preservation and Management
MCA ID	60344
Organization Type	State or U.S. Territorial government
Organization Name	State of Ohio
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	Order 1a
Update Frequency	4-5 years	6-10 years	4-5 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Not required	Nice to have	Nice to have	Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	Required
DTM	Required	Highly desirable	Nice to have	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Not required	Not required	Not required	Not required
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Not required	Nice to have
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Nice to have	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Highly desirable
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Nice to have	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Required
Nautical and/or navigation charts			Highly desirable	Required
Acoustic imagery of the seafloor			Highly desirable	Required
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Nice to have
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Required	Required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have	Highly desirable	Highly desirable	Highly desirable
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Highly desirable	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Highly desirable	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Required	Required
Floating observation/navigation systems			Highly desirable	Required
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Required	
Land use/land cover	Nice to have	Highly desirable	Nice to have	Highly desirable
Wetlands	Nice to have	Highly desirable	Nice to have	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Nice to have	Highly desirable	Nice to have	
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Nice to have	Highly desirable	Highly desirable	
Cultural resources	Required	Highly desirable	Required	
Coastal and riverine structures	Nice to have	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	Moderate
Cost savings/cost reduction	Moderate	Minor	Minor	Minor
Cost avoidance	Minor	Minor	Minor	Minor
Increased revenues	None	Minor	None	None
Mission-driven performance improvements	Moderate	Moderate	Minor	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor	None	Minor

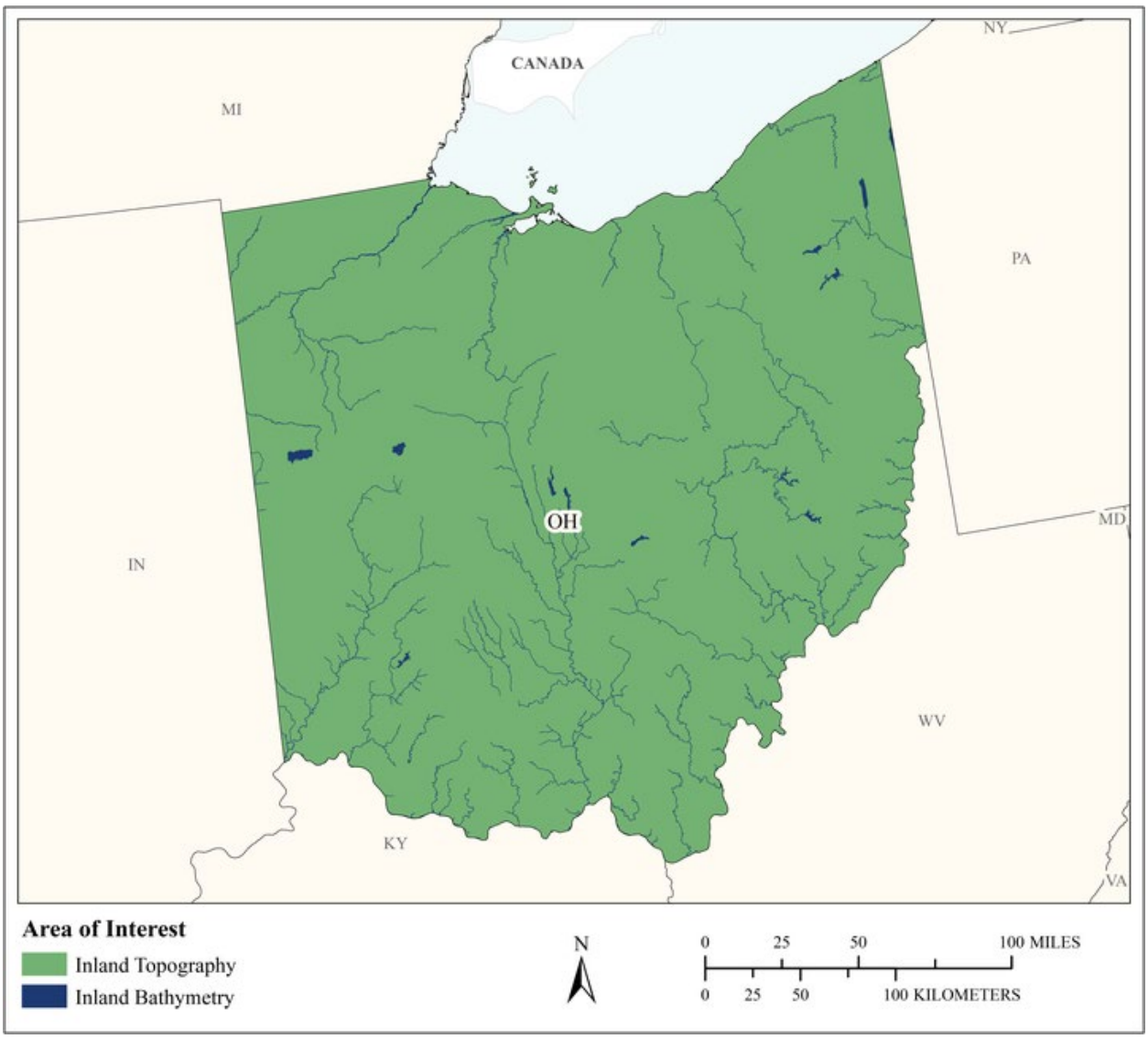
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major	Minor	Moderate
Improved customer experience	Moderate	Moderate	Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	Minor	Minor
Environmental	Minor	Moderate	Minor	Moderate
Public safety, including life and property	Minor	Moderate	None	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Increased revenues	None			None			None			None		
Mission-driven performance improvements	Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$7,562		Annual dollars saved/ realized	$18,134		Annual dollars saved/ realized	$2,563		Annual dollars saved/ realized	$6,343
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$6,611									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Moderate			Minor			Minor		
Environmental	Minor			Minor			Moderate			Moderate		
Public safety, including life and property	Minor			Minor			Minor			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				Yes

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Flood Reduction and Conservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Flood mapping, infrastructure planning and design for utility and campground expansion, dredging, dam safety
MCA Title	Flood Reduction and Conservation
MCA ID	1230
Organization Type	Regional, County, City, or other local government
Organization Name	Muskingum Watershed Conservancy District
Sub-Agency or Division	
Organization Mission	Our mission statement: Responsible stewards dedicated to providing the benefits of flood reduction, conservation and recreation in the Muskingum River Watershed
Program Name	Master Planning program - expansion of parks Shoreline Program - repairing shoreline erosion Dredging program Enterprise GIS - utility in infrastructure
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 22 - Infrastructure and Construction Management
Tertiary Business Use	BU 04 - Forest Resources Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	An area of about a 0.5 meter would work in most instances. Smaller features would be collected using conventional survey methods.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Nice to have
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Not required
5.1 – 10 acres	Not required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B		
Update Frequency	4-5 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI	We own 54,000 acres inside our watershed region. These are the greatest area of interest.			
Acceptable Horizontal Error	Less than 20 cm	Less than 50 cm		
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Nice to have			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Nice to have			Nice to have	
DEM for entire AOI needs to be seamless	Nice to have	Nice to have			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Required		
DTM	Required	Required		
DEM	Highly desirable	Highly desirable		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Highly desirable	Nice to have		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Nice to have		
Ground control/ground truthing	Highly desirable	Not required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required	Highly desirable		
Land use/land cover	Highly desirable	Nice to have		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Highly desirable	Not required		
Landmark features	Not required	Not required		
Cultural resources	Not required	Not required		
Coastal and riverine structures	Required	Not required		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	LiDAR data collected from Ohio Statewide Imagery Program (OSIP) performed 2006-2008. http://www.ogrip.oit.ohio.gov/ServicesData/GEOhioSpatialInformationPortal/OhioSpatialDataInfrastructureDownloads.aspx	We generate our own in project areas using single beam sonar. We use Sea Floor Systems single beam echo sounder with Spectra Precision SP80 GNSS GPS.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				

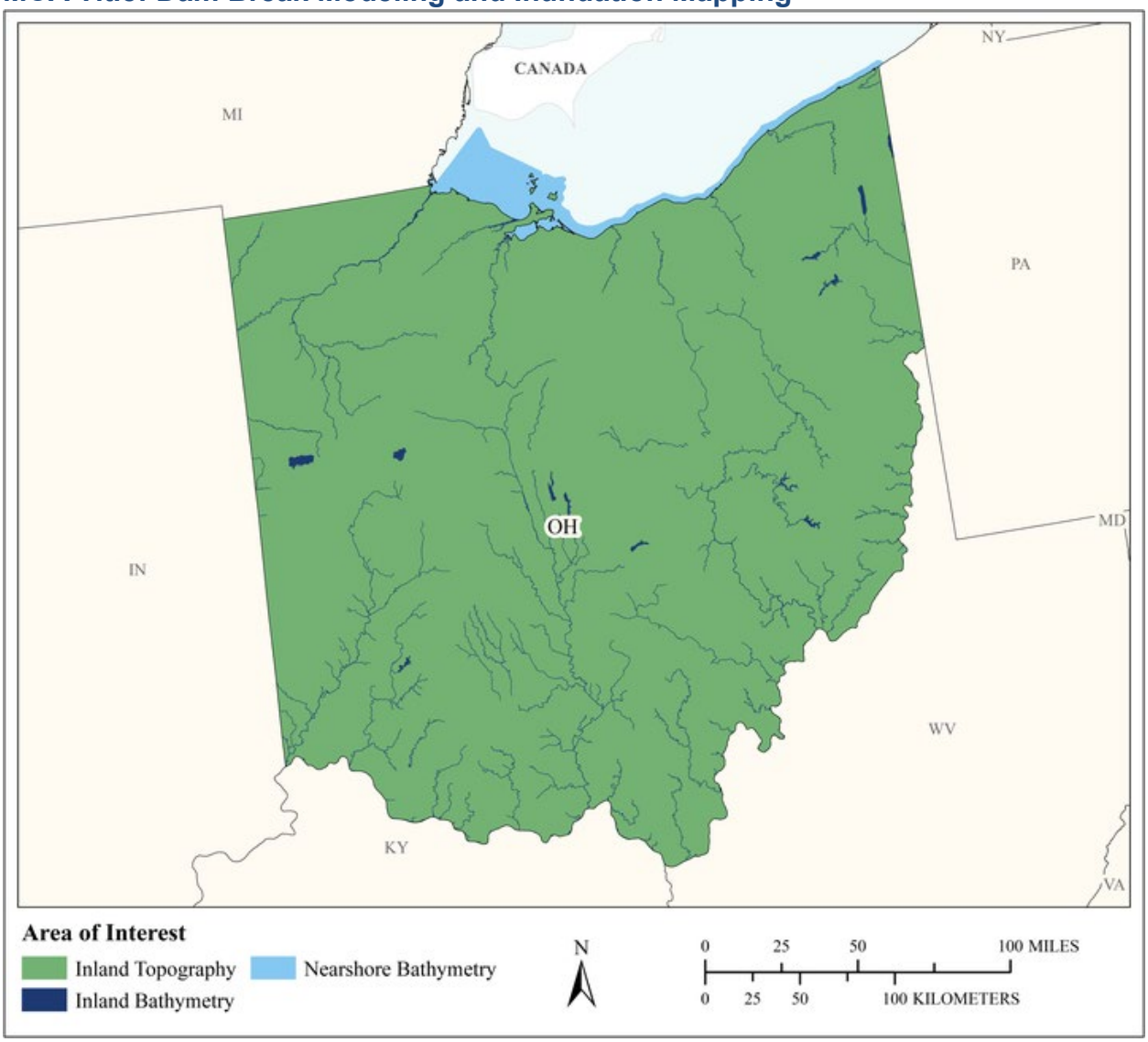
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other	Yes	Yes		
Other description	OSIP: http://www.ogrip.oit.ohio.gov/ServicesData/GEOhioSpatialInformationPortal/OhioSpatialDataInfrastructureDownloads.aspx	We generate our own in project areas using single beam sonar. We use Sea Floor Systems single beam echo sounder with Spectra Precision SP80 GNSS GPS.		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available		
Cost savings/cost reduction	Major	Inland bathy data not available		
Cost avoidance	Major	Inland bathy data not available		
Increased revenues	Minor	Inland bathy data not available		
Mission-driven performance improvements	Moderate	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available		
Improved response or timeliness	Major	Inland bathy data not available		
Improved customer experience	Major	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Inland bathy data not available		
Environmental	Major	Inland bathy data not available		
Public safety, including life and property	Moderate	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$41,908	Major	Annual dollars saved/realized	$24,723						
Time savings description	Reduction in GIS work. Reduction in managerial work. Reduction in survey fieldwork. Reduction in engineering/GIS work.			Savings in engineering. Savings in CAD/GIS work. Savings in engineering/surveying planning. Savings in survey fieldwork.								
Cost savings/cost reduction	Major	Annual dollars saved/realized	$50,000	Major	Annual dollars saved/realized	$30,000						
Cost savings/cost reduction description	Reduction in survey fieldwork.			Savings in survey fieldwork.								
Cost avoidance	Major	Annual dollars saved/realized	$20,000	Moderate	Annual dollars saved/realized	$3,000						
Cost avoidance description	Flood data analysis. Reduction in engineering/GIS work.			CAD/GIS office savings. Bathymetric mapping.								
Increased revenues	I don't know	Unable to provide		None								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements description				Plan for future dredging projects more efficiently. Carry out mission in more timely fashion.								
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$12,060	Major	Annual dollars saved/realized	$6,030						
Value added to products or services description	Reduction in surveying/engineering/GIS work.			Parks and fishing maps for ODNR.								
Improved response or timeliness	Major	Annual dollars saved/realized	$10,251	Major	Annual dollars saved/realized	$6,633						
Improved response or timeliness description	Helping safety department. Reduction in engineering work.			Better mapping to internal and external safety customers. Better mapping to internal and external customers.								
Improved customer experience	Moderate	Annual dollars saved/realized	$603	Minor	Annual dollars saved/realized	$603						
Improved customer experience description	GIS Apps. Online GIS apps.			Better mapping for dredging education for public.								
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			Minor								
Education or outreach description				Better mapping for dredging education for public								
Environmental	Moderate			Major								
Environmental description	Erosion studies/dredging			Better mapping for dredging projects								
Public safety, including life and property	Major			Major								
Public safety, including life and property description	Flood mapping			Better mapping for dredging projects								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Dam Break Modeling and Inundation Mapping



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Dam break modeling and inundation mapping.
MCA Title	Dam Break Modeling and Inundation Mapping
MCA ID	1297
Organization Type	State or U.S. Territorial government
Organization Name	Ohio Department of Natural Resources
Sub-Agency or Division	
Organization Mission	Dam Safety
Program Name	Dam Safety Program
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 22 - Infrastructure and Construction Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Culverts, houses, buildings, spillways

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Highly desirable
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL4B	
Update Frequency	4-5 years	4-5 years	>10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 30 cm	Up to 1 meter	Up to 1 meter	
Acceptable Vertical Error	Up to 20 cm	Less than 10 cm	Up to 50 cm	
How far onshore needed			To Mean Higher High Water (MHHW)	
How far down the beach profile needed	To MLLW		To MLLW	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know		I don't know	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Not required	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Nice to have	Nice to have	
Classified point cloud	Highly desirable	Required	Highly desirable	
Edited/cube XYZ		Not required	Highly desirable	
Full waveform	Highly desirable	Not required	Highly desirable	
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	
Ground control/ground truthing	Highly desirable	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Not required	
Submerged features			Not required	
Subbottom characteristics			Not required	
Geologic and seismic data	Nice to have	Nice to have	Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Not required	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Not required	
Land use/land cover	Required	Required	Not required	
Wetlands	Nice to have	Highly desirable	Highly desirable	
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Nice to have	Not required	Not required	
Cultural resources	Not required	Not required	Not required	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	OSIP lidar bare earth grid (approx. 1ft grid) and 6-inch pixel aerial imagery	Only have data for popular fishing locations most likely done by depth sounding in random areas	Nautical charts	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories		Yes		
State repositories used		Ohio Department of Natural Resources fishing maps		
Data that meet my needs are not available				

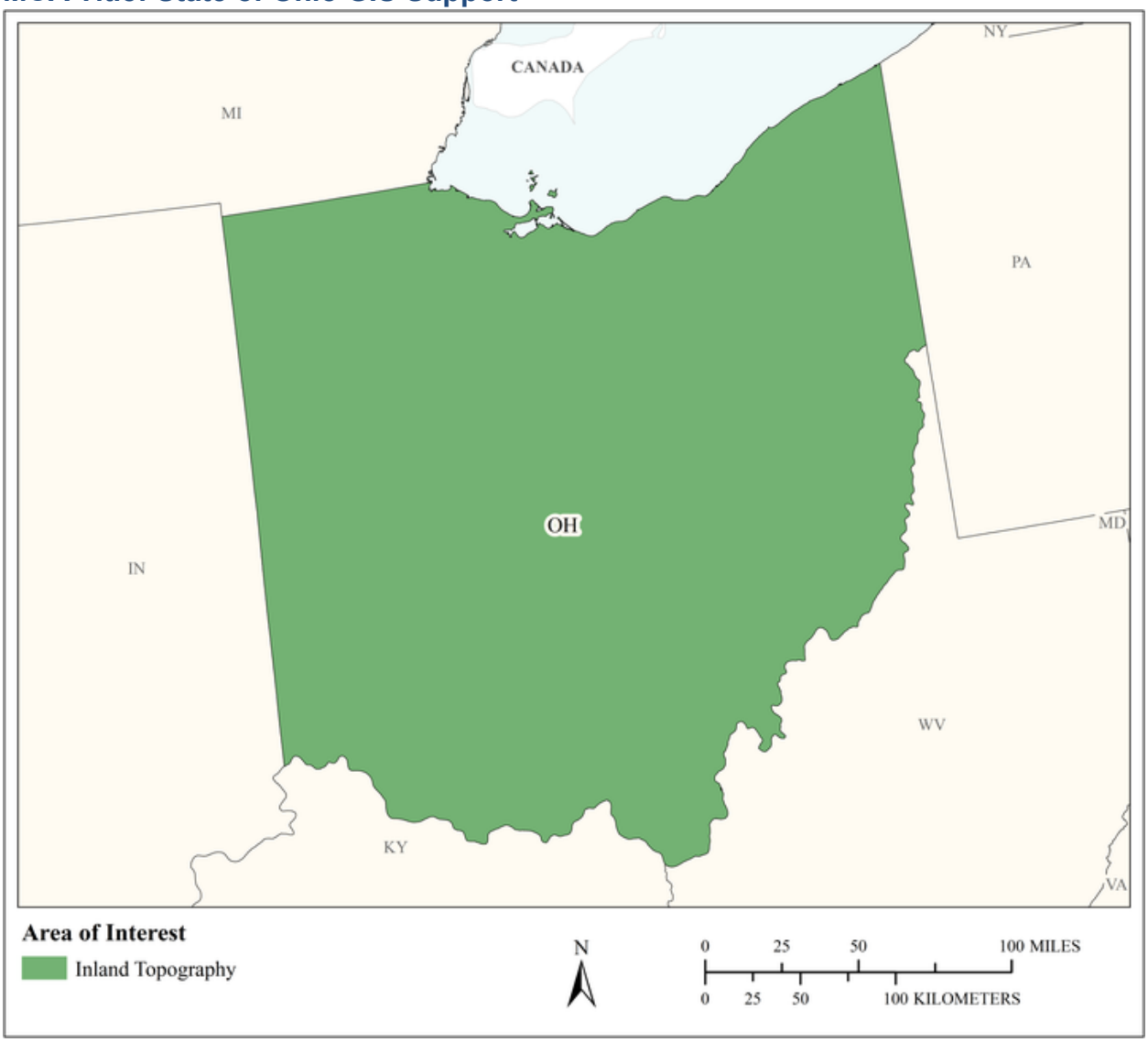
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Inland bathy data not available	None	
Cost savings/cost reduction	I don't know	Inland bathy data not available	None	
Cost avoidance	I don't know	Inland bathy data not available	None	
Increased revenues	I don't know	Inland bathy data not available	None	
Mission-driven performance improvements	Moderate	Inland bathy data not available	None	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Inland bathy data not available	None	
Improved response or timeliness	Moderate	Inland bathy data not available	None	
Improved customer experience	Minor	Inland bathy data not available	None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Inland bathy data not available	None	
Environmental	I don't know	Inland bathy data not available	None	
Public safety, including life and property	Moderate	Inland bathy data not available	None	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$16,281	I don't know	Unable to provide		I don't know	Unable to provide				
Time savings description	More detailed modeling. No need to field verify some structures.											
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide		None					
Cost avoidance	Moderate	Annual dollars saved/realized	$6,000	I don't know	Unable to provide		None					
Increased revenues	I don't know	Unable to provide		None			None					
Mission-driven performance improvements	Major	Annual percent improvement	40%	Major	Annual percent improvement	47%	I don't know	Unable to provide				
Mission-driven performance improvements description	Better data. Better modeling. Better bathy information for inland lakes and rivers.			Having bathy data allows us to know true volumes of lakes. Accurate data for improved modeling. Actually having bathy data.								
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide		I don't know	Unable to provide		None					
Improved response or timeliness description	Better and more inundation mapping. Quick flood modeling in event of developing emergency. More accessible mapping. More accurate data.											
Improved customer experience	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved customer experience description	Single source of data. Inundation mapping portal.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			I don't know			I don't know					
Environmental	None			I don't know			None					
Public safety, including life and property	Moderate			Moderate			I don't know					
Public safety, including life and property description	Public awareness of dam break inundation											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes	Yes	
Hydrologic Flow Accumulation Grids	Yes	Yes	Yes	
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: State of Ohio GIS Support



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	As the State of Ohio GIS Coordinating body, office supports/assists other agencies in meeting their Mission Critical Activities.
MCA Title	State of Ohio GIS Support
MCA ID	21568
Organization Type	State or U.S. Territorial government
Organization Name	Ohio Department of Administrative Services
Sub-Agency or Division	
Organization Mission	Facilitate GIS activities that enhance the development and use of geospatial data through, communication, coordination and collaboration.
Program Name	As the State of Ohio GIS Coordinating body, office supports/assists other agencies in meeting their Mission Critical Activities.
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Road Markings

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	Event driven only – Data need to coincide with a specific event.			
Event type(s)	A disaster.			
Quality Level and/or update frequency variability across AOI	Real time event data are needed to respond to disasters. Otherwise, update frequency varies across state			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed	To MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Lidar from previous Ohio Statewide project			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Ohio Statewide Project			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Moderate			
Cost avoidance	Minor			
Increased revenues	None			
Mission-driven performance improvements	Moderate			

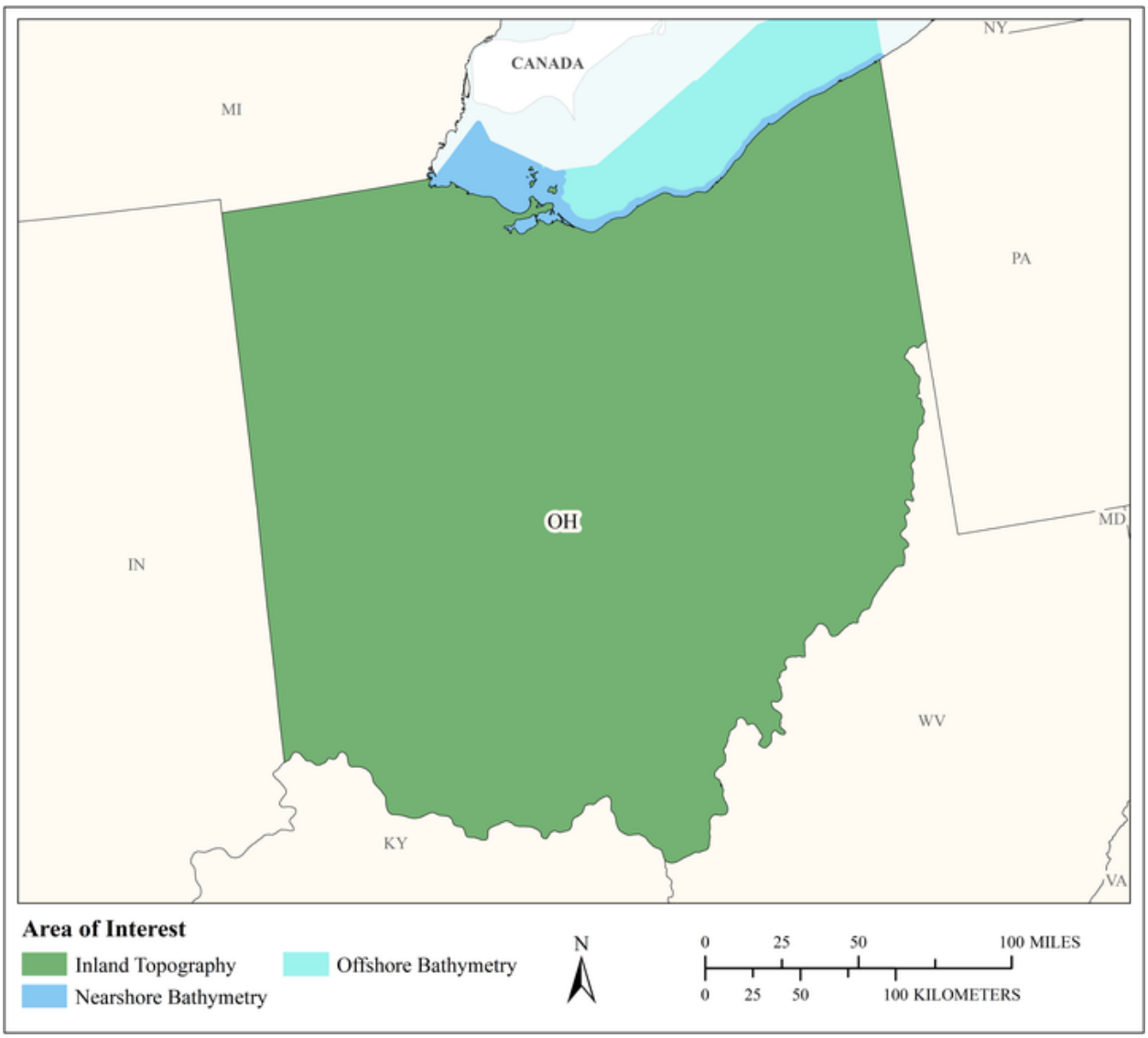
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Moderate			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Moderate	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Moderate											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Sea Level Rise and Subsidence



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	Required
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Modeling and mapping the effects of sea level rise or subsidence. Population and economic vulnerability assessments. Coastal inundation and infrastructure assessment.
MCA Title	Sea Level Rise and Subsidence
MCA ID	60345
Organization Type	State or U.S. Territorial government
Organization Name	State of Ohio
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 16 - Sea Level Rise and Subsidence
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD		QL2B	Order 2
Update Frequency	4-5 years		2-3 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter		Up to 5 meters	Up to 20 meters
Acceptable Vertical Error	Up to 20 cm		Up to 40 cm	Up to 2 meters
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have		Required	Highly desirable		Required
Entire AOI under same environmental conditions	Highly desirable		Required	Highly desirable		Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Required	Required		Required
DEM for entire AOI needs to be seamless	Required		Required	Required		Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable		Highly desirable	Highly desirable
DTM	Required		Highly desirable	Highly desirable
DEM	Required		Required	Required
Raw point cloud data	Highly desirable		Nice to have	Nice to have
Classified point cloud	Required		Highly desirable	
Edited/cube XYZ			Not required	Not required
Full waveform	Not required		Not required	Not required
Bathymetric Attributed Grid (BAG)			Not required	Not required
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	Required
Tide Predictions			Required	Required
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Required
Intensity imagery/sidescan imagery	Highly desirable		Highly desirable	Highly desirable
Ground control/ground truthing	Required		Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Required
Nautical and/or navigation charts			Highly desirable	Required
Acoustic imagery of the seafloor			Nice to have	Not required
Aerial and/or satellite imagery	Required		Required	Required
Underwater videography			Not required	Not required
Bottom texture			Not required	Not required
Bottom type			Nice to have	Nice to have
Submerged features			Nice to have	Not required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have		Nice to have	Not required
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Not required
Water column properties - Biological			Not required	Not required
Currents			Nice to have	Nice to have
Tide/wave heights			Required	Required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Required
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Not required	Not required
Lease areas			Not required	Not required
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required		Highly desirable	
Land use/land cover	Required		Highly desirable	Highly desirable
Wetlands	Required		Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required		Required	
Bridges/culverts	Required			
Landmark features	Highly desirable		Nice to have	
Cultural resources	Nice to have		Nice to have	
Coastal and riverine structures	Required		Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes		Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Major	Major
Cost savings/cost reduction	Major		Major	Major
Cost avoidance	Major		Major	Major
Increased revenues	None		Minor	None
Mission-driven performance improvements	Major		Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		Major	Major

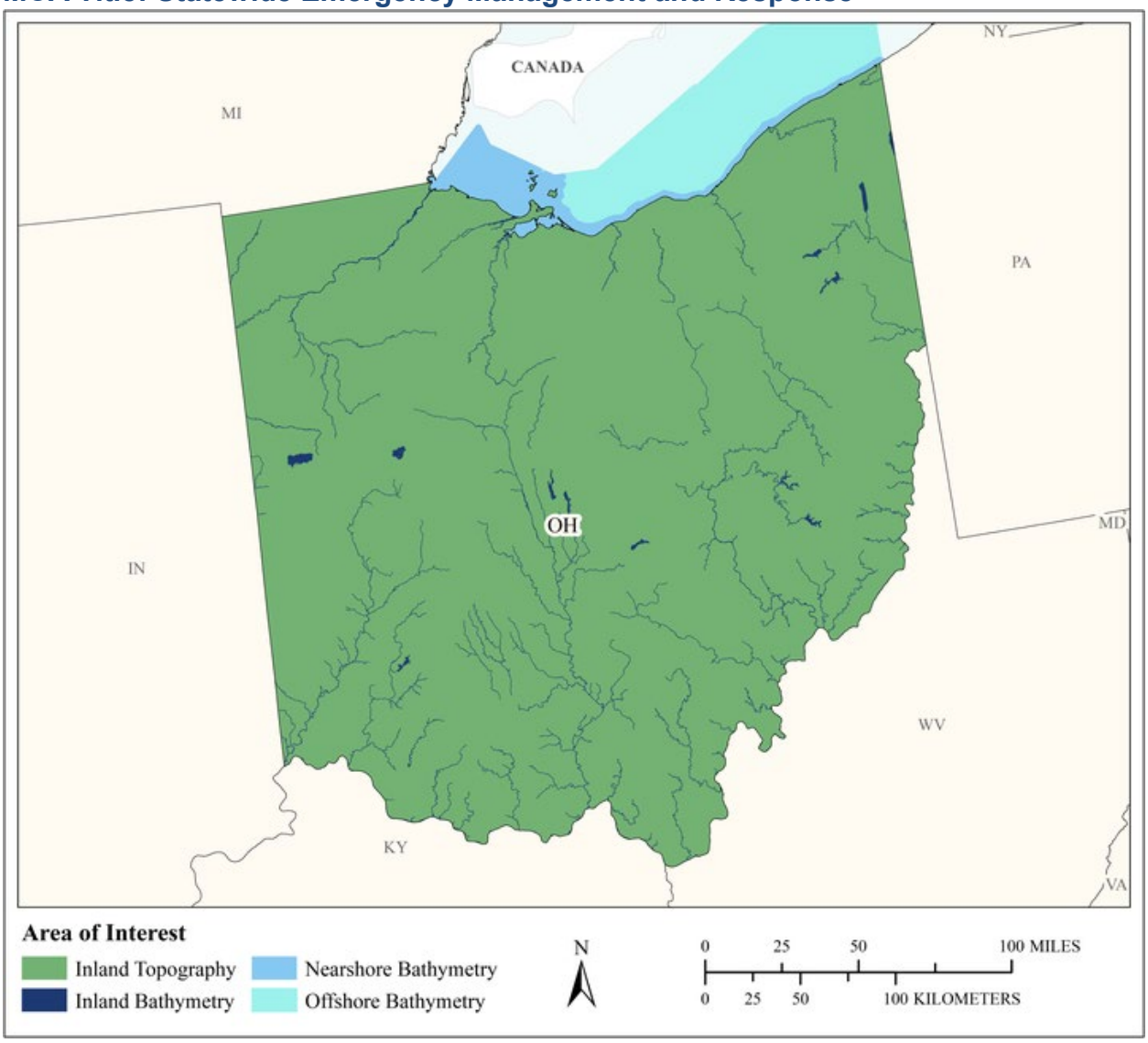
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate		Major	Major
Improved customer experience	Moderate		Major	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major		Major	Moderate
Environmental	Moderate		Major	Major
Public safety, including life and property	Major		Major	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide					Major	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide					Moderate	Unable to provide		Major	Unable to provide	
Increased revenues	Moderate	Unable to provide					Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,172,064									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate						Major			Major		
Environmental	Moderate						Major			Major		
Public safety, including life and property	Moderate						Minor			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	
Contours	Yes		Yes	Yes
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections			Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			Yes
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Statewide Emergency Management and Response



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Flood mitigation activities. Tornado Storm shelter protection (safe rooms). Response to Potential Radiation fallout from Nuclear Power Plants. Response to Water system shut downs from physical damages or bio-hazards. Logistical supply and support to locals, as needed. Maintenance of MARCS radios and Towers. Upkeep, testing and maintenance of the Statewide EAS broadcast network. Testing, maintenance and system expansion of the statewide rainfall and river gauge system known as STORMS. Emergency Management and Communication center. Training and planning for the locals to respond or mitigate emergencies.
MCA Title	Statewide Emergency Management and Response
MCA ID	21605
Organization Type	State or U.S. Territorial government
Organization Name	Ohio Emergency Management Agency
Sub-Agency or Division	
Organization Mission	Mission Statement To coordinate activities to mitigate, prepare for, respond to, and recover from disasters.
Program Name	Ohio EMA- Mitigation Branch
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 01 - Water Supply and Quality

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Normally, houses, bridges, buildings, train cars, train tracks, roads, wells for water or fracking. Submerged wrecks. Significant erosion areas. Shore protection structures.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL4B	Coarser bathymetric data satisfies my needs	Coarser bathymetric data satisfies my needs
Update Frequency	4-5 years	4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	Up to 5 meters	The best horizontal accuracy achievable for the vertical accuracy I need
Acceptable Vertical Error	Up to 20 cm	Up to 50 cm	Up to 1 meter	I don't know
How far onshore needed			None	
How far down the beach profile needed	Below MLLW		None	
Tide correction requirement			No requirement for tide correction	No requirement for tide correction
Cross sections and/or transects meet needs			Partial	
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Nice to have	Nice to have
DTM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Highly desirable	Highly desirable	Highly desirable
Raw point cloud data	Highly desirable	Nice to have	Nice to have	Nice to have
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Highly desirable	Nice to have	Nice to have

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Nice to have	Nice to have
Ground control/ground truthing	Highly desirable	Nice to have	Nice to have	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	Nice to have
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Not required	Not required
Aerial and/or satellite imagery	Required	Highly desirable	Required	Required
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Not required
Bottom type			Nice to have	Not required
Submerged features			Highly desirable	Nice to have
Subbottom characteristics			Not required	Not required
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Nice to have	Nice to have
Tide/wave heights			Nice to have	Not required
Sea ice conditions			Nice to have	Nice to have
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Highly desirable	Highly desirable
Offshore cadastral			Nice to have	Nice to have
Lease areas			Not required	Nice to have
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems				Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Highly desirable	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Required	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Currently using the Ohio OSIP Lidar derived data. Collected over 4 seasons 2011, 12, 13 and 2014 in leaf-off. One foot resolution. Used in conjunction with aerial photography/orthophotos. Also use USGS 1/9 arc DTM/DEM as comparison/crosschecking for errors.	Data is from Ohio Dept, of Natural Resources, Unsure of the metadata.	Comes from Ohio Dept of Natural Resources, GIS download page.	Nautical charts, pre 1970's USACE surveys
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				Yes
USGS Inland Waters server				

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes	Yes	
State repositories used	State of Ohio OGRIP OSIP data. http://ogrip.oit.ohio.gov/ProjectsInitiatives/OSIPDataDownloads.aspx	Ohio Dept of Natural Resources, bathymetry reading for lakes/reservoirs of the state	Comes from Ohio Dept of Natural Resources, GIS download page	
Other				Yes
Other description				Ohio Dept of Natural Resources
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor	I don't know	I don't know	I don't know
Cost savings/cost reduction	Major	I don't know	I don't know	I don't know
Cost avoidance	Major	None	I don't know	I don't know
Increased revenues	I don't know	I don't know	I don't know	I don't know
Mission-driven performance improvements	I don't know	None	I don't know	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	I don't know	I don't know
Improved response or timeliness	Minor	Minor	I don't know	I don't know
Improved customer experience	Major	Minor	I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	I don't know	I don't know
Environmental	I don't know	I don't know	I don't know	I don't know
Public safety, including life and property	Major	Minor	Minor	I don't know

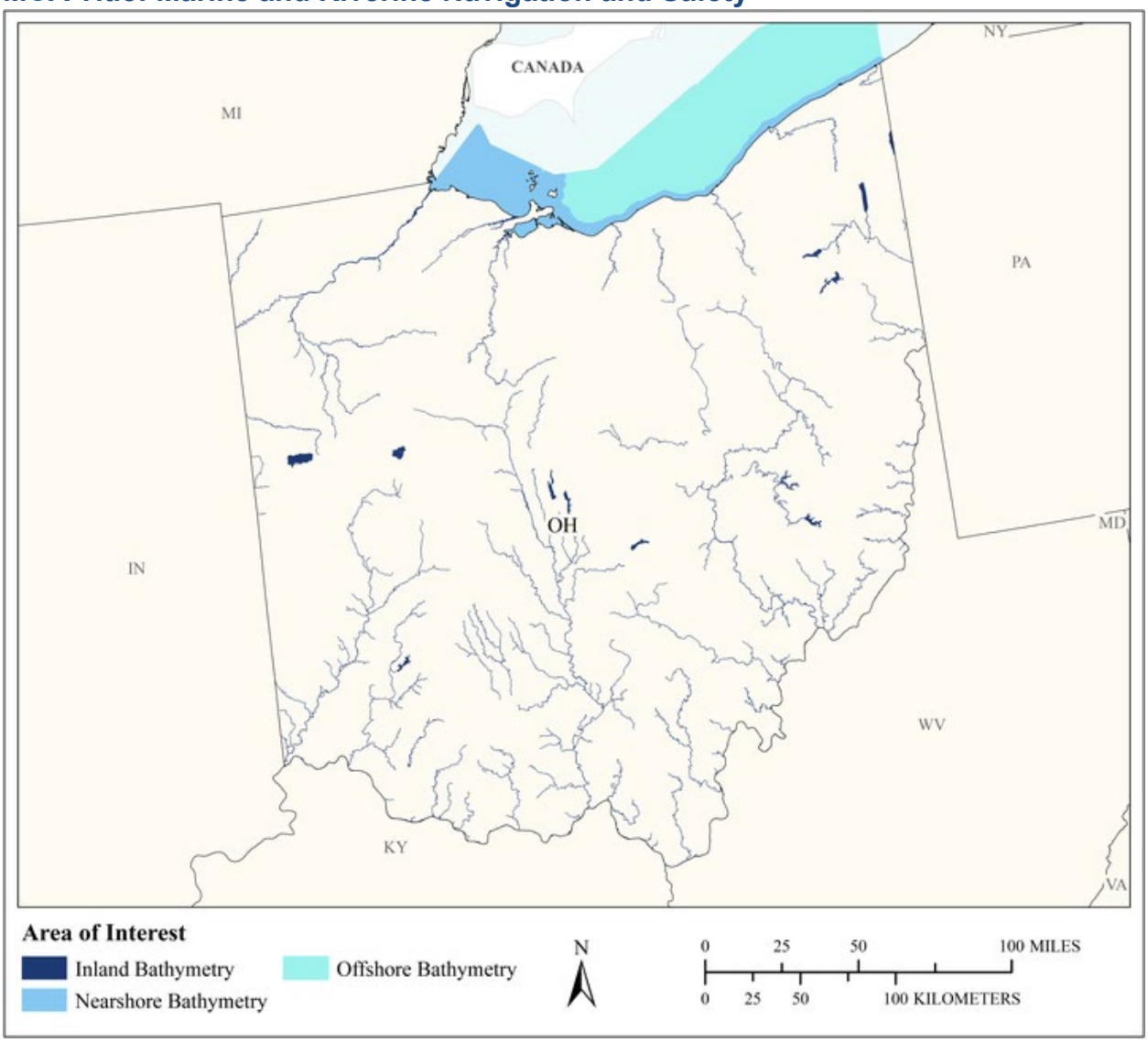
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Minor	Annual dollars saved/realized	$2,533	I don't know	Unable to provide		None			I don't know	Unable to provide	
Time savings description	Time I spend monthly prepping data. Time spent by the watch office to review river levels and flood potential in state and on Ohio River. Time spent by the watch office on a monthly basis reviewing river levels and flood potential in state and on Ohio River. Obviously will improve and help the river/lake flooding forecasts and the inundation potential of dam breaches. Not the responsibility of my office.			Not the responsibility of my office.			Not used. This office is not responsible for this activity.			This agency is not responsible for this activity. This was never an issue in the past. Better data, better accuracy and precision=better maps and models.		
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide		None			I don't know	Unable to provide	
Cost savings/cost reduction description	My office has never been involved in data purchase, nor the RFQ/RFP process in the past. Not the responsibility of my office.			Not the responsibility of my office.			This office is not responsible for this activity.			This office has never paid for data in past, other agencies were the leads. This agency is not responsible for this activity.		
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance description	My office has never been involved in data purchase, nor the RFQ/RFP process in the past.			Not the responsibility of my office.			Not used. This office is not responsible for this activity.			Better data, better accuracy and precision = better maps and models. This was never an issue in the past.		
Increased revenues	I don't know	Unable to provide		None			None			I don't know	Unable to provide	
Increased revenues description	Not the responsibility of my office.			Not the responsibility of my office.			This office is not responsible for this activity.			This agency is not responsible for this activity.		
Mission-driven performance improvements	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements description	It happens with or without/hope it is better with! Better flood depth estimates, timing and duration. It happens with or without.			Better info, better models, more accuracy, faster responses...I hope.			Better data, better estimates, better mitigation. Better data, better estimates.			Better data, better accuracy and precision = better maps and models. Better data, better accuracy and precision = better maps and models/more effective.		
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	None			I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Value added to products or services description	Not the responsibility of my office.			Better info, better models, more accuracy, faster responses...I hope. Not the responsibility of my office.			This office is not responsible for this activity.			This agency is not responsible for this activity.		
Improved response or timeliness	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Improved response or timeliness description	Better models, better accuracy of warnings. More accurate inventory of affected areas. Not the responsibility of my office.			Better inventory of items in area. Not the responsibility of my office.			Better data, better estimates, better mitigation.			Better data, better accuracy and precision = better maps and models. This agency is not responsible for this activity. This was never an issue in the past.		
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience description	Nobody has that expectation now; anything will be more than what we do now.									Better data, better accuracy and precision = better maps and models. This was never an issue in the past.		
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know			None			I don't know		
Education or outreach description										Better data, better accuracy and precision=better maps and models		
Environmental	I don't know			I don't know			None			I don't know		
Environmental description										Better data, better accuracy and precision=better maps and models		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Public safety, including life and property	Moderate	I don't know	Minor	Minor
Public safety, including life and property description	Better models, better accuracy of warnings is the hope		Better data, better estimates, better mitigation, fewer effects!	Better data, better accuracy and precision=better maps and models

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Marine and Riverine Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type		Required	Required	Required
Geographic Area Requirements		One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Nautical charting. Bathymetric measurements of nearshore submerged coastal topography. Identification of hazards to navigation. Sediment management at coastal navigation projects. Precision marine navigation. Movement of goods and fishing vessels.
MCA Title	Marine and Riverine Navigation and Safety
MCA ID	60346
Organization Type	State or U.S. Territorial government
Organization Name	State of Ohio
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Nice to have
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order		QL0B	QL0B	I don't know
Update Frequency		2-3 years	2-3 years	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error		Up to 2 meters	Up to 2 meters	I don't know
Acceptable Vertical Error		Up to 30 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season		Nice to have	Nice to have	I don't know		Nice to have
Entire AOI under same environmental conditions		Nice to have	Nice to have	I don't know		Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless		Required	Required	I don't know		Highly desirable
DEM for entire AOI needs to be seamless		Required	Required	I don't know		Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness		Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM		Highly desirable	Required	I don't know
DTM		Highly desirable	Required	I don't know
DEM		Required	Required	I don't know
Raw point cloud data		Nice to have	Required	I don't know
Classified point cloud		Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Highly desirable	I don't know
Full waveform		Not required	Not required	I don't know
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	I don't know
Breaklines required for standard hydro-flattening		Not required		
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	I don't know
Tide Predictions			Required	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	I don't know
Intensity imagery/sidescan imagery		Nice to have	Highly desirable	I don't know
Ground control/ground truthing		Nice to have	Highly desirable	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	I don't know
Nautical and/or navigation charts			Highly desirable	I don't know
Acoustic imagery of the seafloor			Highly desirable	I don't know
Aerial and/or satellite imagery		Required	Highly desirable	I don't know
Underwater videography			Nice to have	I don't know
Bottom texture			Highly desirable	I don't know
Bottom type			Highly desirable	I don't know
Submerged features			Highly desirable	I don't know
Subbottom characteristics			Nice to have	I don't know
Geologic and seismic data		Not required	Nice to have	I don't know
Water column properties - Physical			Nice to have	I don't know
Water column properties - Chemical			Nice to have	I don't know
Water column properties - Biological			Nice to have	I don't know
Currents			Highly desirable	I don't know
Tide/wave heights			Highly desirable	I don't know
Sea ice conditions			Nice to have	I don't know
Habitat distribution and classification			Highly desirable	I don't know
Boundaries			Nice to have	I don't know
Routes			Required	I don't know
Offshore cadastral			Nice to have	I don't know
Lease areas			Nice to have	I don't know
Fixed obstructions			Required	I don't know
Floating observation/navigation systems			Required	I don't know
Shorelines – current, historic, change rates		Required	Required	
Land use/land cover		Nice to have	Nice to have	I don't know
Wetlands		Required	Highly desirable	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	I don't know
Inland surface water features		Required	Highly desirable	
Bridges/culverts		Highly desirable		
Landmark features		Nice to have	Nice to have	
Cultural resources		Highly desirable	Nice to have	
Coastal and riverine structures		Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts		Yes	Yes	
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings		Major	Minor	I don't know
Cost savings/cost reduction		I don't know	Minor	I don't know
Cost avoidance		Major	Minor	I don't know
Increased revenues		None	Minor	I don't know
Mission-driven performance improvements		Minor	Minor	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services		None	Minor	I don't know

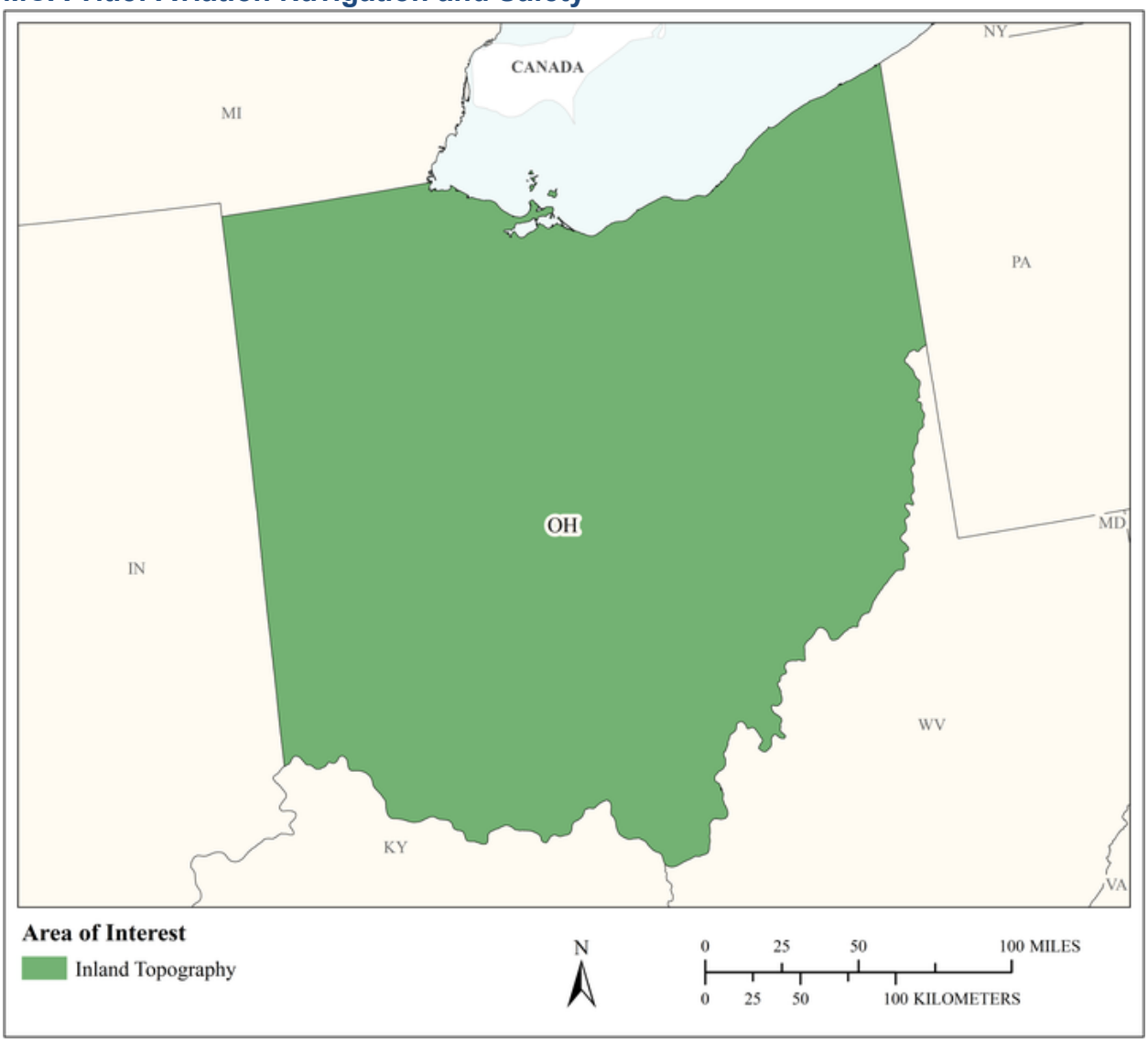
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness		None	Minor	I don't know
Improved customer experience		None	Minor	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach		None	Minor	I don't know
Environmental		None	Minor	I don't know
Public safety, including life and property		None	Major	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings				Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction				Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Cost avoidance				Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Increased revenues				Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements				Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation					Annual dollars saved/ realized	$752,558		Annual dollars saved/ realized	$686,633			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services				Minor	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness				Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Improved customer experience				Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Future annual customer service benefits added during validation					Annual dollars saved/ realized	$99,045		Annual dollars saved/ realized	$23,247			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach				Moderate			Minor			I don't know		
Environmental				Moderate			Major			I don't know		
Public safety, including life and property				Moderate			Major			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes	Yes	
Contours		Yes	Yes	Yes
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps				Yes
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)		Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints		Yes		
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				Yes

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Aviation Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of in-flight hazards and path obstructions. Aeronautical charting. Runway construction and repair.
MCA Title	Aviation Navigation and Safety
MCA ID	60347
Organization Type	State or U.S. Territorial government
Organization Name	State of Ohio
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 21 - Aviation Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes			
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Major			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

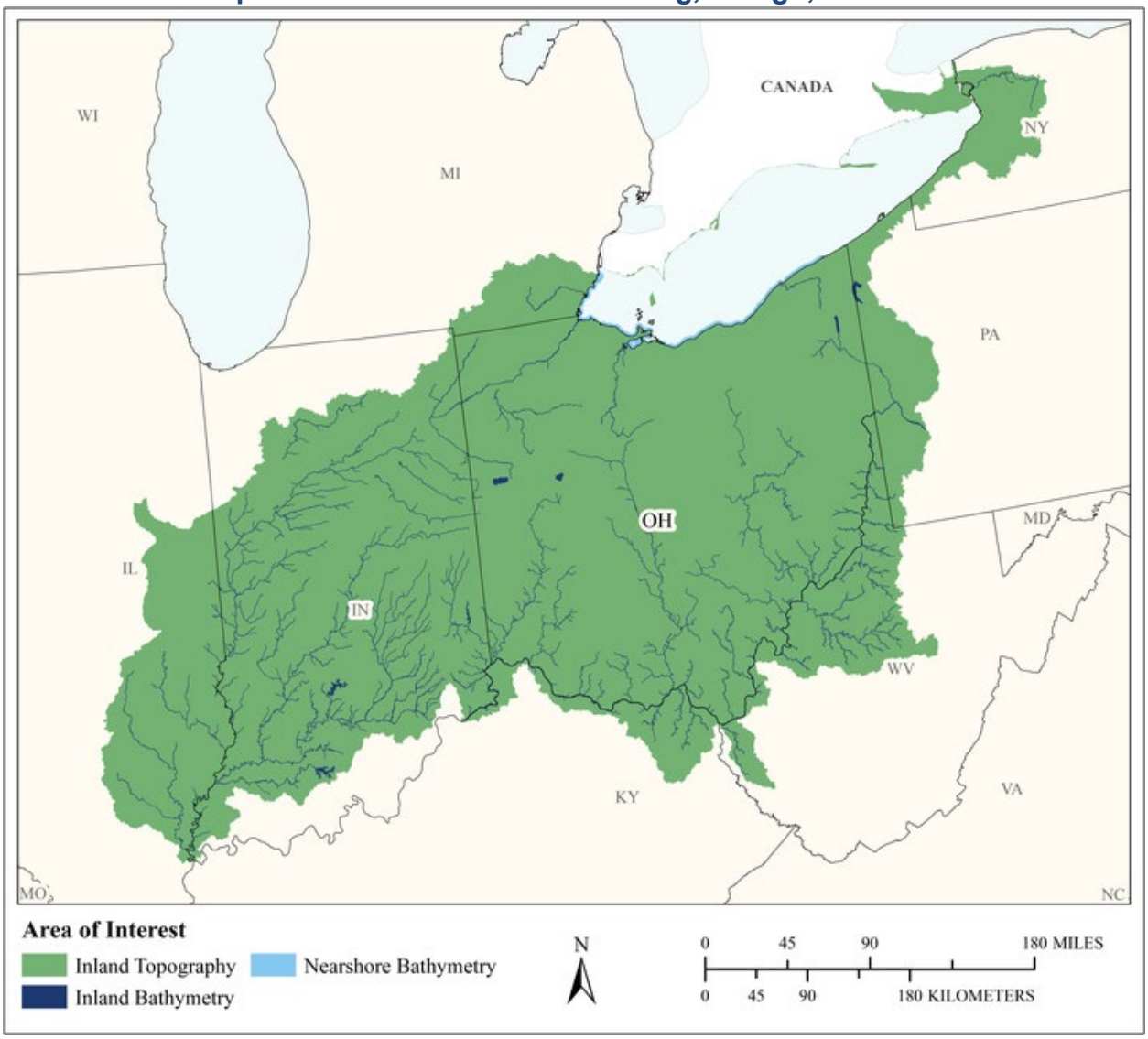
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$139,470									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$173,705									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Moderate											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Transportation Infrastructure Planning, Design, and Maintenance



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)	One or more Hydrologic Units (HUC4s)	Nearshore areas along the coast (including the Great Lakes) off one or more Hydrologic Units (HUC4s)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Maintain transportation systems (highways, state routes, etc.) so they provide the motoring public with safe and efficient routes.
MCA Title	Transportation Infrastructure Planning, Design, and Maintenance
MCA ID	1277
Organization Type	State or U.S. Territorial government
Organization Name	Ohio Department of Transportation
Sub-Agency or Division	
Organization Mission	To provide easy movement of people and goods from place to place, we will: 1. Take care of what we have. 2. Make our system work better. 3. Improve safety. 4. Enhance capacity.
Program Name	Ohio Department of Transportation
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 23 - Urban and Regional Planning
Tertiary Business Use	BU 19 - Land Navigation and Safety

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Not required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Road deformations (rutting, buckling, potholes, etc.), land subsidence, sinkholes, etc.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	Cross sections and/or transects meet needs	QL1B	
Update Frequency	Event driven only – Data need to coincide with a specific event.	Event driven only – Data need to coincide with a specific event.	Event driven only – Data need to coincide with a specific event.	
Event type(s)	New highways, emergencies, erosion/landslides, fires, or mine collapse.	Event driven only	Event driven only	
Quality Level and/or update frequency variability across AOI	Design requires higher accuracy.		Design requires higher accuracy	
Acceptable Horizontal Error	Less than 20 cm	Less than 50 cm	Less than 50 cm	
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm	Less than 10 cm	
How far onshore needed			To MHW	
How far down the beach profile needed	Below MLLW		To MLLW	
Tide correction requirement			No requirement for tide correction	
Cross sections and/or transects meet needs		Yes	Partial	
Cross section/transect requirement		25 foot cross-sections Vertical accuracy <10cm	25 foot cross-sections Vertical accuracy <10cm	

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Required	Required	
DTM	Required	Required	Required	
DEM	Required	Highly desirable	Required	
Raw point cloud data	Required	Required	Required	
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Required	Highly desirable	
Full waveform	Not required	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Nice to have	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Nice to have	
Underwater videography			Nice to have	
Bottom texture			Not required	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Nice to have	Not required	Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Highly desirable	
Water column properties - Biological			Highly desirable	
Currents			Highly desirable	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Highly desirable	
Routes			Nice to have	
Offshore cadastral			Required	
Lease areas			Highly desirable	
Fixed obstructions			Required	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Required	
Land use/land cover	Highly desirable	Nice to have	Required	
Wetlands	Highly desirable	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Highly desirable	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Required	Required	Required	
Cultural resources	Not required	Not required	Not required	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Data we use is collected in-house by our own equipment on a project by project basis. Dates vary, starting from 2004. Data is collected by our licensed surveying staff.	Data we use is collected in-house by our own equipment on a project by project basis. Dates vary, starting from 2004. Data is collected by our licensed surveying staff.	Data we use is collected in-house by our own equipment on a project by project basis. Dates vary, starting from 2004. Data is collected by our licensed surveying staff.	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes	Yes	Yes	
Other description	Collected in-house	Collected in-house	Collected in-house	
Data that meet my needs are not available				

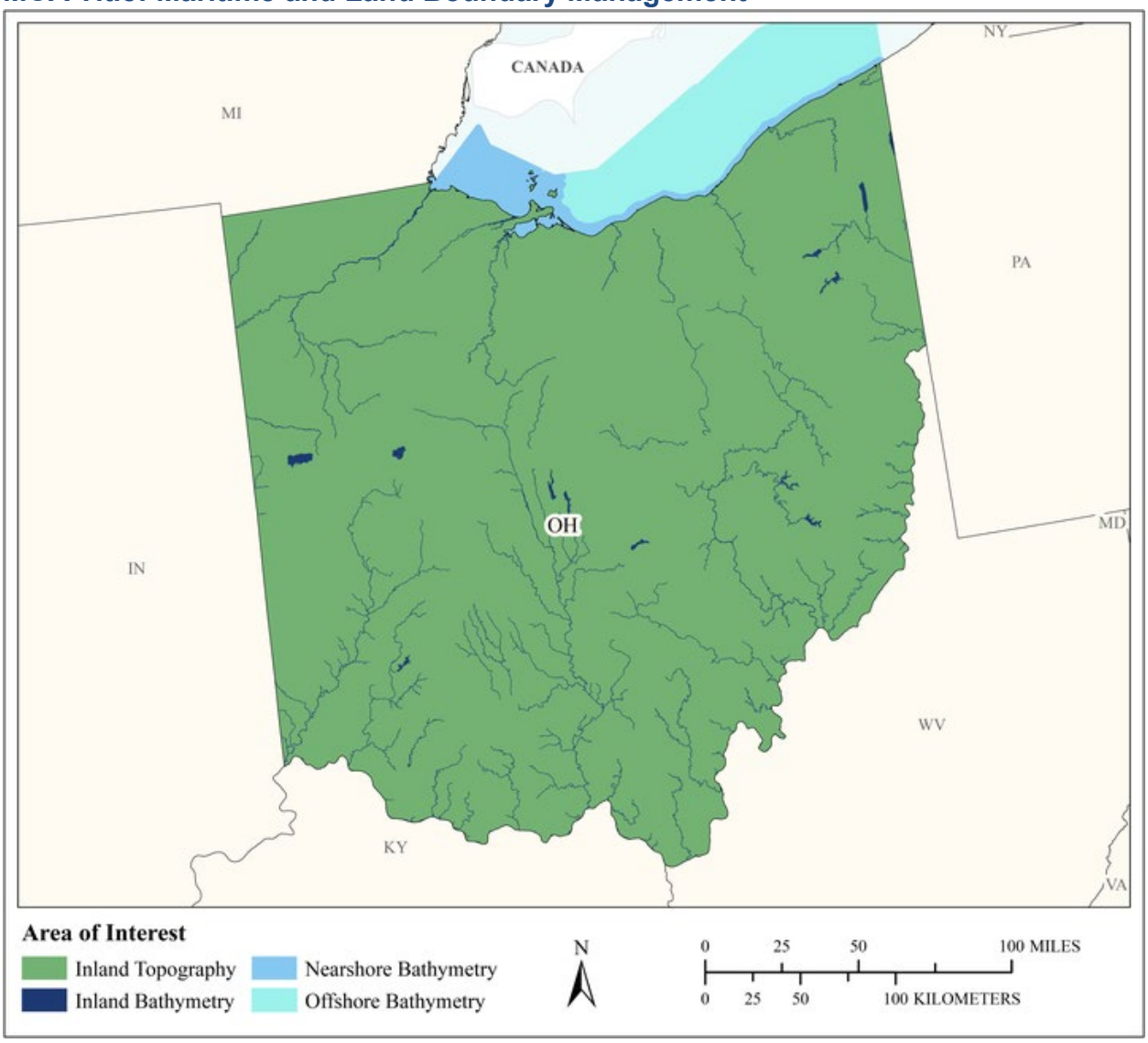
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Major	Major	
Cost savings/cost reduction	Moderate	Moderate	Moderate	
Cost avoidance	Major	Moderate	Moderate	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	
Improved response or timeliness	Major	Major	Major	
Improved customer experience	Moderate	Moderate	Moderate	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	Minor	
Environmental	Minor	Moderate	Moderate	
Public safety, including life and property	Moderate	Moderate	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Time savings description	Have been using own field collected airborne lidar for 15 years, QL0 would meet needs for planning but not design, with QL0 FHA required submittals could be met, also subsidence evaluations, etc.											
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost savings/cost reduction description	Have been using own field collected airborne lidar for 15 years, QL0 would meet needs for planning but not design, with QL0 FHA required submittals could be met, also subsidence evaluations, etc.											
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements description	Have been using own field collected airborne lidar for 15 years, QL0 would meet needs for planning but not design, with QL0 FHA required submittals could be met, also subsidence evaluations, etc.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness description	Have been using own field collected airborne lidar for 15 years, QL0 would meet needs for planning but not design, with QL0 FHA required submittals could be met, also subsidence evaluations, etc.											
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know			I don't know					
Environmental	I don't know			I don't know			I don't know					
Public safety, including life and property	I don't know			I don't know			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes	Yes	
Hydrologic Flow Accumulation Grids	Yes	Yes	Yes	
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement	Yes	Yes	Yes	
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Maritime and Land Boundary Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Delimitation of legal and other coastal boundaries, inland boundaries, and ordinary high water lines (OHWL).
MCA Title	Maritime and Land Boundary Management
MCA ID	60348
Organization Type	State or U.S. Territorial government
Organization Name	State of Ohio
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 30 - Maritime and Land Boundary Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B	QL0B	I don't know
Update Frequency	6-10 years	6-10 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Highly desirable	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Nice to have	Nice to have	Highly desirable	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable	Highly desirable	Required	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable	Highly desirable	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	Required
DTM	Required	Required	Required	Required
DEM	Highly desirable	Required	Required	Required
Raw point cloud data	Nice to have	Highly desirable	Required	Required
Classified point cloud	Highly desirable	Highly desirable	Required	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Not required	Nice to have
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Not required
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Nice to have	Required	Not required	Not required
Ground control/ground truthing	Highly desirable	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Required	Highly desirable	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Nice to have
Water column properties - Biological			Not required	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Highly desirable	Nice to have
Routes			Nice to have	Highly desirable
Offshore cadastral			Highly desirable	Nice to have
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Required	Required
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Nice to have
Wetlands	Required	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Highly desirable	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Minor	None	I don't know
Cost savings/cost reduction	Moderate	None	Minor	Moderate
Cost avoidance	Moderate	None	Minor	Moderate
Increased revenues	Minor	None	None	I don't know
Mission-driven performance improvements	Major	None	Moderate	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None	None	I don't know

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	None	Minor	Moderate
Improved customer experience	Major	None	Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	Moderate
Environmental	Major	Minor	Minor	Moderate
Public safety, including life and property	Moderate	None	Minor	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	Minor	Unable to provide		None			None			I don't know	Unable to provide	
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$46,424		Annual dollars saved/ realized	$34,840		Annual dollars saved/ realized	$205,754			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$177,995									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Moderate			Moderate		
Environmental	Minor			Major			Major			Major		
Public safety, including life and property	None			Moderate			Moderate			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps		Yes		
Cross sections		Yes		
Height-Above-Ground maps		Yes		
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

Oklahoma

Current status of elevation data for Oklahoma

The landscape of Oklahoma varies across the state, including flat, arid regions, vast areas of moderately hilly topography, as well as mountainous areas. Oklahoma regularly experiences serious hazardous conditions including floods, drought, wildfires, tornadoes, earthquakes, and landslides. Improved elevation data are recognized as a critical need across the state for applications related to water supply and quality, environmental monitoring, natural resource planning, hazard mitigation, infrastructure planning and management, private commercial development, and public safety. Lidar acquisitions that have taken place since 2006 by agencies such as Federal Emergency Management Agency (FEMA), Natural Resources Conservation Service (NRCS), and USGS, as well as smaller local government acquisitions have led to 100% lidar coverage for the state in 2020. With 100% coverage attained, approximately 50% of the state has 3DEP-compliant Quality Level 2 (QL2) data, with the remainder of the state having older, lower quality QL3 data.

In August 2014 the ability to view and download lidar and lidar derivatives such as Digital Elevation Models (DEMs) and bare-earth 2-foot contours derived from DEM data were added to the state's geospatial clearinghouse, OKMaps, https://okmaps.org/ogi/search.aspx. Since that time by the end of FY'19 the clearinghouse has seen a 655% increase in monthly downloads of data, much of that being lidar or lidar derivatives. The interest in these data products is also reflected in the 430% increase in the number of monthly visitations by users. Much of this elevation data is being downloaded by a wide variety of commercial business entities such as oil and gas, engineering, and environmental firms either planning or implementing projects throughout the state. As higher quality elevation data are acquired and coverage increases, an increased demand for this data is expected. High-quality elevation data are a critical component of the Oklahoma Spatial Data Infrastructure (OSDI). Continued collaboration is critical to enhance, maintain and distribute this very important dataset.

Oklahoma has very limited resources to invest in the acquisition of statewide, high-quality elevation data. Oklahoma benefits from partnerships with various federal agencies that have provided and continue to provide this very important data. Oklahoma's intent is to freely distribute this elevation data and appropriate derivatives to its many customers in order to foster public safety, economic development, and wise resource management and development within the state.

Importance of elevation data to Oklahoma

In this study, eleven Mission Critical Activities (MCAs) within six primary Business Uses (BUs) were identified by the study participants. Water Supply and Quality was the most reported BU, with four MCAs. Two MCAs were identified within the BU of Flood Risk Management. Two MCAs were identified within the BU of Land Navigation and Safety. Each of the following BUs were identified with one MCA each: Wildlife and Habitat Management, Geologic Assessment and Hazard Mitigation, and Homeland Security.

MCAs are summarized by each responding organization:

- Oklahoma Water Resources Board (OWRB)
    - Water Supply Planning and Water Rights Program Administration: Elevation data are needed for water resources administration, primarily of groundwater. OWRB studies the use of water within an aquifer and determines what can be used. Bathymetry is needed for volumetric analysis of lakes and to study sedimentation over time. Technical studies

are performed to support the administration of the water rights program, water supply planning, research, and water resource mapping.

  - Water Quality Monitoring and Standards: Bathymetric surveys of lakes are needed for establishing contours of the present lake level, the conservation pool, and the flood pool, in order to wisely manage water resources. OWRB currently performs bathymetry collections using boats with sonar/GPS. Elevation data are also needed for water quality uses – to identify and map wetlands, and to identify beneficial uses.
  - Hazard Mitigation – Dam Safety and Floodplain Management: Activities include Hydrologic and hydraulic (H&H) modeling, dam breach and inundation modeling, flood studies, and NFIP floodplain administration.

- Oklahoma Department of Environmental Quality (ODEQ)
  - Environmental Protection: Activities include spill and other disaster response, air modeling, environmental remediation planning, environmental permit application review.
- Oklahoma Biological Survey (OBS)
  - Habitat Biodiversity Conservation: OBS is tasked with providing the best available information on biodiversity in the State of Oklahoma. OBS pursues this objective by doing surveys, inventories, and research on the state's biodiversity. OBS also collects, curates, and shares existing biodiversity data. Finally, OBS is committed to training students in biodiversity science.
- Oklahoma Geological Survey (OGS)
  - Geohazards and Landslides: OGS research focuses primarily on mapping geology, geohazards (mass movement, landslides and soil, etc.) and industrial minerals; seismology; surface and sub-surface hydrology; and hydrocarbon resources. Elevation data are used to map geology and evaluate geologic hazards such as earthquakes and landslides.
- Oklahoma Department of Public Safety
  - Public Safety Investigation and Real Time Analysis: Elevation data are needed for real world operations under water, in air, and on land. The data are used to identify structures that would impede flight and for search and rescue. Divers need bottoms of lakes and rivers, watersheds, river channels and their currents. Elevation data are also needed for real time analysis and investigation, emergency planning and response.
- Oklahoma Dept of Transportation
  - Transportation Network and Infrastructure: Activities include planning, surveying, designing, building, and maintaining the transportation network.
- Chickasaw Nation
  - Water Supply and Quality: Elevation data assist with developing a tribal water plan to assure sustainable water supplies of good water quality for the future.
- City of Ardmore
  - Emergency Planning and Response / Hazard Mitigation: City activities that depend on elevation data include: flood risk modeling and mapping of stream centerlines and floodplains, flood risk analysis, dam/dike/levee safety analysis, emergency management, flood forecasts, potential buy out areas that repeatedly flood, and local Flood Hazard Mitigation Plans.
  - Urban Planning: Providing the citizens with a well-planned safe community with ample community resources. Planning for development, impact studies, H&H modeling, FIRM data, finished floor elevations, ensuring new construction is built above the base flood

elevation. Oklahoma survey data are used for lakes within the city for volume calculations, and search and recovery operations.

High-level summary of elevation data requirements

QL2 lidar collected on average every two to three years is suitable for 55% of reported MCAs, while QL1 is desired for 18% of MCAs. A need for QL0 was reported for 18% of MCAs for specific features such as landslides and fault mapping by OGS, and infrastructure maintenance by ODOT. The most common inland bathymetry requirement is for QL1B, however the update frequency for QL1B varies from one year to greater than ten years. One requirement was listed for each of the following inland bathy QLs: QL0B, QL2B, and QL3B. Respective update frequencies for these QLs are 2-3 years, 6-10 years, and 4-5 years.

High-level summary of benefits that would come from higher resolution elevation data

As illustrated by the responses to this study, there is a pressing need for higher resolution elevation data in Oklahoma, in order for entities to accomplish their missions and serve the public to the best of their abilities. While statewide lidar coverage is now a reality, a challenge on the horizon for Oklahoma is the need for updated lidar coverage in areas where the existing data are older and will no longer meet the needs of most users and stakeholders.

Some notable benefits of higher resolution elevation data reported by agencies include the following:

- OWRB: More accurate calculations for water right permitting and flood/inundation hazard mitigation efforts; to identify potential wetland areas and sinkholes, as well as the elevation of well heads and springs in aquifer studies; better representation of water rights boundaries, more accurate water table maps; more efficient permit approval; improved availability of technical study data and water rights data for public use.
- ODEQ: Customer assistance is one of ODEQ's biggest priorities, everything is geared toward providing better assistance. Better visualization tools improve its ability to communicate with customers. Better 3D data of Oklahoma is key to accomplishing its mission: to protect human health and the environment.
- OBS: High-resolution elevation data will greatly speed up the analysis that would otherwise require site visits. Spatial extent of projects could be enlarged with availability of such data. For species distribution modeling, high-resolution elevation data are absolutely essential.

Additional comments

Oklahoma's recommendation for a future national elevation data program is to revisit the areas containing QL3 data and capture the data as QL2 or higher.

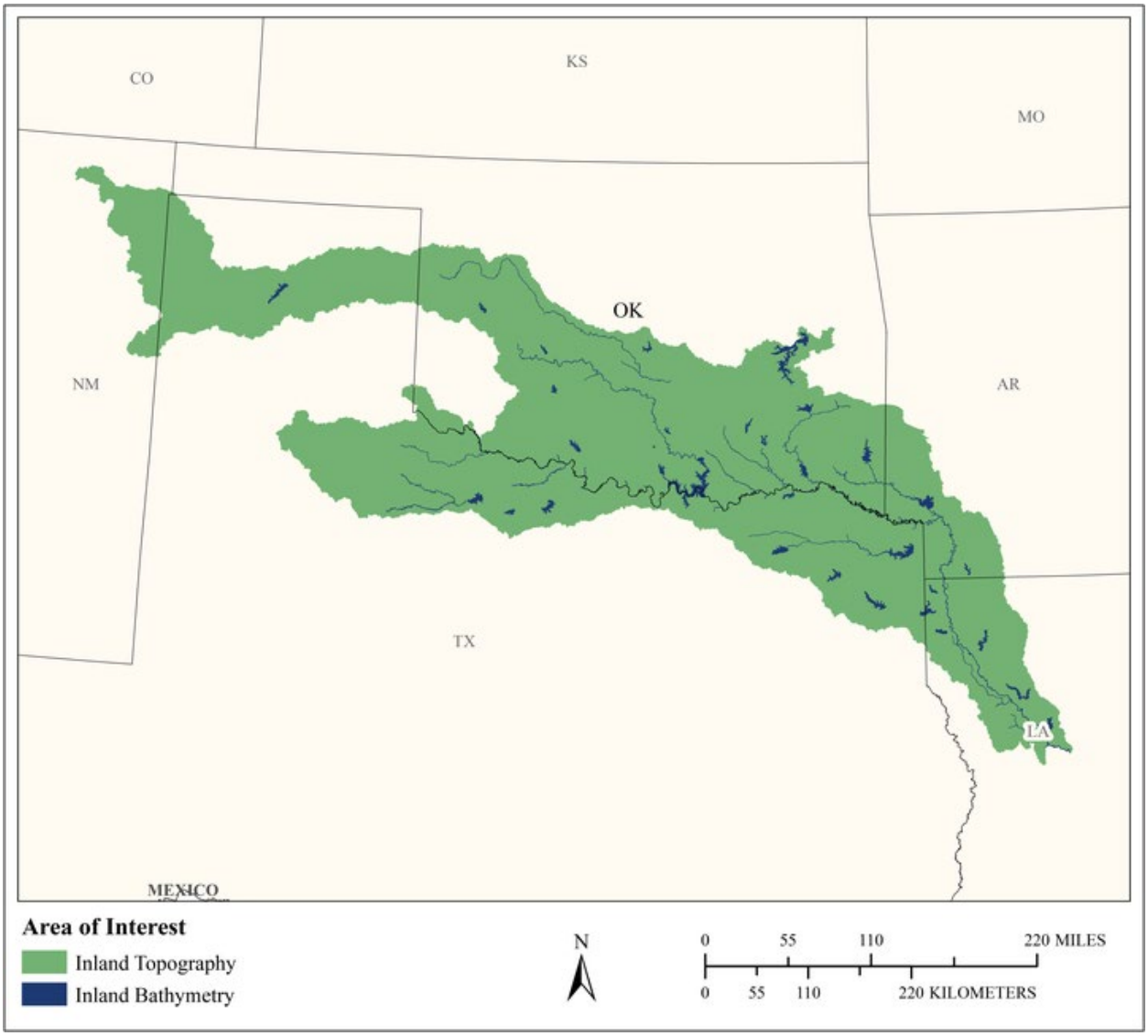
The State of Oklahoma has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	Chickasaw Nation	1085	Water Supply and Quality	Inland Topo	QL1	2-3 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL1B	6-10 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 01 – Water Supply and Quality	Oklahoma Water Resources Board	21479	Water Supply Planning and Water Rights Program Administration	Inland Topo	QL2	2-3 years	$114,464 to $143,914	$34,604	Major	Moderate	Minor
BU 01 – Water Supply and Quality	Oklahoma Water Resources Board	21507	Water Quality Monitoring and Standards	Inland Topo	QL2	2-3 years	$125,689 to $129,189	$34,604	Major	Moderate	Moderate
				Inland Bathy	QL2B	6-10 years	$838,329	$87,608	Major	Moderate	Minor
BU 01 – Water Supply and Quality	Oklahoma Department of Environmental Quality	21711	Environmental Protection	Inland Topo	QL2	6-10 years	$129,189	$34,604	Minor	Moderate	Minor
				Inland Bathy	Cross sections and/or transects meet needs	6-10 years	$838,329	$87,608	Minor	Moderate	Moderate
BU 07 – Wildlife and Habitat Management	Oklahoma Biological Survey	21600	Habitat Biodiversity Conservation	Inland Topo	QL2	Annually	$16,650	$48,091	Major	Major	Minor
				Inland Bathy	QL1B	Annually	$133,441	$80,657	Major	Major	None
BU 10 – Geologic Assessment	Oklahoma Geological Survey	21541	Geohazards and Landslides	Inland Topo	QL0	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Inland Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	Major	Moderate	Moderate
BU 15 – Flood Risk Management	Oklahoma Water Resources Board	21480	Hazard Mitigation – Dam Safety and Floodplain Management	Inland Topo	QL2	2-3 years	$9,798,136	$1,714,361	Moderate	Moderate	Major
				Inland Bathy	QL3B	4-5 years	$680,656	$764,188	Moderate	Moderate	Major
BU 15 – Flood Risk Management	City of Ardmore	22065	Emergency Planning and Response / Hazard Mitigation	Inland Topo	Cross sections and/or transects meet needs	6-10 years	$16,283	$2,849	Moderate	Moderate	Major
				Inland Bathy	QL1B	6-10 years	$1,131	$1,270	Moderate	Moderate	Major
BU 18 – Homeland Security	Oklahoma Department of Public Safety	21646	Public Safety Investigation and Real Time Analysis	Inland Topo	QL2	2-3 years	$2,062,066	$36,446	Moderate	I don't know	Major
				Inland Bathy	Cross sections and/or transects meet needs	2-3 years	$580,730	$37,051	I don't know	I don't know	I don't know
BU 19 – Land Navigation	City of Ardmore	1134	Urban Planning	Inland Topo	QL1 HD	4-5 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Major
				Inland Bathy	QL1B	>10 years	Unable to quantify	Unable to quantify	Major	Major	Major

MCA Description				**Requirements**			**Future Operational Benefits**	**Future Customer Service Benefits**	**Future Societal Benefits**		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 19 – Land Navigation	Oklahoma Dept of Transportation	22384	Transportation Network and Infrastructure	Inland Topo	QL0 HD	2-3 years	$905,513	$73,124	I don't know	I don't know	I don't know
				Inland Bathy	QL0B	2-3 years	$38,624	$399	I don't know	I don't know	I don't know

MCA Title: Water Supply and Quality



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)	One or more Hydrologic Units (HUC4s)		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	We are developing a tribal water plan to assure sustainable water supplies of good water quality for the future.
MCA Title	Water Supply and Quality
MCA ID	1085
Organization Type	Tribal government
Organization Name	Chickasaw Nation
Sub-Agency or Division	
Organization Mission	Enhance the overall quality of life for the Chickasaw people.
Program Name	Tribal Water Plan
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 06 - Natural Resources Conservation
Tertiary Business Use	BU 27 - Recreation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Stream channel, underwater surfaces, streambed cross-sections, shorelines and lake bottoms

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required
Other	Nice to have
Other description	50 acres

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B		
Update Frequency	2-3 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 30 cm	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have		
DTM	Highly desirable	Nice to have		
DEM	Required	Required		
Raw point cloud data	Nice to have	Not required		
Classified point cloud	Nice to have	Not required		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Not required		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Nice to have	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Not required		
Ground control/ground truthing	Nice to have	Not required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Nice to have	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Nice to have		
Land use/land cover	Nice to have	Nice to have		
Wetlands	Nice to have	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Highly desirable		
Bridges/culverts	Not required	Not required		
Landmark features	Nice to have	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Nice to have	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	NRCS lidar collections, TNM	Lake bathymetry completed by the Oklahoma Water Resource Board or by Tribal consultants.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	NRCS			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor	Minor		
Cost savings/cost reduction	None	Minor		

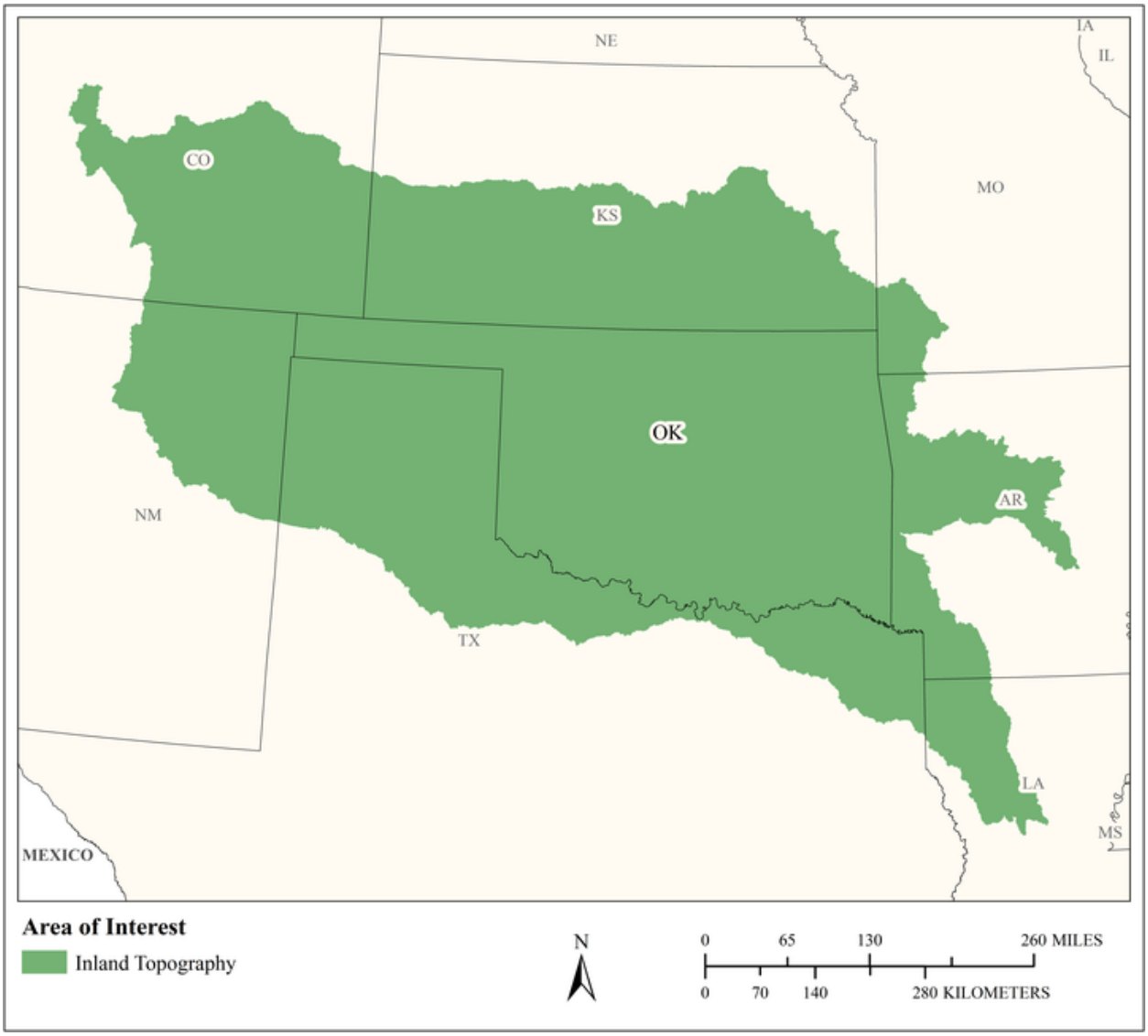
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Cost avoidance	None	Minor		
Increased revenues	None	Minor		
Mission-driven performance improvements	None	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None	Minor		
Improved response or timeliness	Moderate	Minor		
Improved customer experience	Moderate	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate		
Environmental	Moderate	Major		
Public safety, including life and property	Moderate	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		I don't know	Unable to provide							
Cost avoidance	Moderate	Unable to provide		I don't know	Unable to provide							
Increased revenues	Minor	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Minor	Unable to provide		I don't know	Unable to provide							
Other operational benefits	Moderate	Unable to provide		Moderate	Unable to provide							
Other operational benefits description	Better bathymetric data.			Improved lake bathymetry.								
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide							
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide							
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide							
Other customer service benefits	Moderate	Unable to provide										
Other customer service benefits description	Delineation of stream channels.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			I don't know								
Education or outreach description	Conduct public meetings to inform the public on a project or concern											
Environmental	Moderate			I don't know								
Environmental description	Defining riparian areas that need restoration											
Public safety, including life and property	Moderate			I don't know								
Public safety, including life and property description	Delineating potential flood areas to prevent accidents											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Water Supply Planning and Water Rights Program Administration



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Technical Studies- Water Supply Planning, Research, Water Resource Mapping. Water Use Appropriation and Permitting. Elevation data are needed for water resources administration within the state, primarily groundwater. OWRB studies the use of water within an aquifer and determines what can be used. Bathymetry is needed for volumetric analysis of lakes and to study sedimentation over time. Technical studies are performed to support the administration of the water rights program. BU 23 – Urban and Regional Planning is an additional Business Use.
MCA Title	Water Supply Planning and Water Rights Program Administration
MCA ID	21479
Organization Type	State or U.S. Territorial government
Organization Name	Oklahoma Water Resources Board
Sub-Agency or Division	
Organization Mission	The mission of the OWRB is to protect and enhance the quality of life for Oklahomans by managing and improving the state's water resources to ensure clean and reliable water supplies, a strong economy, and a safe and healthy environment.
Program Name	Technical Studies
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Water wells (wellheads), pond dams.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Not required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Required			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We utilize elevation data downloaded from the USDA Data Warehouse and National Map. It varies across the state both in quality and the date it was obtained.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	OK Maps, which is maintained by the Oklahoma GIS Data Clearinghouse			
Data that meet my needs are not available				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	I don't know			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

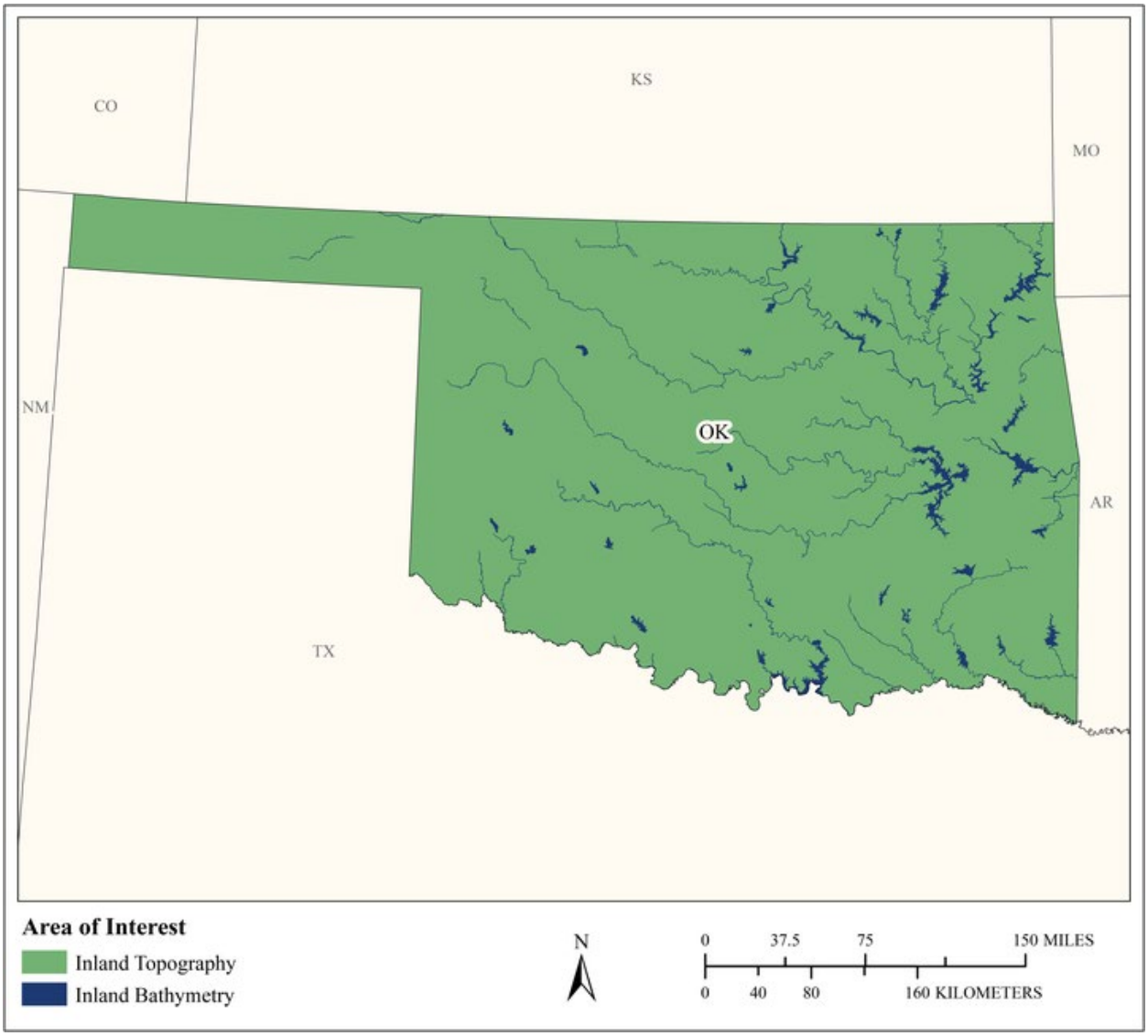
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Time savings description	Less time delineating permit boundaries. Fewer hours reviewing and correcting data.											
Cost savings/cost reduction	None											
Cost avoidance	Major	Unable to provide										
Cost avoidance description	Fewer hours reviewing and correcting data.											
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Mission-driven performance improvements description	More accurate data acquisition and administration of water rights. Better data for modeling and creation of 3D surfaces and for resolving permit disputes. Less need for field measurements, more efficient permitting process.											
Other operational benefits	Major	Annual dollars saved/realized	$14,725 to $44,175									
Other operational benefits description	A range of 1-3% of annual funding for the programs associated with this MCA would be $14,725 - $44,175.											
Future annual operational benefits added during validation		Annual dollars saved/ realized	$99,739									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Value added to products or services description	More accurate water table maps and other representation of data, better representation of water rights boundaries.											
Improved response or timeliness	Major	Unable to provide										
Improved response or timeliness description	Allow presentation of technical study data and water rights data online for public use. More up to date presentation of technical study data and water rights data for online public use. Quicker data reviews and more efficient permit approval.											
Improved customer experience	Major	Unable to provide										
Improved customer experience description	Increased data availability and accuracy from agency download website. More detailed data and maps result in increased confidence of users/viewers of the data.											
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$34,604									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Education or outreach description	Present best available data to the public											
Environmental	Moderate											

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Public safety, including life and property	Minor			

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Water Quality Monitoring and Standards



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Water Quality Monitoring and Standards. Bathymetric surveys of lakes are needed for establishing contours of the present lake level, the conservation pool, and the flood pool (1/2' contours are needed). The conservation pool is the normal shoreline. If the lake is controlled it is the maintenance level. The flood pool is what would pass over the spillway. OWRB currently performs bathymetry collections using boats with sonar/GPS. Elevation data are also needed for water quality uses – to identify and update wetlands, and to identify beneficial uses.
MCA Title	Water Quality Monitoring and Standards
MCA ID	21507
Organization Type	State or U.S. Territorial government
Organization Name	Oklahoma Water Resources Board
Sub-Agency or Division	
Organization Mission	The mission of the OWRB is to protect and enhance the quality of life for Oklahomans by managing and improving the state's water resources to ensure clean and reliable water supplies, a strong economy, and a safe and healthy environment.
Program Name	Water Quality
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 02 - Riverine Ecosystem Management
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Shoreline/wetland/streambed

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B		
Update Frequency	2-3 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	Up to 1 meter		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs		Partial		
Cross section/transect requirement		0.8 feet vertical accuracy 1-5 feet longitudinal sampling density Cross sections/transects of Body of Reservoir		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Highly desirable

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Required			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Nice to have	
DEM for entire AOI needs to be seamless	Required	Required			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable		
DTM	Highly desirable	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Highly desirable		
Classified point cloud	Not required	Nice to have		
Edited/cube XYZ		Highly desirable		
Full waveform	Not required	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Not required	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Nice to have		
Ground control/ground truthing	Highly desirable	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required	Highly desirable		
Land use/land cover	Highly desirable	Nice to have		
Wetlands	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Highly desirable		
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Not required		
Cultural resources	Not required	Not required		
Coastal and riverine structures	Highly desirable	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We utilize elevation data downloaded from the USDA Data Warehouse and National Map. It varies across the state both in quality and the date it was obtained.	Self-collected bathymetry data sets at approximately QL2b -single beam echo sounder with DGPS location		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	OK Maps, which is maintained by the Oklahoma GIS Data Clearinghouse	Oklahoma Water Resources Board (OWRB)		
Data that meet my needs are not available				

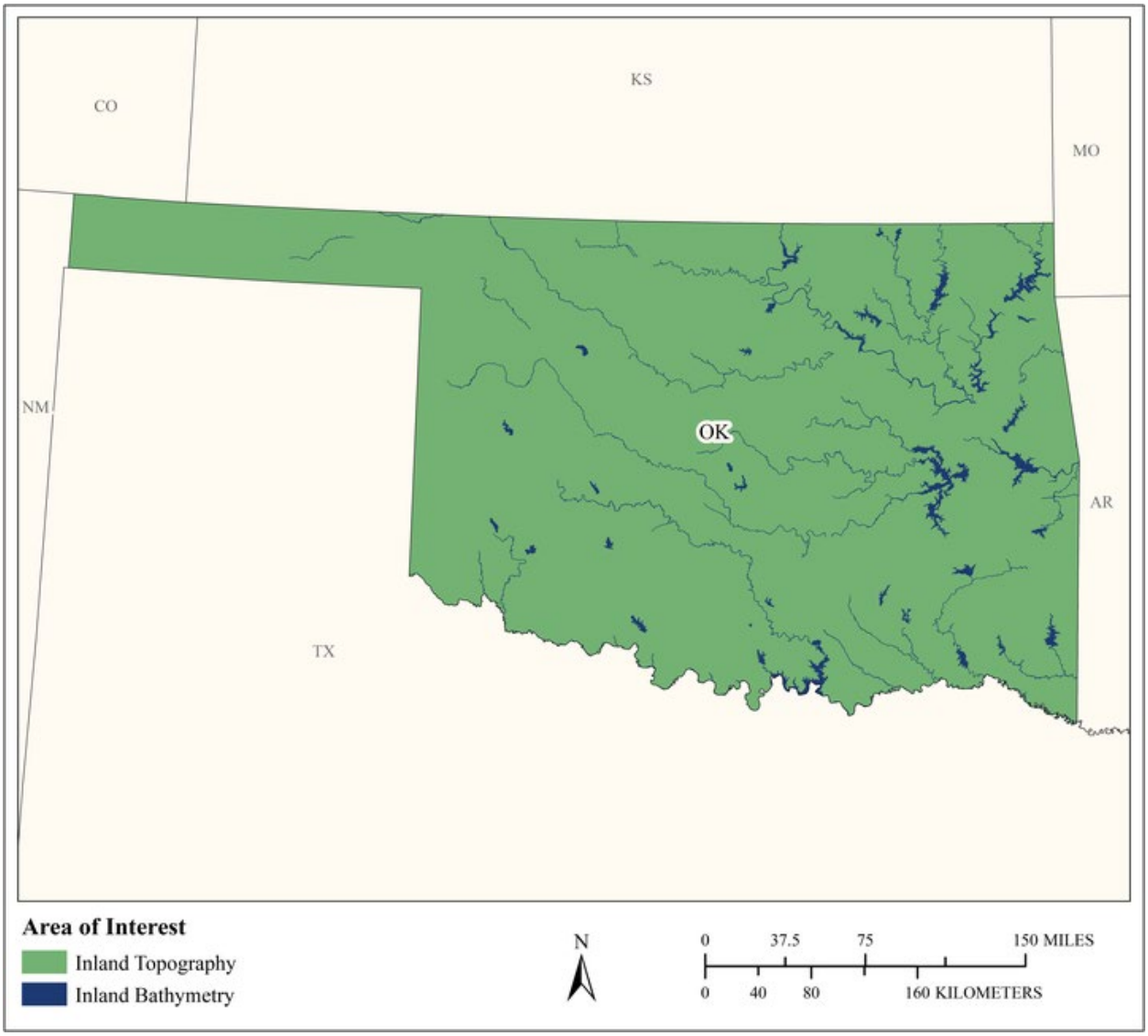
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	None		
Cost savings/cost reduction	Minor	None		
Cost avoidance	Minor	None		
Increased revenues	Minor	Major		
Mission-driven performance improvements	Major	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		
Improved response or timeliness	Major	None		
Improved customer experience	Major	Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major		
Environmental	Moderate	Minor		
Public safety, including life and property	Major	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Time savings description	Reduced time collecting data. Better data will speed up processes. Able to pre-inspect sites for special circumstances.			Reduced time collecting data. Able to pre-inspect sites for special circumstances. Better data sets will speed processing.								
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction description	Less time in the field.			Less time in the field.								
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide							
Increased revenues	Major	Unable to provide		Major	Unable to provide							
Increased revenues description	Provide more detailed products.			Able to provide more detailed products.								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements description	Higher quality. Assessing with more data. New approaches.			Higher quality. Assessing more data. New approaches.								
Other operational benefits	Major	Annual dollars saved/realized	$3,500 to $7,000									
Other operational benefits description	A range of 0.5-1% of annual funding for the program associated with this MCA would be $3,500 - $7,000.											
Future annual operational benefits added during validation		Annual dollars saved/ realized	$122,189		Annual dollars saved/ realized	$838,329						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Value added to products or services description	New coverages. More updated measurements.			New coverages. More updated measurements.								
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide							
Improved response or timeliness description				More accurate to current conditions.								
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Improved customer experience description	More coverage. Sharing acquired data. More detail.			More coverage. Sharing acquired data. More detail.								
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$34,604		Annual dollars saved/ realized	$87,608						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Education or outreach description	Share increased accuracy and detail			Share accuracy and detail								
Environmental	Moderate			Moderate								
Public safety, including life and property	Moderate			Minor								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps				
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Environmental Protection



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Spill and other disaster response, air modeling, environmental remediation planning, environmental permit application review
MCA Title	Environmental Protection
MCA ID	21711
Organization Type	State or U.S. Territorial government
Organization Name	Oklahoma Department of Environmental Quality
Sub-Agency or Division	
Organization Mission	The mission of the Oklahoma Department of Environmental Quality is to protect people through the air we breathe, the water we drink, and the land on which we thrive, helping to make Oklahoma an even better place to live.
Program Name	Water Quality Division, Environmental Complaints and Local Services
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	This could be a public water well house (size of a small shed).

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	Cross sections and/or transects meet needs		
Update Frequency	6-10 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	Up to 1 meter		
Acceptable Vertical Error	Up to 20 cm	Up to 1 meter		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs		Yes		
Cross section/transect requirement		20cm vertical accuracy; longitudinal spacing could vary from 5 feet to 1 mile		

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Not required	Nice to have			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Nice to have			Nice to have	
DEM for entire AOI needs to be seamless	Nice to have	Nice to have			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable		
DTM	Highly desirable	Highly desirable		
DEM	Highly desirable	Highly desirable		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Nice to have	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Highly desirable		
Land use/land cover	Nice to have	Nice to have		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Highly desirable		
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Nice to have		
Cultural resources	Not required	Not required		
Coastal and riverine structures	Nice to have	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We use either purchased data for smaller projects or the OK maps site. https://okmaps.org/ogi/search.aspx	Data from partnerships with OWRB		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	OK maps site. https://okmaps.org/ogi/search.aspx	https://okmaps.org/ogi/search.aspx		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor	Minor		
Cost savings/cost reduction	Minor	Minor		

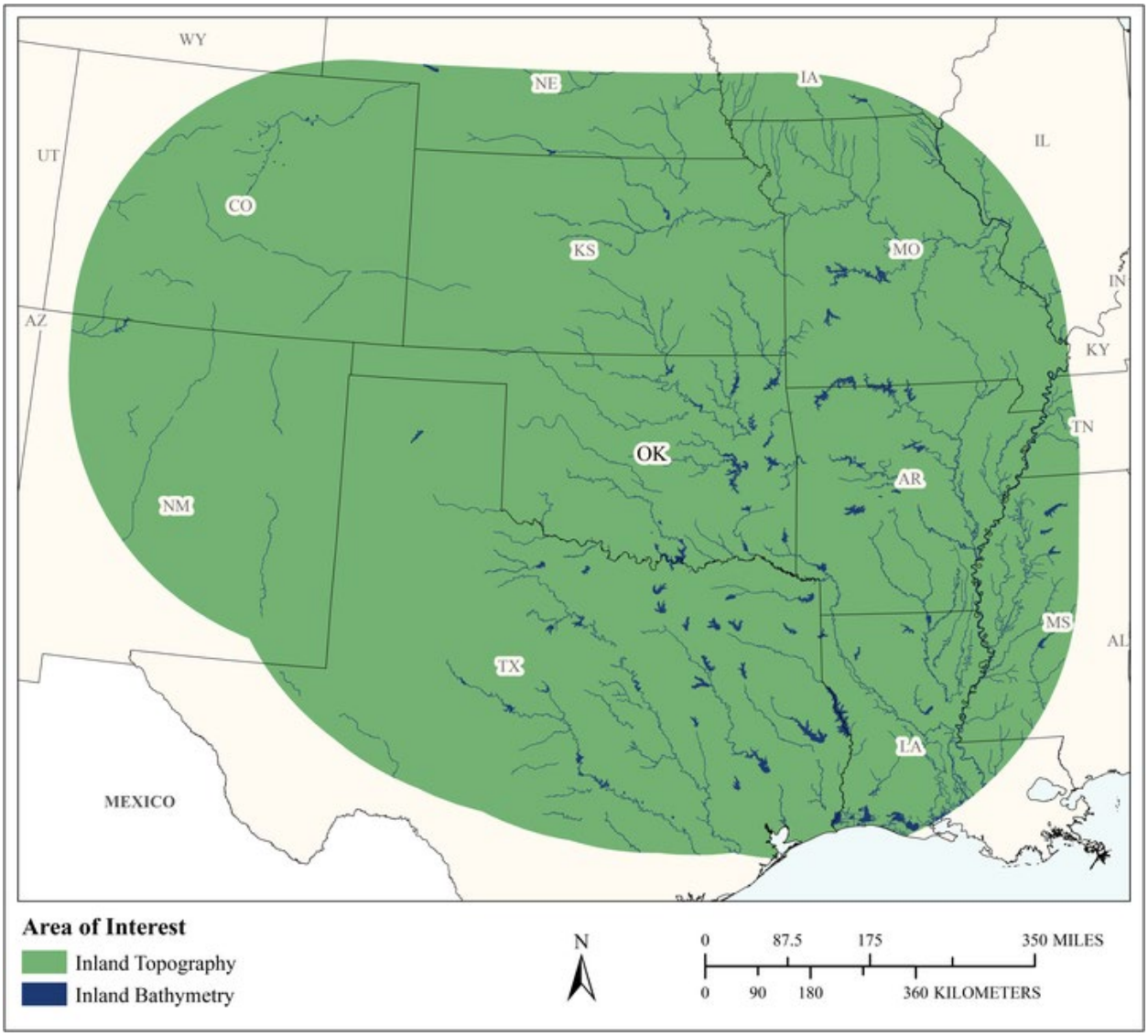
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost avoidance	Minor	Minor		
Increased revenues	None	None		
Mission-driven performance improvements	Minor	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	Minor		
Improved response or timeliness	Minor	Minor		
Improved customer experience	Minor	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor		
Environmental	Minor	Minor		
Public safety, including life and property	None	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Moderate	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Moderate	Unable to provide		Minor	Unable to provide							
Increased revenues	I don't know	Unable to provide		None								
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$129,189		Annual dollars saved/ realized	$838,329						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		Minor	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness description	Customer assistance is one of the biggest priorities of our agency, everything is geared toward providing better assistance. Better visualization tools improve our ability to communicate with our customers. Data would help provide faster response options and cost estimates. Process data faster leading to faster approval of customer's work product.											
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$34,604		Annual dollars saved/ realized	$87,608						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor								
Environmental	Moderate			Moderate								
Public safety, including life and property	Minor			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps				
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Habitat Biodiversity Conservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Custom description	Custom description		
Sub Area Requirements	Oklahoma and 300 miles into adjoining states	Oklahoma and 300 miles into adjoining states		

MCA Description	Response
Mission Critical Activity	Conservation of critical habitats.
MCA Title	Habitat Biodiversity Conservation
MCA ID	21600
Organization Type	Academic or Not-for-Profit
Organization Name	Oklahoma Biological Survey
Sub-Agency or Division	
Organization Mission	The Oklahoma Biological Survey (OBS) is both a state agency and a research unit in the College of Arts and Sciences at the University of Oklahoma. OBS is tasked with providing the best available information on biodiversity in the state of Oklahoma. OBS pursues this objective by doing surveys, inventories, and research on the state's biodiversity. OBS also collects, curates, and shares existing biodiversity data. Finally, OBS is committed to training students in biodiversity science. To achieve these goals, OBS works closely with other allied organizations throughout the state and region.
Program Name	Oklahoma Natural Heritage Inventory
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	BU 06 - Natural Resources Conservation
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	For habitat mapping and monitoring, small features should suffice. Small shrubs or bushes, individual trees, bushes, shrubs. For freshwater aquatics: stream channel widths and depths.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required

Inland Bathy Feature Size Requirements	Response
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B		
Update Frequency	Annually	Annually		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 30 cm	Up to 1 meter		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Nice to have			Nice to have	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable		
DTM	Highly desirable	Required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Nice to have		
Classified point cloud	Highly desirable	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Nice to have		
Ground control/ground truthing	Not required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Required		
Land use/land cover	Required	Required		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Highly desirable	Nice to have		
Landmark features	Highly desirable	Nice to have		
Cultural resources	Highly desirable	Nice to have		
Coastal and riverine structures	Nice to have	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	TNM, OKMAPS; small unmanned systems are used to collect elevation data for very small area projects	TNM, OKMAPS; OWRB bathy		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI		Yes		
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	OKMaps (Oklahoma). Occasionally, I will have to work in adjoining states (or even beyond). In such instances, the repositories I use will vary.	Oklahoma (OKMaps)		
Data that meet my needs are not available				

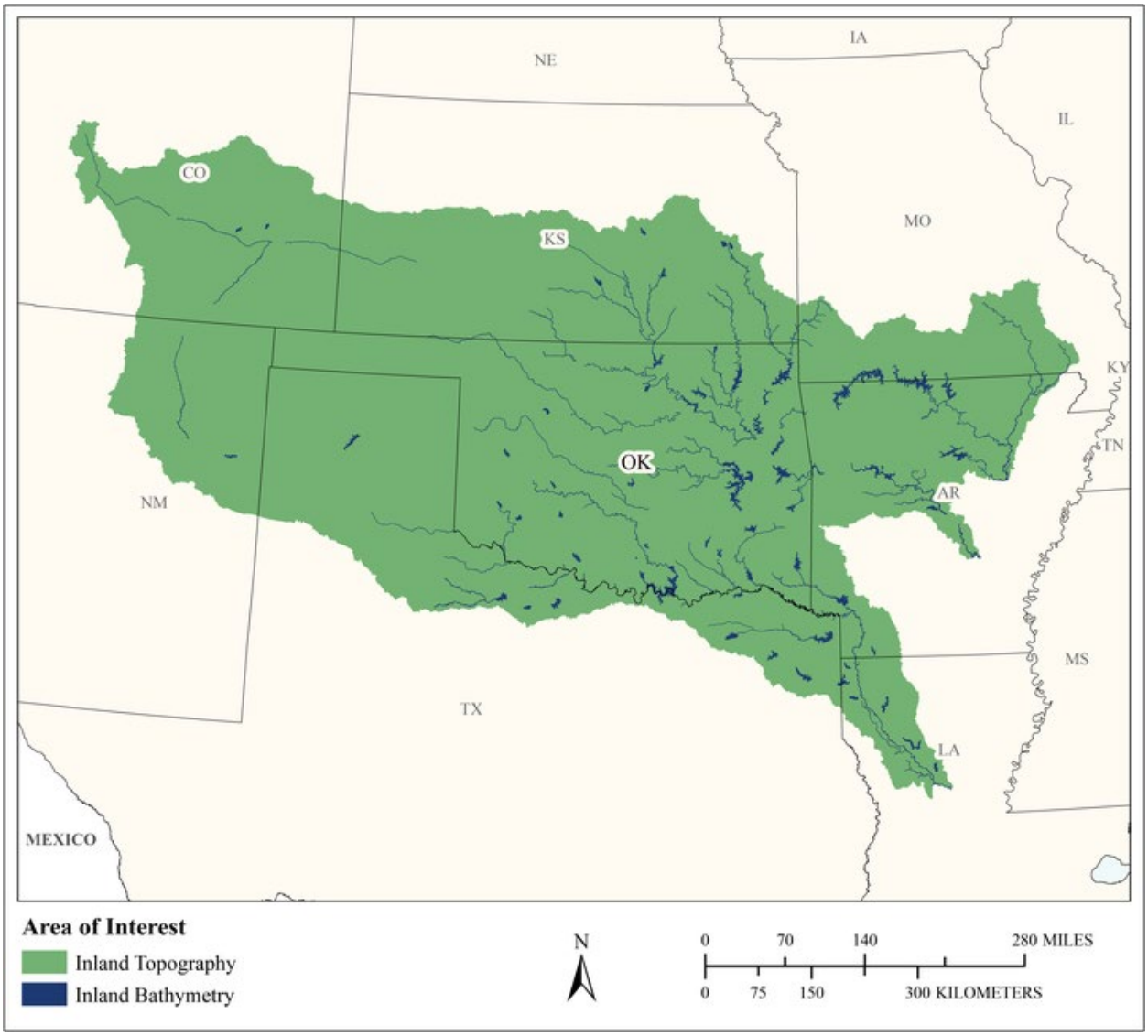
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Major	Moderate		
Cost avoidance	Major	Major		
Increased revenues	None	None		
Mission-driven performance improvements	Moderate	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Major		
Improved response or timeliness	Minor	Major		
Improved customer experience	Minor	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Major		
Environmental	Major	Major		
Public safety, including life and property	None	None		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Time savings description	If we have access to high resolution elevation data, this will greatly speed up the analysis that would otherwise require site visits. Spatial extent of projects could be enlarged with availability of such data.			If we have access to high resolution elevation data, this will greatly speed up the analysis that would otherwise require site visits. Spatial extent of projects could be enlarged with availability of such data.								
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Moderate	Unable to provide		Moderate	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements description	Species distribution modeling: high resolution elevation data is absolutely essential.			Species distribution modeling: high resolution elevation data is absolutely essential.								
Future annual operational benefits added during validation		Annual dollars saved/ realized	$16,650		Annual dollars saved/ realized	$133,441						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness description	Land cover mapping could be improved with better elevation data.											
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Improved customer experience description	Individual stakeholders who receive data services will get better quality data products, as our products and services are improved. Always working to improve tools and applications, so data that can improve those are of major benefit.											
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$48,091		Annual dollars saved/ realized	$80,657						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Education or outreach description	Education and outreach are within our mission statement			Education and outreach are within our mission statement								
Environmental	Major			Major								
Public safety, including life and property	Minor			None								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps	Yes	Yes		
Cross sections				
Height-Above-Ground maps	Yes	Yes		
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geohazards and Landslides



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Custom description	Custom description		
Sub Area Requirements	HUC2 that covers Oklahoma	HUC2 that covers Oklahoma		

MCA Description	Response
Mission Critical Activity	OGS research focuses primarily on mapping geology, geohazards (mass movement, landslides and soil, etc.) and industrial minerals; seismology; surface and sub-surface hydrology; and hydrocarbon resources. Additionally, OGS is involved in various outreach activities, such as K-12 education, field training, and organizing workshops.
MCA Title	Geohazards and Landslides
MCA ID	21541
Organization Type	State or U.S. Territorial government
Organization Name	Oklahoma Geological Survey
Sub-Agency or Division	
Organization Mission	Investigating the state's land, water, mineral, and energy resources, and disseminating the results of those investigations to promote the wise use of Oklahoma's natural resources consistent with sound environmental practices.
Program Name	Oklahoma Geological Survey
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 13 - Oil and Gas Resources
Tertiary Business Use	BU 11 - Geologic Resource Mining and Extraction

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Landslide, road segment, rock outcrop, soil deposit, drainage.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Highly desirable
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have

Inland Bathy Feature Size Requirements	Response
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL1B		
Update Frequency	2-3 years	2-3 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI	Depends on the features being studied (i.e., landslides, or Geological Mapping). Annual updates are needed for landslides, one-time mapping is OK for karst and fault mapping.			
Acceptable Horizontal Error	Up to 80 cm	Up to 1 meter		
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs		Partial		
Cross section/transect requirement		Full surface is preferred. If cross sections, 10 cm accuracy, 20 meter spacing		

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Nice to have	Nice to have			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level			Up to double the required TVU at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Highly desirable	Highly desirable		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required	Nice to have		
Ground control/ground truthing	Nice to have	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Nice to have		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required	Not required		
Land use/land cover	Highly desirable	Nice to have		
Wetlands	Required	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Highly desirable		
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Nice to have	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	1 and 2m LiDAR Bare Earth data downloaded from 3DEP	Used some data from OWRB, plan to use more in the future.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI	Yes			
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Oklahoma			
Other		Yes		
Other description		OWRB		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	I don't know		
Cost savings/cost reduction	Major	I don't know		
Cost avoidance	Major	I don't know		
Increased revenues	None	I don't know		

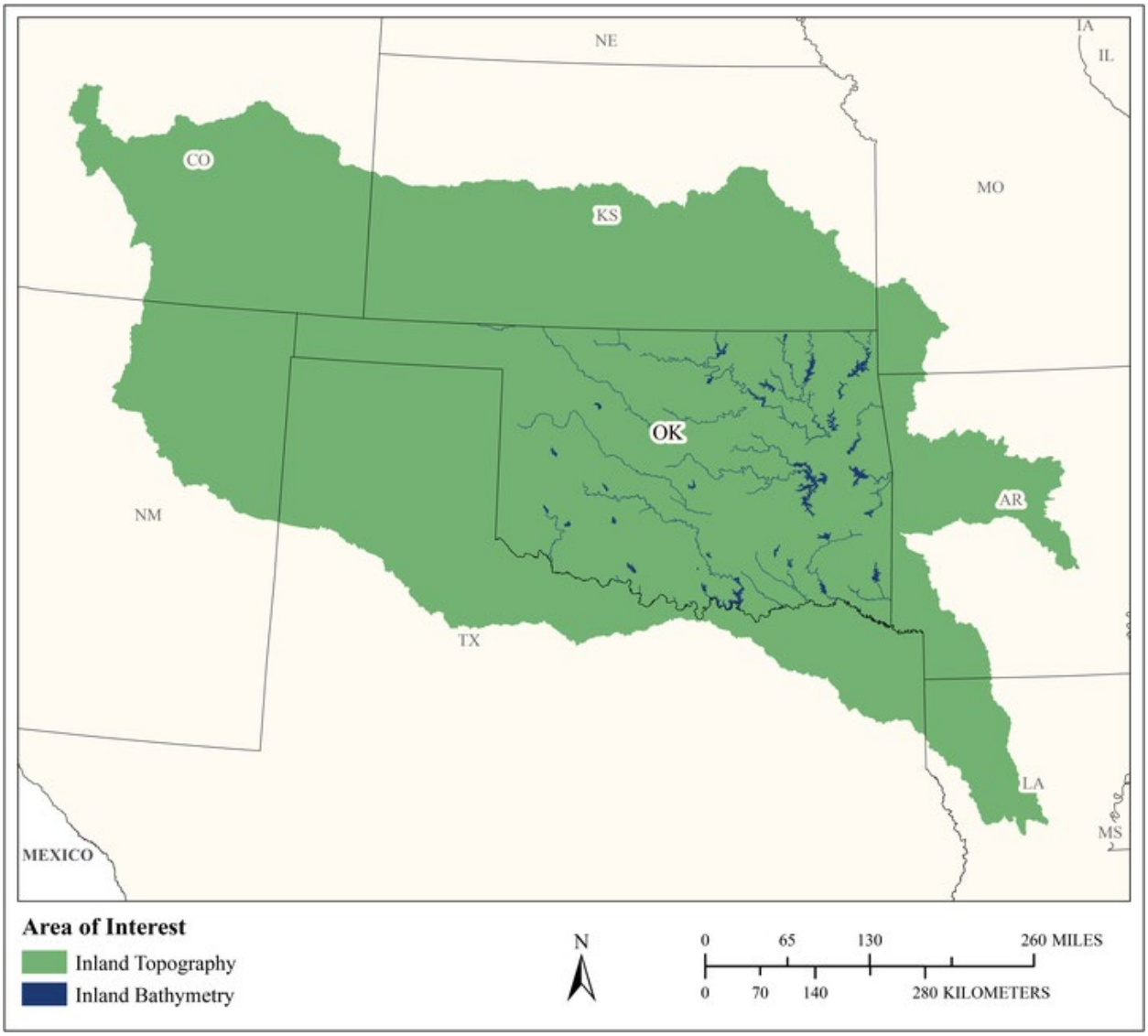
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Mission-driven performance improvements	Major	I don't know		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None	I don't know		
Improved response or timeliness	Moderate	I don't know		
Improved customer experience	None	I don't know		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major		
Environmental	Moderate	Minor		
Public safety, including life and property	Major	I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		I don't know	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Moderate	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Major			Moderate								
Public safety, including life and property	Major			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps	Yes	Yes		
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes	Yes		
Other (please specify)	Yes	Yes		
Other description	Various terrain modeling			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Hazard Mitigation – Dam Safety and Floodplain Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Hazard Mitigation – Dam Safety, Floodplain Management. H&H modeling, dam breach and inundation modeling, flood studies, and NFIP floodplain administration.
MCA Title	Hazard Mitigation – Dam Safety and Floodplain Management
MCA ID	21480
Organization Type	State or U.S. Territorial government
Organization Name	Oklahoma Water Resources Board
Sub-Agency or Division	
Organization Mission	The mission of the OWRB is to protect and enhance the quality of life for Oklahomans by managing and improving the state's water resources to ensure clean and reliable water supplies, a strong economy, and a safe and healthy environment.
Program Name	Hazard Mitigation
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 22 - Infrastructure and Construction Management
Tertiary Business Use	BU 08 - Agriculture and Precision Farming

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Dams, culverts

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required

Inland Bathy Feature Size Requirements	Response
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL3B		
Update Frequency	2-3 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters		
Acceptable Vertical Error	Up to 10 cm	Up to 50 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs		Partial		
Cross section/transect requirement		Unsure		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Highly desirable

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable		
DTM	Highly desirable	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Not required	Not required		
Classified point cloud	Not required	Not required		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Nice to have		
Ground control/ground truthing	Not required	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Required	Highly desirable		
Wetlands	Nice to have	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Highly desirable		
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have		
Cultural resources	Highly desirable	Nice to have		
Coastal and riverine structures	Required	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We utilize elevation data downloaded from the USDA Data Warehouse and National Map. It varies across the state both in quality and the date it was obtained.	Self (OWRB) collected Bathy data sets at approximately QL2b - Single Beam Echo Sounder with DGPS		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	OK Maps, which is maintained by the Oklahoma GIS Data Clearinghouse	Oklahoma Water Resources Board		
Data that meet my needs are not available				

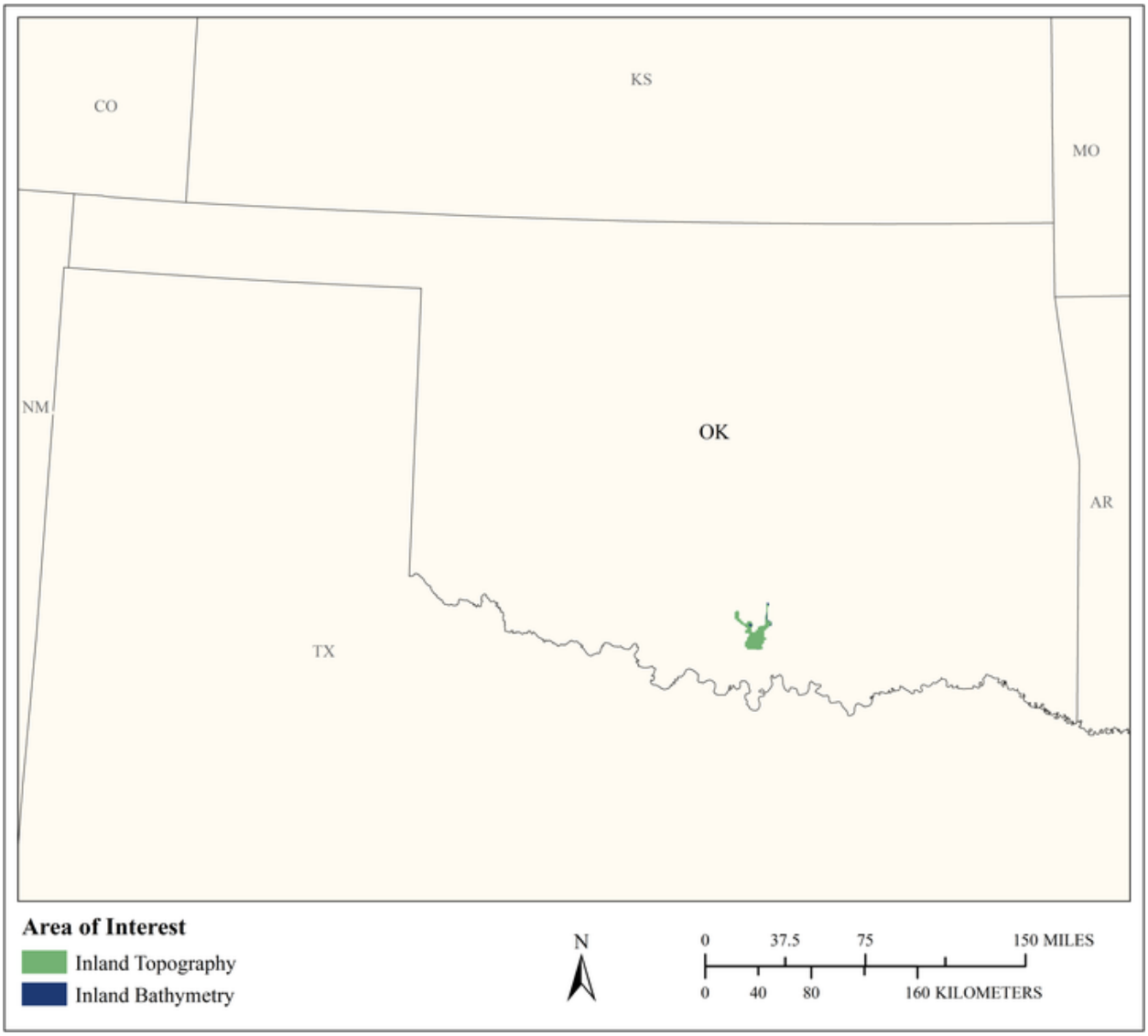
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	Major	Minor		
Increased revenues	I don't know	None		
Mission-driven performance improvements	Major	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		
Improved response or timeliness	Major	Minor		
Improved customer experience	Major	Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor		
Environmental	Moderate	Moderate		
Public safety, including life and property	Major	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$1,206	Major	Annual dollars saved/realized	$603						
Time savings description	More efficient modeling and mapping.			More efficient modeling and mapping.								
Cost savings/cost reduction	Major	Annual dollars saved/realized	$700	Major	Annual dollars saved/realized	$350						
Cost savings/cost reduction description	Savings due to less man hours for field data acquisition.			Savings due to less man hours for field data acquisition.								
Cost avoidance	Major	Annual dollars saved/realized	$101,000	Major	Annual dollars saved/realized	$500						
Cost avoidance description	Savings due to less man hours for data correction. One house saved per breach map. Savings due to less man hours for processing field data.			Savings due to less man hours for data correction. Less damage due to flooding. Savings due to less man hours for processing field data.								
Increased revenues	None			None								
Mission-driven performance improvements	Major	Unable to provide		Major	Annual percent improvement	10%						
Mission-driven performance improvements description	More efficient products for hazard mitigation. Better data available to mitigate hazards. More accurate data for hazard mitigation.			More efficient products for hazard mitigation. Better data available to mitigate hazards. More accurate data for hazard mitigation.								
Future annual operational benefits added during validation		Annual dollars saved/ realized	$9,695,230		Annual dollars saved/ realized	$679,203						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Value added to products or services description	Better flood hazard and dam inundation maps.			Better flood hazard and dam inundation maps.								
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness description	More efficient reviews of flood plain and inundation boundaries. More up to date flood and inundation map data.			More up to date flood and inundation data. More up to date flood and inundation maps.								
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Improved customer experience description	Increased data availability and accuracy from agency download website. More detailed data and maps result in increased confidence of users/viewers of the data.			Increased data availability and accuracy from agency download website. More detailed data and maps result in increased confidence of users/viewers of the data.								
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,714,361		Annual dollars saved/ realized	$764,188						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate								
Environmental	Moderate			Moderate								
Public safety, including life and property	Major			Major								
Public safety, including life and property description	Less damage due to flooding			Less damage due to flooding								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Emergency Planning and Response / Hazard Mitigation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Respondent provided own shapefile, KML, or geodatabase	Respondent provided own shapefile, KML, or geodatabase		
Sub Area Requirements	City of Ardmore, OK	City of Ardmore, OK		

MCA Description	Response
Mission Critical Activity	Emergency Planning and Response / Hazard Mitigation for the City of Ardmore, OK. Need survey data at 6" – 1' vertical accuracy, any data of worse accuracy can only be used for reference. One-foot contours are needed for most activities. City activities that depend on elevation data include: flood risk modeling and mapping of stream centerlines and floodplains, flood risk analysis, dam/dike/levee safety analysis, emergency management, flood forecasts, potential buy out areas that repeatedly flood, and local Flood Hazard Mitigation Plans. The city works in conjunction with FEMA and the Oklahoma Office of Emergency Management on local hazard mitigation plans. Elevation data are also needed for determination of natural fuel and fire susceptibility, fire behavior modeling to support wildfire suppression activities, wild land/urban interface building identification, infrastructure protection, search and rescue, line-of-sight analysis in urban areas, disaster response, determining what travel routes and infrastructure may be impacted by heavy icing on existing tree canopy, and determining low lying areas where hazardous materials would flow / travel in the event of a spill. Ardmore works on hazard mitigation plans, disaster response and recovery, security planning and site / infrastructure hardening with all fire, law, and EMS agencies.
MCA Title	Emergency Planning and Response / Hazard Mitigation
MCA ID	22065
Organization Type	Regional, County, City, or other local government
Organization Name	City of Ardmore
Sub-Agency or Division	
Organization Mission	Emergency Planning & Response / Hazard Mitigation for the City of Ardmore, OK.
Program Name	Flood risk modeling and mapping of stream centerlines & floodplains. Dam/dike/levee safety analysis. Emergency management. Flood forecasts. Potential buy out areas that repeatedly flood. Local Flood / Hazard mitigation plans. Works in conjunction with FEMA & Oklahoma Office of Emergency Management Determination of natural fuel and fire susceptibility. Fire behavior modeling to support wildfire suppression activities. Wild land/urban interface building identification. Ardmore works in conjunction with FEMA & Oklahoma Office of Emergency Management on local hazard mitigation plans. Infrastructure protection. Search and rescue. Line-of-sight analysis in urban areas. Disaster response. Flood risk analysis. Determining what travel routes & infrastructure may be impacted by heavy icing on existing tree canopy. Determining low lying areas where hazardous materials would flow / travel in the event of a spill. Ardmore works on Hazard mitigation plans, disaster response & recovery, security planning & site / infrastructure hardening with all Fire, Law, & EMS agencies. Too comprehensive to list.
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 17 - Wildfire Management, Planning, and Response
Tertiary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required

What Needs to be Measured in 3D	Response
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Survey-level features

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	Cross sections and/or transects meet needs	QL1B		
Update Frequency	6-10 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	The best horizontal accuracy achievable for the vertical accuracy I need		
Acceptable Vertical Error	Up to 10 cm	Up to 20 cm		
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs	Yes			
Cross section/transect requirement	6” to 1' vertical accuracy, 100' spacing			

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required		
DTM	Highly desirable	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Required	Required		
Classified point cloud	Required	Highly desirable		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Highly desirable		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Nice to have	Highly desirable		
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Required	Required		
Cultural resources	Required	Required		
Coastal and riverine structures	Not required	Not required		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Photogrammetric 1' contours, planimetrics, breaklines	OWRB data		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI	Yes			
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	https://okmaps.org	https://okmaps.org		
Other	Yes	Yes		
Other description	Locally Acquired Data	Locally Acquired Data		
Data that meet my needs are not available				

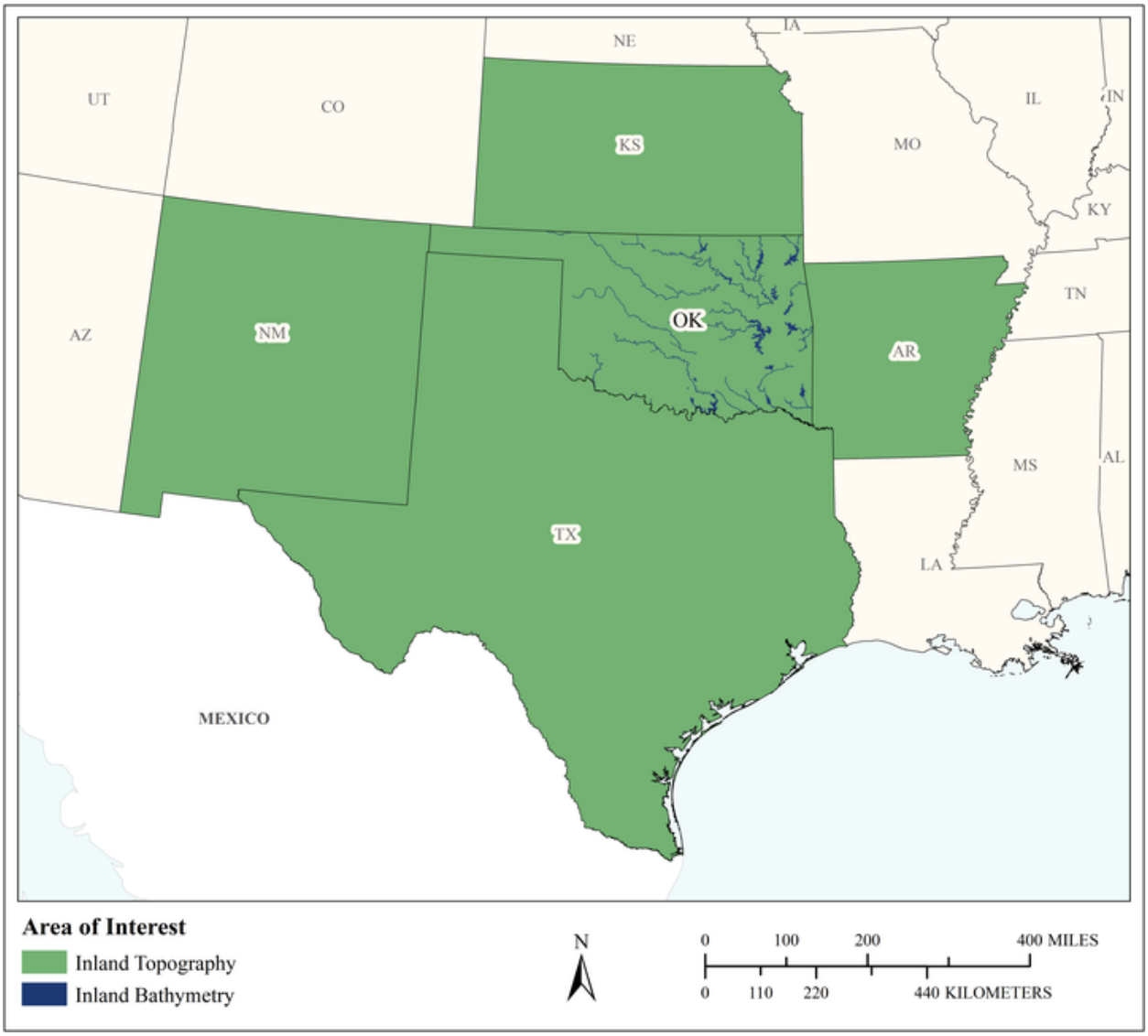
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Moderate		
Cost avoidance	Major	Moderate		
Increased revenues	Moderate	None		
Mission-driven performance improvements	Major	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		
Improved response or timeliness	Major	Major		
Improved customer experience	Major	Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major		
Environmental	Major	Major		
Public safety, including life and property	Major	Major		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Moderate	Unable to provide		Moderate	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Other operational benefits				Moderate	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$16,283		Annual dollars saved/ realized	$1,131						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide							
Other customer service benefits				Moderate	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$2,849		Annual dollars saved/ realized	$1,270						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate								
Environmental	Moderate			Moderate								
Public safety, including life and property	Major			Major								
Other												
Other benefits				Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps	Yes	Yes		
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes	Yes		
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints		Yes		
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Public Safety Investigation and Real Time Analysis



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management Statutory Authority Definition O.S 47 § 2-117.A Full Police Powers O.S 47 § 2-117.B.1 Enforce Traffic Laws and when directed by Governor O.S 47 § 2-117.B.2 Arrest any person detected violating the law O.S 47 § 2-117.B.3 Pursue fleeting violations in state and out of state O.S 47 § 2-117.B.4 Assist in the location of stolen property O.S 47 § 2-117.B.5 Traffic control at emergency scenes O.S 47 § 2-117.B.6 Inspect livestock moving on the highways O.S 47 § 2-117.B.7 Inspect vehicles of registration and equipment O.S 47 § 2-117.B.8 Inspect public garages and salvage yards for stolen cars O.S 47 § 2-117.B.9 Serve district court traffic warrants O.S 47 § 2-117.B.10 Investigate collisions, secure testimony of witnesses O.S 47 § 2-117.B.11 Investigate reported stolen vehicles, trailers and semitrailers O.S 47 § 2-117.B.12 Conduct mechanical inspections to ensure road safety. O.S 47 § 2-117.B.13 Enforce the general laws on vehicles operating on the roadways O.S 47 § 2-117.B.14 Enforce registration and licensing laws O.S 47 § 2-117.B.15 Enforce all laws regarding the operation of vehicles on a highway O.S 47 § 2-117.B.16 Perform size and weights enforcements to prevent damage to roads O.S 47 § 2-117.B.17 Investigate/Report to OCC/OTC any violation of their rules ref to transportation O.S 47 § 2-117.B.18 Investigate violation of laws regulated to excise tax and motor fuels O.S 47 § 2-117.B.19 Regulate the movement of traffic on the highway system O.S 47 § 2-117.B.20 Investigate damage to state property along the highway system O.S 47 § 2-117.B.21 Investigate all incidents involving department employees in the course of their duty O.S 47 § 2-117.B.22 Initiate or assist in manhunt/fugitive investigations O.S 47 § 2-105.3.A Dignitary Protection for the Governor O.S 47 § 2-105.7 Capitol Patrol Functions O.S 47 § 2-105.4B Bomb Squad O.S 47 § 2-105.6 Marine Enforcement O.S 47 § 2-106.3 Fraudulent Document Investigations O.S 47 § 2-118 Training Division O.S 47 § 954 Wrecker Inspection O.S 21 § 99A Assist Law Enforcement O.S 47 § 2-117.E.3 Conduct speed trap investigations O.S 47 § 2-118 Administration of the department O.S 74 § 150.12A Take reports on missing persons O.S 4 § 85.5 Responding to and investigate stray animals on highway (livestock) O.S 12A § 4-1-102.9.c Hazardous material spills outside of a municipality The Oklahoma Department of Public Safety is responsible by law for the above activities. Elevation data are needed for real world operations under water, in air, and on land. The data are used to identify structures that would impede flight and for search and rescue. Bottoms of lakes and rivers are needed by divers, also watersheds, river channels and their currents. On-the-scene sonar is often collected, but existing data are also needed for change detection, to identify changes in land, wells or ponds that have changed including hand dug wells, before and after crime scene investigations (new depressions can indicate burials, etc.); altitude is also needed for real time analysis and investigation. Urban structures are needed for use in voxel based software. Drone units are coming on line for use within the department as well.
MCA Title	Public Safety Investigation and Real Time Analysis
MCA ID	21646
Organization Type	State or U.S. Territorial government
Organization Name	Oklahoma Department of Public Safety

Sub-Agency or Division	
Organization Mission	The Oklahoma Department of Public Safety (OKDPS) is a department of the government of Oklahoma. Under the supervision of the Oklahoma Secretary of Safety and Security, DPS provides for the safety of Oklahoman's and the administration of justice in the state. DPS is responsible for statewide law enforcement, vehicle regulation, homeland security and such other duties as the Governor of Oklahoma may proscribe. DPS has the duty to provide for the protection and security of the Governor and Lieutenant Governor. The Department is led by the Commissioner of Public Safety. The Commissioner is appointed by the Governor of Oklahoma, with the approval of the Oklahoma Senate, to serve at his/her pleasure.
Program Name	Statutory Authority Definition O.S 47 § 2-117.A Full Police Powers O.S 47 § 2-117.B.1 Enforce Traffic Laws and when directed by Governor O.S 47 § 2-117.B.2 Arrest any person detected violating the law O.S 47 § 2-117.B.3 Pursue fleeting violations in state and out of state O.S 47 § 2-117.B.4 Assist in the location of stolen property O.S 47 § 2-117.B.5 Traffic control at emergency scenes O.S 47 § 2-117.B.6 Inspect livestock moving on the highways O.S 47 § 2-117.B.7 Inspect vehicles of registration and equipment O.S 47 § 2-117.B.8 Inspect public garages and salvage yards for stolen cars O.S 47 § 2-117.B.9 Serve district court traffic warrants O.S 47 § 2-117.B.10 Investigate collisions, secure testimony of witnesses O.S 47 § 2-117.B.11 Investigate reported stolen vehicles, trailers and semitrailers O.S 47 § 2-117.B.12 Conduct mechanical inspections to ensure road safety. O.S 47 § 2-117.B.13 Enforce the general laws on vehicles operating on the roadways O.S 47 § 2-117.B.14 Enforce registration and licensing laws O.S 47 § 2-117.B.15 Enforce all laws regarding the operation of vehicles on a highway O.S 47 § 2-117.B.16 Perform size and weights enforcements to prevent damage to roads O.S 47 § 2-117.B.17 Investigate/Report to OCC/OTC any violation of their rules ref to transportation O.S 47 § 2-117.B.18 Investigate violation of laws regulated to excise tax and motor fuels O.S 47 § 2-117.B.19 Regulate the movement of traffic on the highway system O.S 47 § 2-117.B.20 Investigate damage to state property along the highway system O.S 47 § 2-117.B.21 Investigate all incidents involving department employees in the course of their duty O.S 47 § 2-117.B.22 Initiate or assist in manhunt/fugitive investigations O.S 47 § 2-105.3.A Dignitary Protection for the Governor O.S 47 § 2-105.7 Capitol Patrol Functions O.S 47 § 2-105.4B Bomb Squad O.S 47 § 2-105.6 Marine Enforcement O.S 47 § 2-106.3 Fraudulent Document Investigations O.S 47 § 2-118 Training Division O.S 47 § 954 Wrecker Inspection O.S 21 § 99A Assist Law Enforcement O.S 47 § 2-117.E.3 Conduct speed trap investigations O.S 47 § 2-118 Administration of the department O.S 74 § 150.12A Take reports on missing persons O.S 4 § 85.5 Responding to and investigate stray animals on highway (livestock) O.S 12A § 4-1-102.9.c Hazardous material spills outside of a municipality
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	BU 28 - Telecommunications
Tertiary Business Use	BU 17 - Wildfire Management, Planning, and Response

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable

What Needs to be Measured in 3D	Response
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required
Other	Highly desirable
Other description	Aviation Obstacles such as towers, poles, high line wires, or other such objects that create risk for search and rescue or manhunt situations supported by our aviation units

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Sign, curb, road line, mailbox, tree, car, mooring anchor, small dock, house, building, road, underwater wreck, etc.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	Cross sections and/or transects meet needs		
Update Frequency	2-3 years	2-3 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter		

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Vertical Error	Up to 1 meter	Up to 1 meter		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs		Yes		
Cross section/transect requirement		1 meter vertical accuracy, 3 meter spacing		

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Nice to have	Nice to have			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Nice to have			Nice to have	
DEM for entire AOI needs to be seamless	Nice to have	Nice to have			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Highly desirable	Highly desirable		
DEM	Highly desirable	Highly desirable		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Nice to have	Nice to have		
Edited/cube XYZ		Highly desirable		
Full waveform	Not required	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Not required	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Nice to have	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Highly desirable		
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Not required	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Esri, Open data sources	Esri, Open data sources		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes	Yes		
Other description	Esri	Esri		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know	Inland bathy data not available		
Cost savings/cost reduction	I don't know	Inland bathy data not available		
Cost avoidance	I don't know	Inland bathy data not available		

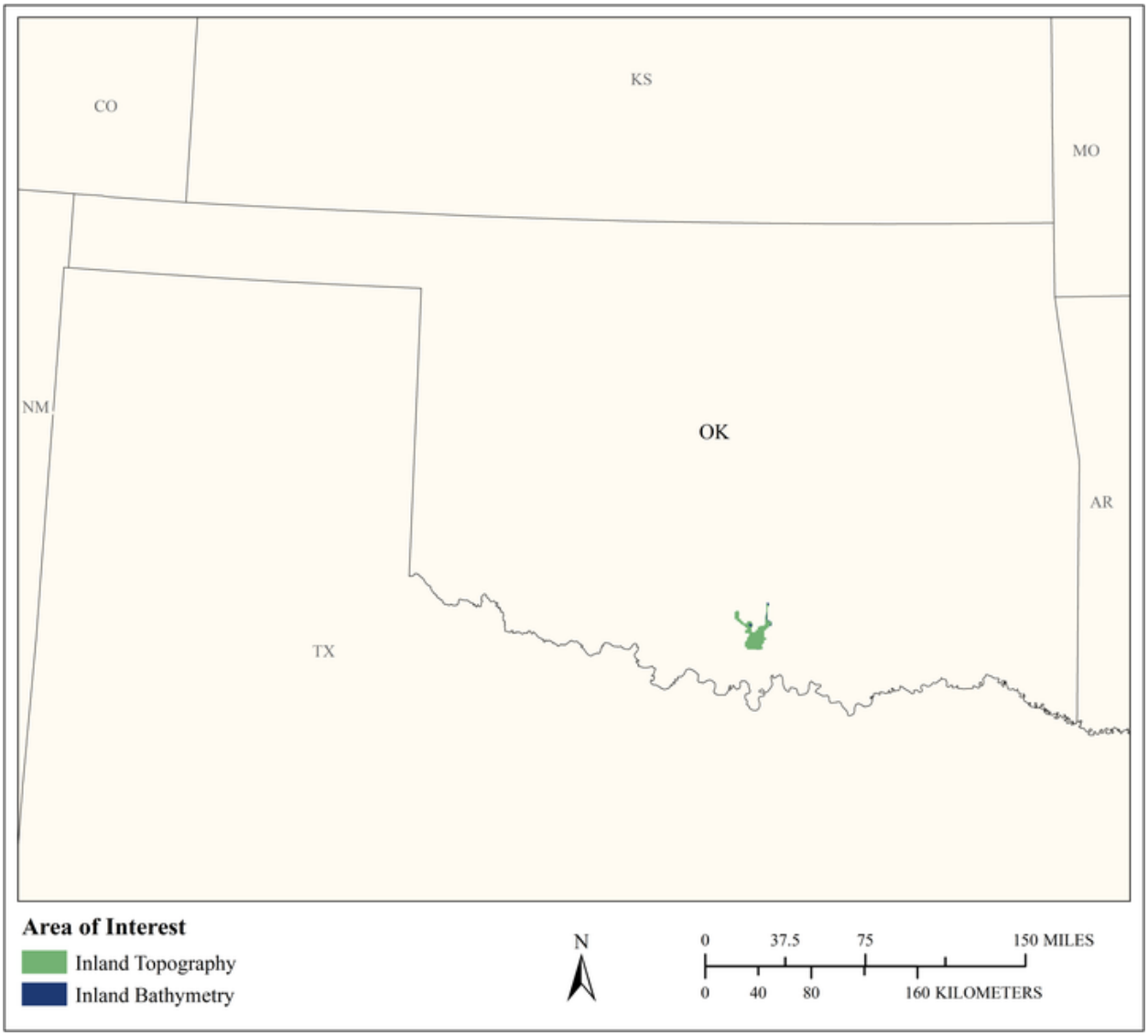
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	I don't know	Inland bathy data not available		
Mission-driven performance improvements	I don't know	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know	Inland bathy data not available		
Improved response or timeliness	I don't know	Inland bathy data not available		
Improved customer experience	I don't know	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	Inland bathy data not available		
Environmental	I don't know	Inland bathy data not available		
Public safety, including life and property	I don't know	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide							
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide							
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	I don't know	Unable to provide		I don't know	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,062,066		Annual dollars saved/ realized	$580,730						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	I don't know	Unable to provide		I don't know	Unable to provide							
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$36,446		Annual dollars saved/ realized	$37,051						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			I don't know								
Environmental	I don't know			I don't know								
Public safety, including life and property	Major			I don't know								
Public safety, including life and property description	Lives save, bodies recovered, closure for families											
Other												
Other benefits	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades				
Slope maps	Yes	Yes		
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Urban Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Respondent provided own shapefile, KML, or geodatabase	Respondent provided own shapefile, KML, or geodatabase		
Sub Area Requirements	City of Ardmore, OK	City of Ardmore, OK		

MCA Description	Response
Mission Critical Activity	Providing the citizens of Ardmore a well-planned, developed safe community with ample community resources. Planning for development, impact studies, H&H modeling, FIRM data, finished floor elevations, ensuring new construction is built above the BFE. Oklahoma survey data are used for four lakes within the city for volume calculations, search and recovery (diving), etc.
MCA Title	Urban Planning
MCA ID	1134
Organization Type	Regional, County, City, or other local government
Organization Name	City of Ardmore
Sub-Agency or Division	
Organization Mission	Providing the citizens of Ardmore a well-planned, developed safe community with ample community resources.
Program Name	Road route selection, development, and maintenance. Various projects working in conjunction with local developers, Carter County, & Oklahoma Department of Transportation to maintain & develop better travel corridors within Ardmore. Land development and zoning. Municipal mapping of building footprints and elevations. Parks and transportation planning. Urban ecology planning. Erosion control. Rainfall penetration studies, impervious surfaces. Ensuring a new developed site does not adversely impact the surrounding downstream areas due to excessive runoff rates & volumes. Ardmore Development Services works with local developers & Ardmore Development Authority to strategically build a better, more pleasing & self-sustaining community. Adequate citywide absorbtion of runoff without excessive erosion within Ardmore. Works in conjunction with Oklahoma Department of Environmental Quality, Environmental Protection Agency Health emergency response. Habitat modeling and disease prevention. Public health and safety. Prevention of waterborne diseases. Mosquito Control Program. Ardmore works with the Carter County & Oklahoma Health Department to conduct several health related programs where elevation data is used in planning & analysis.
Total Annual Program Budget	
Primary Business Use	BU 19 - Land Navigation and Safety
Secondary Business Use	BU 23 - Urban and Regional Planning
Tertiary Business Use	BU 24 - Health and Human Services

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)

General Geographic Area and Size	
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Survey-level features

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL1B		
Update Frequency	4-5 years	>10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Less than 50 cm		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Nice to have	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required		
DTM	Highly desirable	Required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Required		
Classified point cloud	Highly desirable	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required	Required		
Land use/land cover	Nice to have	Nice to have		
Wetlands	Nice to have	Nice to have		
Estuaries				
Inland surface water features	Highly desirable	Required		
Bridges/culverts	Highly desirable	Required		
Landmark features	Highly desirable	Required		
Cultural resources	Highly desirable	Required		
Coastal and riverine structures	Not required	Not required		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Photogrammetric 1' contours, planimetrics, breaklines	OWRB data		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes	Yes		
Other description	Locally acquired data	Oklahoma Water Resources Board		
Data that meet my needs are not available				

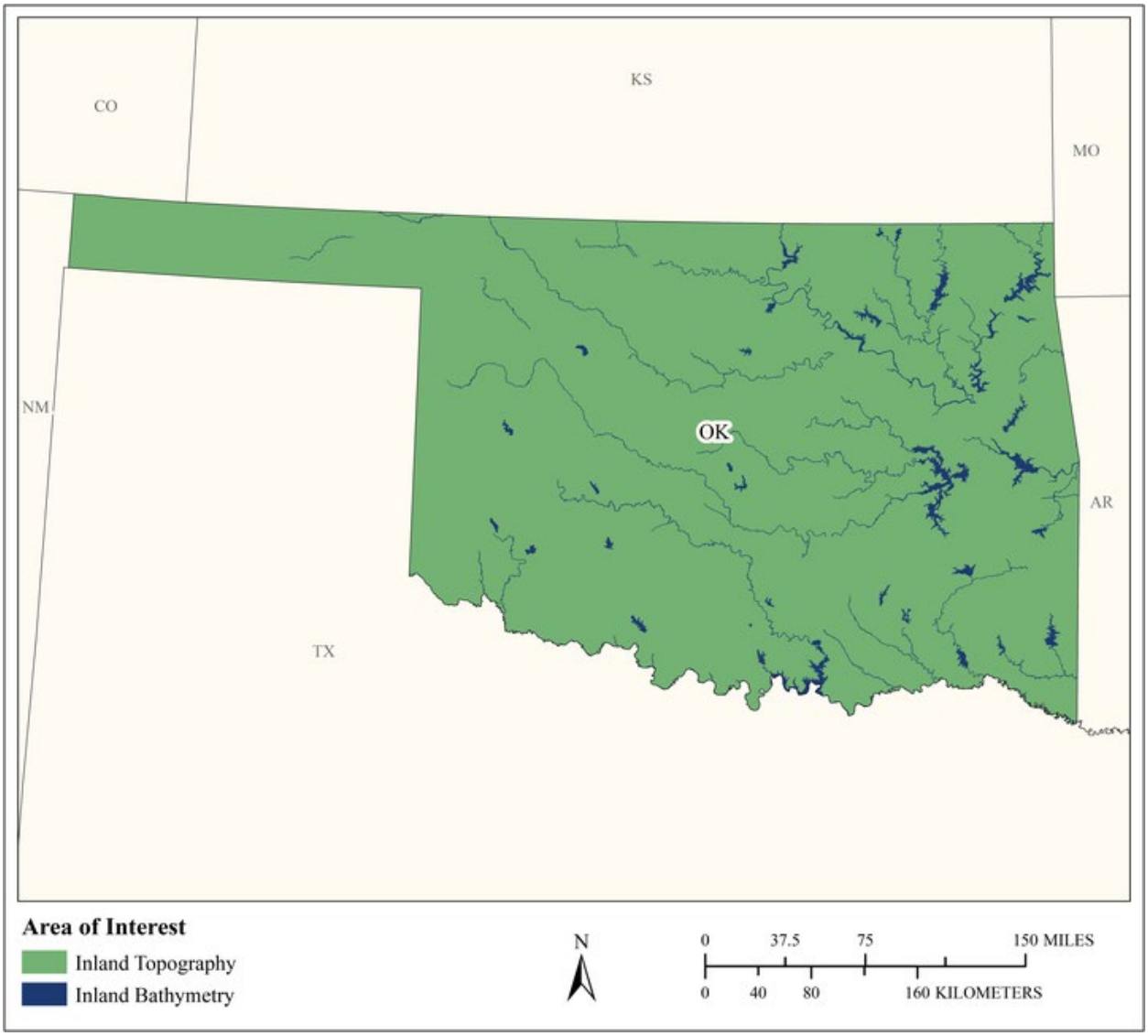
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Major		
Increased revenues	Moderate	Minor		
Mission-driven performance improvements	Moderate	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		
Improved response or timeliness	Major	Moderate		
Improved customer experience	Major	Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Major		
Environmental	Moderate	Moderate		
Public safety, including life and property	Major	Major		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Moderate	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Other operational benefits	Major	Unable to provide										
Other operational benefits description												
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide							
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide							
Other customer service benefits	Moderate	Unable to provide		Moderate	Unable to provide							
Other customer service benefits description												
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major								
Environmental	Moderate			Major								
Public safety, including life and property	Major			Major								
Other												
Other benefits	Moderate			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Transportation Network and Infrastructure



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Transportation network and infrastructure planning, surveying, designing, building and maintaining.
MCA Title	Transportation Network and Infrastructure
MCA ID	22384
Organization Type	State or U.S. Territorial government
Organization Name	Oklahoma Dept of Transportation
Sub-Agency or Division	
Organization Mission	The mission of the Oklahoma Department of Transportation is to provide a safe, economical and effective transportation network for the people, commerce and communities of Oklahoma.
Program Name	8 year plan
Total Annual Program Budget	
Primary Business Use	BU 19 - Land Navigation and Safety
Secondary Business Use	BU 22 - Infrastructure and Construction Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Along roadways
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Survey-level features

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B		
Update Frequency	2-3 years	2-3 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Less than 50 cm		
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required			Not required	
Entire AOI under same environmental conditions	Highly desirable	Nice to have			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Nice to have			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Nice to have		
DTM	Highly desirable	Highly desirable		
DEM	Required	Highly desirable		
Raw point cloud data	Nice to have	Highly desirable		
Classified point cloud	Nice to have	Highly desirable		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Not required		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Nice to have	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Not required		
Land use/land cover	Nice to have	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Highly desirable		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Not required	Not required		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Surveys collected by our crews, LiDAR and photogrammetric data	Our survey crews		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	ODOT's Servers			
Other		Yes		
Other description		Survey crews		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	I don't know		
Cost savings/cost reduction	Moderate	I don't know		
Cost avoidance	Minor	I don't know		
Increased revenues	Minor	I don't know		

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Mission-driven performance improvements	Minor	I don't know		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	I don't know		
Improved response or timeliness	Moderate	I don't know		
Improved customer experience	Moderate	I don't know		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	I don't know		
Environmental	I don't know	I don't know		
Public safety, including life and property	I don't know	I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		Moderate	Unable to provide							
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Minor	Unable to provide		Moderate	Unable to provide							
Increased revenues	Minor	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Minor	Unable to provide		Moderate	Unable to provide							
Other operational benefits	Minor	Unable to provide										
Other operational benefits description	Planning.											
Future annual operational benefits added during validation		Annual dollars saved/ realized	$905,513		Annual dollars saved/ realized	$38,624						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	Minor	Unable to provide		Minor	Unable to provide							
Improved customer experience	Minor	Unable to provide		Minor	Unable to provide							
Other customer service benefits	Minor	Unable to provide										
Other customer service benefits description	Better drainage studies.											
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$73,124		Annual dollars saved/ realized	$399						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know								
Environmental	I don't know			I don't know								
Public safety, including life and property	I don't know			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

Oregon

Current status of elevation data for Oregon

The Oregon Department of Geology and Mineral Industries (DOGAMI) has been supervising and coordinating the collection of high-resolution, high-accuracy lidar data in the Pacific Northwest since 2006. In 2007, DOGAMI created the Oregon Lidar Consortium (OLC) for the purpose of acquiring lidar over the entire state of Oregon. To date, the OLC has ordered 72 lidar flights, supported by funding from more than 80 different federal, tribal, state, city, and private partners. Taken together with data collected by other agencies and stakeholders, 49% of Oregon (48,220 square miles) has lidar coverage, including 98% of Oregon's populated areas. Bathymetric lidar coverage in Oregon is limited in scope and lags behind the pace of terrestrial lidar collection. Riverine and lake bathymetry data only exist for small tributaries or reservoirs while nearshore bathymetry is collected exclusively by the National Coastal Mapping Program on a five-year cycle.

The Oregon Geospatial Enterprise Office (GEO) assists in coordinating data standardization and stewardship for lidar collected in Oregon. Since 2007, Oregon lidar data standards and procedures have been amended to reflect changes in lidar sensor technology and to maintain the most stringent specifications for lidar accuracy. Oregon State Price Agreement 7525 Amendment 8 (https://www.oregongeology.org/lidar/DAS-Quantum_7525Amendment8.pdf) provides specifications for Quality Level 1 (QL1) terrestrial and bathymetric 3DEP lidar collection in Oregon. The Oregon Elevation Framework Implementation Team (Elevation-FIT), an elevation workgroup within GEO, developed a Lidar Prioritization Plan (https://www.oregon.gov/geo/FIT%20Documents/2014%20Oregon%20Lidar%20Prioritization%20Plan.pdf) that prioritizes watersheds based on need or use. The Lidar Prioritization Plan is used as a guideline for developing and funding future lidar collections in Oregon.

Importance of elevation data to Oregon

Oregon's dynamic topography comprises various geologic terranes and diverse ecosystems. Uses for lidar and bathymetry elevation data vary across Oregon, but lidar data products are needed for a broad range of business and scientific and academic applications. Elevation data products are used by governments at all levels for the assessment, monitoring, and management of infrastructure, agriculture, and emergency management. High-resolution lidar data products are vital for natural resource management within forestry, geology, and watersheds. Underpinning the importance of lidar for managing natural and man-made resources is the need to mitigate risk of natural hazards.

The dynamic nature of the state's geology and Oregon's population growth makes natural hazard mitigation a top priority. High-density, highly accurate elevation data are critical tools for understanding natural hazards and developing resiliency in Oregon:

- Tsunami - The Cascadia Subduction Zone, a 960-kilometer-long (600 mile) earthquake fault zone sits off the Pacific Northwest coast. High-density, high-resolution terrestrial lidar and nearshore bathymetry lidar data have been vital for tsunami inundation modeling and developing evacuation routes for coastal Oregon communities that can be affected by tsunamis. https://www.oregongeology.org/tsuclearinghouse/beatthewave.htm
- Flooding - Flooding is a common and costly natural hazard along rivers and the coast in Oregon. The National Flood Insurance Program (NFIP) identifies 251 communities in Oregon as flood prone, including locations in all 36 counties, 212 cities, and 3 tribal nations. Elevation data are being used to improve our understanding of flood inundation locations. https://www.oregongeology.org/flood/default.htm

- Landslide - Landslides are a common, chronic problem in Oregon, especially in places with or near moderate to steep slopes, during times of heavy precipitation, and during earthquakes. Landslides can be catastrophic. High-density lidar is changing our fundamental understanding of landslide hazards through the discovery of landslide deposits and the tracking of movement. Understanding past landslide hazards is key to predicting future landslides. https://www.oregongeology.org/slido/index.htm
- Earthquake - Earthquake hazards have been recognized as one of the major natural hazards in Oregon. The generation of bare ground lidar products assists with the discovery and analysis of faults in Oregon. First return lidar data also help identify assets that are at risk, such as the exact locations of buildings and other structures. https://www.oregongeology.org/earthquakes/earthquakehome.htm
- Forest Fire - With over 28 million acres of forested land in Oregon, wildfire management is a major resource investment. Lidar data are helpful for wildfire prevention as well as wildfire containment. As with other hazards, lidar helps identify infrastructure and assets at risk. https://www.oregon.gov/ODF/Fire/Pages/default.aspx

High-level summary of elevation data requirements

As part of the Oregon GEO mission to coordinate data standardization in Oregon, the Oregon Lidar Consortium has worked with Elevation-FIT) (https://www.oregon.gov/geo/Pages/elevframe.aspx) to develop elevation data standards. E-FIT is composed of representatives from federal, state, local, tribal, and private organizations. This group of stakeholders for Oregon elevation data has determined that QL1 inland topography and QL1B inland bathymetry is the preferred data standard across the entire state of Oregon.

QL1B nearshore bathymetry data are required along coastal Oregon due to the development of coastal communities and their vulnerability. The combination of ocean warming, sea level rise, and natural disasters requires updated, highly accurate data for modeling. Order 1a offshore bathymetry is required to support shipping channels and monitor the health of the ocean, which serves the commercial fishing and recreational economies of coastal Oregon.

High-level summary of benefits that would come from higher resolution elevation data

One part of Oregon's strategic mission for lidar data collection is developing plans for recollection of older lidar datasets. Most of western Oregon including coastal communities, Oregon coastal mountain ranges, and the Willamette Valley have lidar coverage that is eight to ten years old. Recollecting these areas with improved lidar technology will result in better data for environmental analysis. Recollecting western Oregon with higher resolution lidar data is a major goal for the Oregon Lidar Consortium over the next five to ten years. Studies in Oregon using lidar differencing show great promise for understanding small to large changes to the earth's surface including landslides and sediment erosion evaluations. These two processes affect human and environmental risk. In order to evaluate these processes accurately, higher resolution elevation data are fundamental.

Additional information:

The West Coast was the focus for a seafloor data prioritization effort in 2019:

https://coastalscience.noaa.gov/project/prioritizing-areas-for-future-seafloor-mapping-research-and-exploration-offshore-of-california-oregon-and-washington/

Results of that work are posted online at:

https://gis.ngdc.noaa.gov/arcgis/rest/services/nccos/BiogeographicAssessments_WestCoastPrioritizationResults/MapServer

https://www.arcgis.com/home/webmap/viewer.html?url=https%3A%2F%2Fgis.ngdc.noaa.gov%2Farcgis%2Frest%2Fservices%2Fnccos%2FBiogeographicAssessments_WestCoastPrioritizationResults%2FMapServer&source=sd

The data show a high priority need for offshore bathymetry/backscatter data in an area about 50-60 kilometers west of Lincoln City and Depoe Bay. Also an area 20-50 kilometers west of Newport is designated as high priority as well. Another area of high priority need is about 80-90 kilometers offshore from the shoreline between Yachats and Newport. Finally, the region about 25-40 kilometers offshore from the mouth of the Columbia River is deemed high priority.

Preparations are underway by JALBTCX to collect high-resolution topobathymetric data for Oregon's coastline along the Pacific Ocean (Columbia River to the California border) in 2020. This effort is a part of the five-year cycle associated with the National Coastal Mapping Program. The data extent will be from 500 meters onshore to 1000 meters offshore.

Some areas of topobathymetric data priorities appear to be around Coos Bay and Yaquina Bay based on interactions with staff at the State of Oregon and interactions with stakeholders (e.g., the South Slough National Estuarine Research Reserve).

From State website:

[The Oregon State University Active Tectonics and Seafloor Mapping Lab maintains an Oregon State Waters Mapping Program, which is an outgrowth of a Seafloor Mapping Task Force formed at Oregon State University in 2006. This group met on numerous occasions through 2007 and 2008 to discuss the needs for nearshore mapping with state legislators, biologists, geologists and members of coastal communities to develop the proposal. Presentations were made to the Joint Committee on Emergency Preparedness and Ocean Policy on four occasions, and to the State Land Board. Further discussions were held with the Department of Land Conservation and Development, DOGAMI, Oregon Department of Fish and Wildlife, and others about the needs and application to the missions of these agencies. Discussion and questions about tsunami modeling, wave energy siting, and marine reserves and the needs for basic seafloor data were addressed at these meetings.

In 2008, detailed bottom mapping existed for only about 5% of the area of the Oregon Territorial Sea, which extends three nautical miles from the coast and comprises approximately 950 square nautical miles. Effective decisions concerning the management and conservation of ocean resources in accordance with Department of State Lands Strategic and Asset Management Plans depend upon better knowledge of nearshore waters. To address this problem the Oregon Department of State Lands initiated a seafloor mapping program within Oregon's Territorial Sea.

The State Waters Mapping Program Downloads Page hosts numerous data products related to the seafloor off the coast of Oregon, including bathymetric maps, backscatter/sidescan sonar images, and seafloor habitat maps.

That site is located here:

http://activetectonics.coas.oregonstate.edu/state_waters_download.htm

The State of Oregon has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

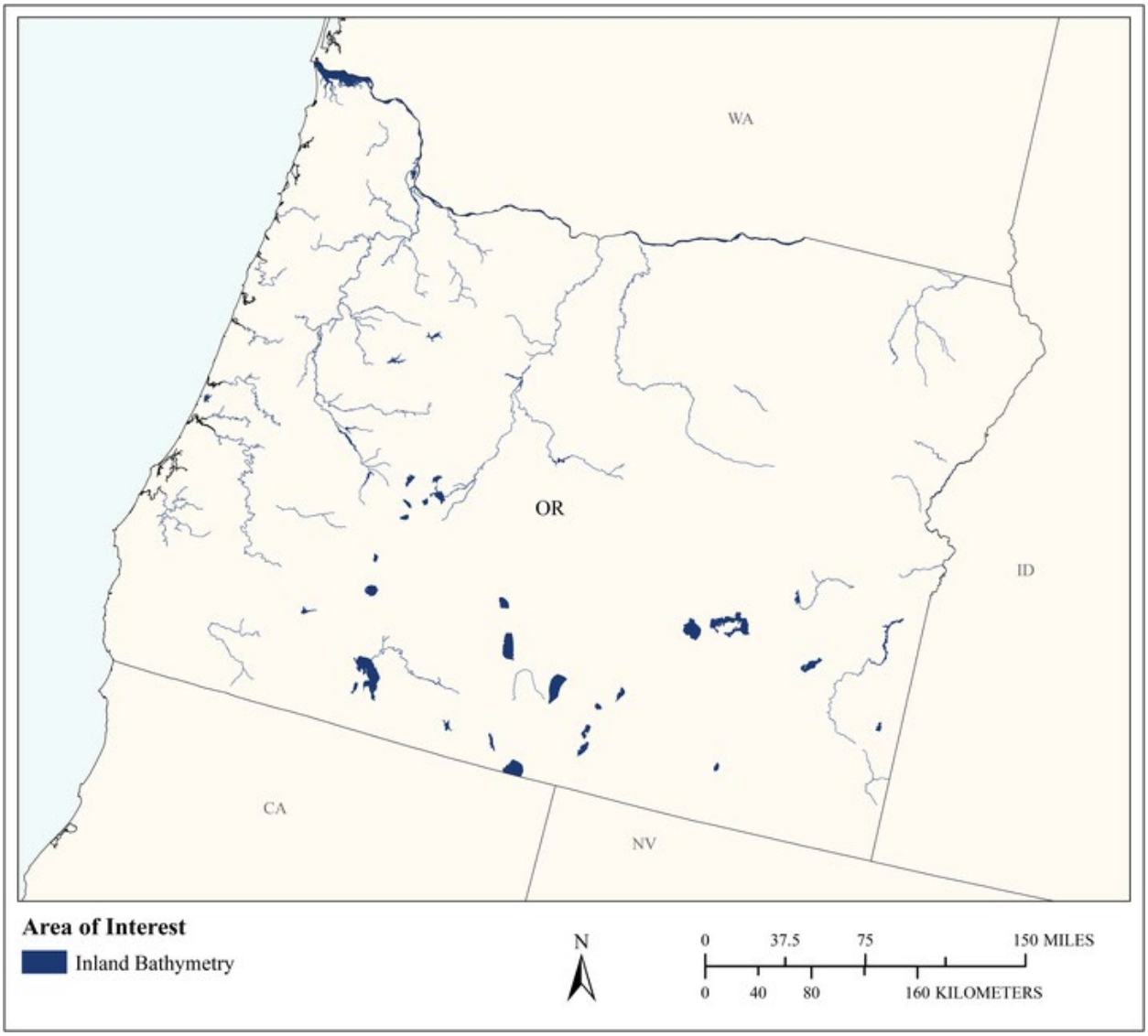
Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	Portland State University, Oregon	21630	Oregon Lakes and Reservoirs Research and Data Provisioning	Inland Bathy	Coarser bathymetric data satisfies my needs	Event driven	$2,000	$7,000	Moderate	I don't know	I don't know
BU 01 – Water Supply and Quality	State of Oregon	60349	Water Supply and Quality	Inland Bathy	QL1B	6-10 years	$2,327,748	$243,259	Moderate	Major	Moderate
				Nearshore Bathy	QL1B	4-5 years	$8,886	$14,639	Moderate	Moderate	Moderate
BU 02 – Riverine Ecosystem Management	State of Oregon	60350	Riverine Ecosystem Management	Inland Topo	QL1 HD	6-10 years	$148,538	$14,836	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$79,072	$5,575	Major	Major	Major
				Nearshore Bathy	QL0B	2-3 years	$26,950	$20,594	Moderate	Moderate	Moderate
BU 03 – Coastal Zone Management	Oregon Coastal Management Program	21606	Coastal Community Resiliency	Inland Topo	QL1	4-5 years	$937,584	$163,909	Moderate	Major	Major
				Nearshore Bathy	QL1B	2-3 years	$30,174	$51,044	Major	Major	Major
BU 03 – Coastal Zone Management	Oregon Parks and Recreation Department	21670	Ocean Shore Management for Protection Structure Permitting and Recreation Access	Inland Topo	QL1	4-5 years	$23,762	$4,139	I don't know	Minor	I don't know
				Nearshore Bathy	QL4B	4-5 years	$30,472	$51,081	I don't know	Minor	I don't know
BU 04 – Forest Resource Management	Oregon Department of Forestry	1360	Statewide Wildfire Management and Forest Management	Inland Topo	QL0 HD	6-10 years	$506,878	$69,103	Minor	Moderate	Moderate
BU 06 – Natural Resource Management	State of Oregon	60351	Natural Resources Conservation	Inland Topo	QL1 HD	4-5 years	$3,806,356	$13,978,100	Major	Major	Major
				Inland Bathy	QL0B	6-10 years	$515,908	$23,225	Major	Major	Major
BU 07 – Wildlife and Habitat Management	State of Oregon	60352	Wildlife and Habitat Management	Inland Topo	QL2	4-5 years	$23,116	$66,767	Moderate	Major	Moderate
				Inland Bathy	QL2B	4-5 years	$185,259	$111,979	Moderate	Moderate	Moderate
				Nearshore Bathy	QL0B	4-5 years	$266	$15	Moderate	Major	Moderate
BU 08 – Agriculture	State of Oregon	60353	Agriculture and Precision Farming	Inland Topo	QL2	2-3 years	$112,356	$89,072	Major	Major	Minor
				Inland Bathy	QL4B	4-5 years	$196,849	$89,072	Moderate	Major	Major

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 09 – Fisheries Management and Aquaculture	State of Oregon	60354	Fisheries Management and Aquaculture	Inland Bathy	QL0B	6-10 years	$194,176	$88,377	Major	Major	Moderate
				Nearshore Bathy	QL0B	6-10 years	$42,329	$3,108	Moderate	Major	Minor
				Offshore Bathy	Special Order	6-10 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Minor
BU 10 – Geologic Assessment	Oregon Dept. Geology and Mineral Industries	1184	Geohazard Mitigation and Geologic Resource Identification and Mapping	Inland Topo	(a) QL0 (b) QL2	(a) 4-5 years (b) 6-10 years	$10,494,296	$218,572	Moderate	Major	Major
				Inland Bathy	QL1B	6-10 years	$1,569,296	$1,108,442	Minor	Moderate	Major
				Nearshore Bathy	QL2B	6-10 years	$112,663	$100,000	Major	Moderate	Major
BU 10 – Geologic Assessment	Governor's Office, State of Oregon	1246	State Infrastructure Resiliency	Inland Topo	QL2	4-5 years	$10,242,526	$179,807	Major	Major	Major
				Nearshore Bathy	QL4B	4-5 years	$10,390	$16,718	Major	Major	Major
				Offshore Bathy	Order 1	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 11 – Geologic Resource Extraction	State of Oregon	60355	Geologic Resource Mining and Extraction	Inland Topo	QL1 HD	2-3 years	$23,705	$15,724	Minor	Major	Major
BU 12 – Renewable Energy Resources	State of Oregon	60356	Renewable Energy Resources	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	None
				Inland Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Offshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 14 – Cultural Resource Management	Oregon Parks and Recreation Department	21672	Statewide Cultural Resource Protection and Preservation	Inland Topo	QL1	4-5 years	$17,787	$15,551	Minor	None	None
				Inland Bathy	QL0B	6-10 years	$42,655	Unable to quantify	Moderate	Minor	Minor
				Nearshore Bathy	QL3B	6-10 years	$771	Unable to quantify	I don't know	I don't know	I don't know
				Offshore Bathy	Order 1a	6-10 years	$2,529	Unable to quantify	Minor	Moderate	Minor

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 15 – Flood Risk Management	Oregon Water Resources Dept.	1306	Dam Safety Analysis, Flood Risk Modeling, and Mapping	Inland Topo	QL0	As long as data is an accurate representation of the site, it is acceptable.	Unable to quantify	Unable to quantify	None	None	Major
				Inland Bathy	QL0B	Only if the bathymetry has changed.	$7,236	Unable to quantify	None	None	Major
BU 16 – Sea Level Rise and Subsidence	State of Oregon	60357	Sea Level Rise and Subsidence	Inland Topo	QL1 HD	4-5 years	$5,109,129	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Minor
BU 17 – Wildfire Management	State of Oregon	60358	Wildfire Management, Planning, and Response	Inland Topo	QL1	4-5 years	$521,404	Unable to quantify	Major	Major	Major
BU 18 – Homeland Security	State of Oregon	60359	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management	Inland Topo	QL2	4-5 years	$2,862,820	$50,599	Major	Moderate	Major
				Inland Bathy	QL0B	4-5 years	$806,243	$51,439	Major	Moderate	Major
				Nearshore Bathy	QL1B	6-10 years	$2,482	$71	Moderate	Moderate	Major
BU 19 – Land Navigation	Oregon Department of Transportation	21870	Transportation Engineering	Inland Topo	QL1	2-3 years	$1,257,147	$101,520	Minor	Major	Major
				Inland Bathy	QL0B	4-5 years	$53,622	$554	I don't know	Major	Major
				Nearshore Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	Minor	Minor	Minor
BU 22 – Infrastructure Management	Oregon Parks and Recreation Department	21664	Engineering and Facilities Management	Inland Topo	QL1	4-5 years	$61,708	Unable to quantify	None	None	None
BU 23 – Urban and Regional Planning	Oregon Councils of Government	21615	Regional GIS and Data Services	Inland Topo	(a) QL1 HD (b) QL2	(a) 2 years (b) 2-4 years	$14,304,192	$1,651,425	Minor	Moderate	I don't know
				Inland Bathy	QL1B	2-3 years	$582,584	$737,019	Minor	Moderate	Moderate
				Nearshore Bathy	QL1B	2-3 years	$25,870	$27,291	I don't know	I don't know	I don't know

MCA Title: Oregon Lakes and Reservoirs Research and Data Provisioning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type		Required		
Geographic Area Requirements		One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Manage bathymetric data as part of Oregon GIS Framework
MCA Title	Oregon Lakes and Reservoirs Research and Data Provisioning
MCA ID	21630
Organization Type	Academic or Not-for-Profit
Organization Name	Portland State University, Oregon
Sub-Agency or Division	
Organization Mission	Public service research on lake water quality, consulting limnology, manage bathymetric data for Oregon
Program Name	Oregon GIS Framework, Elevation
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 06 - Natural Resources Conservation
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Limnological research on lakes, typically one lake

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Not required
51 - 100 ft	Not required
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Required
Other	Required

Inland Bathy Feature Size Requirements	Response
Other description	Major tributaries especially those with dams

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order		Coarser bathymetric data satisfies my needs		
Update Frequency		Event driven only – Data need to coincide with a specific event.		
Event type(s)		Dam removal, changes to levee network, a flooding event, or a landslide that affects a river.		
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error		Up to 10 meters		
Acceptable Vertical Error		Up to 1 meter		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs		Partial		
Cross section/transect requirement		Most of our lake bathymetry is collected with 50M+ transects with single beam sonar. with vertical accuracy of plus or minus a meter and a sampling frequency of 2 M		

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season		Highly desirable				
Entire AOI under same environmental conditions		Highly desirable				
Other		Highly desirable				
Other description		We collect the best available				
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless		Not required				
DEM for entire AOI needs to be seamless		Not required				
Amount of acceptable vertical manipulation to achieve spatial seamlessness						

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM		Not required		
DTM		Highly desirable		
DEM		Highly desirable		
Raw point cloud data		Not required		
Classified point cloud		Highly desirable		
Edited/cube XYZ		Not required		
Full waveform		Highly desirable		
Bathymetric Attributed Grid (BAG)		Required		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening		Not required		
Additional breaklines for hydro-enforcement of culverts				
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery		Not required		
Ground control/ground truthing		Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery		Not required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data		Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates		Highly desirable		
Land use/land cover		Highly desirable		
Wetlands		Highly desirable		
Estuaries				
Inland surface water features		Required		
Bridges/culverts		Nice to have		
Landmark features		Nice to have		
Cultural resources		Nice to have		
Coastal and riverine structures		Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used		We are collecting and publishing the best bathymetric data available for Oregon lakes and reservoirs for the elevation element of Oregon's GIS framework. We are partnering with the Portland Office of USACE but I assume they will address their interests. We are collecting the best bathymetry available and attempting to provide useful metadata for legacy surveys.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				

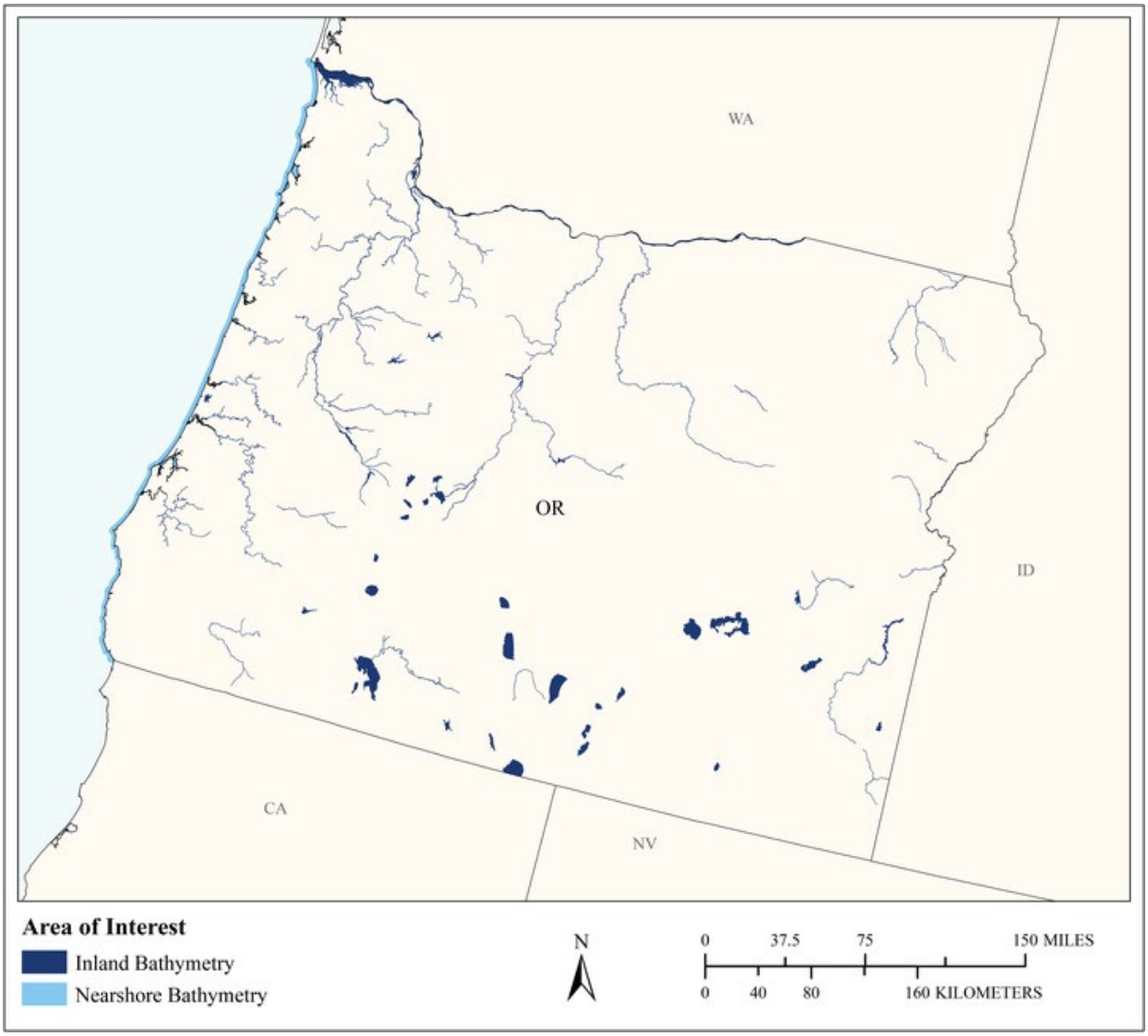
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other		Yes		
Other description		Various public and private surveys		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings		Moderate		
Cost savings/cost reduction		Inland bathy data not available		
Cost avoidance		Inland bathy data not available		
Increased revenues		Inland bathy data not available		
Mission-driven performance improvements		Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services		Minor		
Improved response or timeliness		Major		
Improved customer experience		Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach		Moderate		
Environmental		Moderate		
Public safety, including life and property		Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings				I don't know	Unable to provide							
Cost savings/cost reduction				I don't know	Unable to provide							
Cost avoidance				I don't know	Unable to provide							
Increased revenues				Moderate	Annual dollars saved/realized	$1,000						
Mission-driven performance improvements				Major	Annual percent improvement	22%						
Other operational benefits				Moderate	Annual dollars saved/realized	$1,000						
Other operational benefits description												
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services				I don't know	Unable to provide							
Improved response or timeliness				I don't know	Unable to provide							
Improved customer experience				Moderate	Annual dollars saved/realized	$2,000						
Other customer service benefits				Major	Annual dollars saved/realized	$5,000						
Other customer service benefits description				Provide data on web.								
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach				Moderate								
Education or outreach description				We use in teaching, research, and public service								
Environmental				I don't know								
Public safety, including life and property				I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes		
Contours		Yes		
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Water Supply and Quality



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type		Required	Required	
Geographic Area Requirements		One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Fate and transport of contaminants. Pollution risk mitigation. Runoff and sedimentation analyses. Point- or non-point source pollution modeling. Management of contaminants and marine debris - point, non-point, vessel, and atmospheric pollution; spills; trash.
MCA Title	Water Supply and Quality
MCA ID	60349
Organization Type	State or U.S. Territorial government
Organization Name	State of Oregon
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order		QL1B	QL1B	
Update Frequency		6-10 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error		Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error		Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season		Nice to have	Nice to have			Nice to have
Entire AOI under same environmental conditions		Highly desirable	Highly desirable			Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless		Highly desirable	Nice to have			Nice to have
DEM for entire AOI needs to be seamless		Required	Highly desirable			Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM		Highly desirable	Nice to have	
DTM		Highly desirable	Nice to have	
DEM		Required	Required	
Raw point cloud data		Nice to have	Nice to have	
Classified point cloud		Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform		Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening		Highly desirable		
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery		Nice to have	Nice to have	
Ground control/ground truthing		Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery		Highly desirable	Highly desirable	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data		Nice to have	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates		Highly desirable	Highly desirable	
Land use/land cover		Highly desirable	Highly desirable	
Wetlands		Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features		Required	Highly desirable	
Bridges/culverts		Highly desirable		
Landmark features		Nice to have	Nice to have	
Cultural resources		Nice to have	Nice to have	
Coastal and riverine structures		Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings		Moderate	Moderate	
Cost savings/cost reduction		Minor	Moderate	
Cost avoidance		Minor	Minor	
Increased revenues		None	Minor	
Mission-driven performance improvements		Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services		Minor	Moderate	

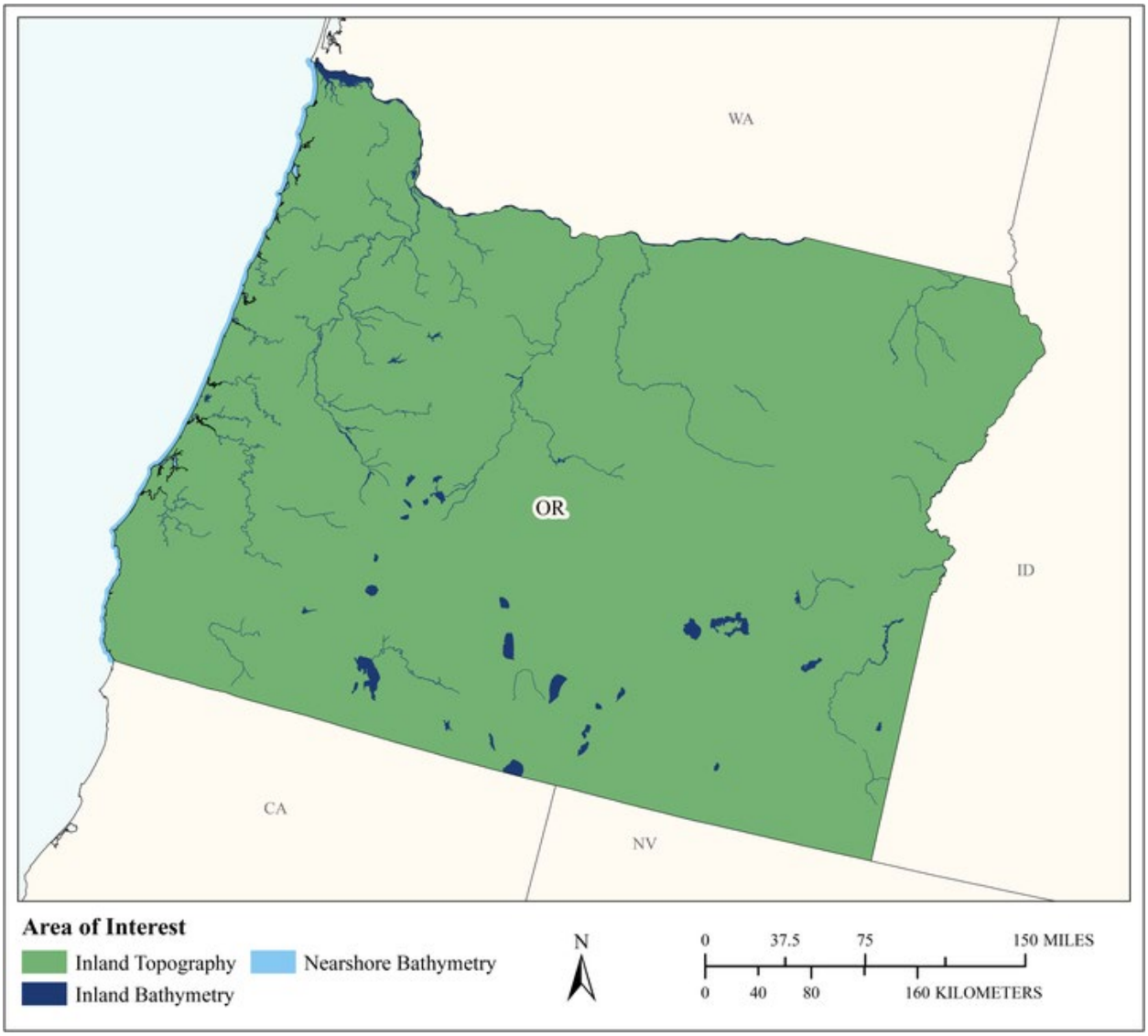
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness		Minor	Moderate	
Improved customer experience		Minor	Moderate	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach		Minor	Minor	
Environmental		Moderate	Moderate	
Public safety, including life and property		Minor	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings				Major	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction				Major	Unable to provide		Minor	Unable to provide				
Cost avoidance				Major	Unable to provide		Moderate	Unable to provide				
Increased revenues				Minor	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements				Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation					Annual dollars saved/ realized	$2,327,748		Annual dollars saved/ realized	$8,886			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services				Moderate	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness				Moderate	Unable to provide		Moderate	Unable to provide				
Improved customer experience				Moderate	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation					Annual dollars saved/ realized	$243,259		Annual dollars saved/ realized	$14,639			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach				Moderate			Moderate					
Environmental				Major			Moderate					
Public safety, including life and property				Moderate			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes		
Contours		Yes	Yes	
Hillshades		Yes	Yes	
Slope maps			Yes	
Aspect maps				
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids		Yes	Yes	
Hydrologic Flow Accumulation Grids		Yes	Yes	
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Riverine Ecosystem Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Stream channel analysis and mapping. Stream bank erosion analysis. Aquatic and terrestrial species habitat management. Environmental management.
MCA Title	Riverine Ecosystem Management
MCA ID	60350
Organization Type	State or U.S. Territorial government
Organization Name	State of Oregon
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B	QL0B	
Update Frequency	6-10 years	4-5 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable		Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Required		Highly desirable	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Required	Required		Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	
DTM	Required	Highly desirable	Required	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Nice to have	Nice to have	
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Not required	Nice to have	
Full waveform	Nice to have	Nice to have	Highly desirable	
Bathymetric Attributed Grid (BAG)		Not required	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Nice to have	
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Highly desirable	Required	
Underwater videography			Not required	
Bottom texture			Highly desirable	
Bottom type			Required	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Nice to have	Nice to have	Not required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates	Nice to have	Nice to have	Highly desirable	
Land use/land cover	Highly desirable	Nice to have	Required	
Wetlands	Highly desirable	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have	Not required	
Cultural resources	Nice to have	Nice to have	Not required	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	
Cost savings/cost reduction	Moderate	Minor	Moderate	
Cost avoidance	Moderate	None	None	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	None	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Minor	

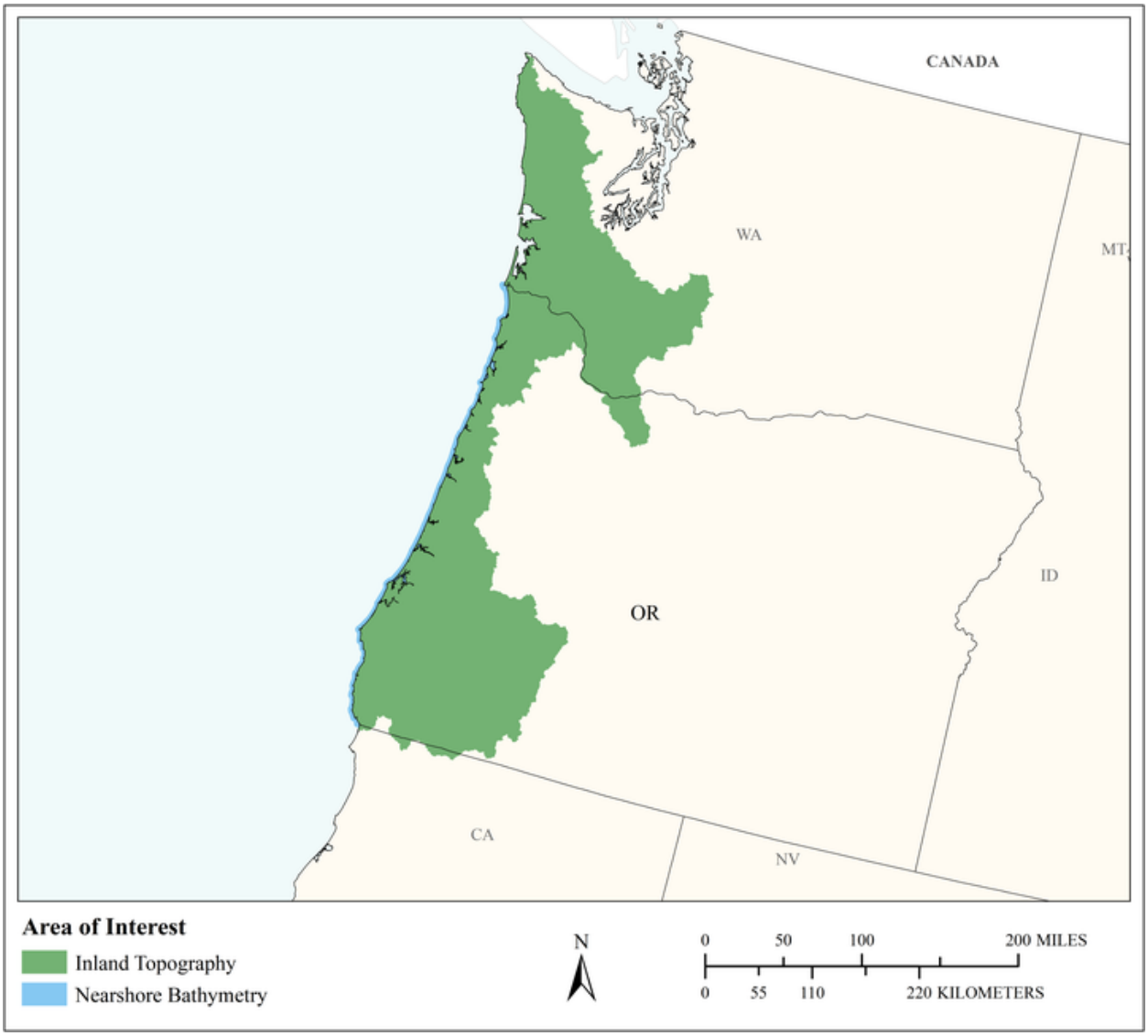
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Moderate	Minor	
Improved customer experience	Major	Minor	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Minor	
Environmental	Major	Major	Moderate	
Public safety, including life and property	Major	Moderate	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$148,538		Annual dollars saved/ realized	$79,072		Annual dollars saved/ realized	$26,950			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$14,836		Annual dollars saved/ realized	$5,575		Annual dollars saved/ realized	$20,594			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate					
Environmental	Major			Major			Moderate					
Public safety, including life and property	Major			Major			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps			Yes	
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints			Yes	
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Coastal Community Resiliency



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Coastal hazards mitigation planning through identification of coastal erosion rates and hazard zones, flood hazard zones, landslide hazard zones and tsunami inundation hazard zones.
MCA Title	Coastal Community Resiliency
MCA ID	21606
Organization Type	State or U.S. Territorial government
Organization Name	Oregon Coastal Management Program
Sub-Agency or Division	
Organization Mission	The mission of the Oregon Coastal Management Program is to work in partnership with coastal local governments, state and federal agencies, and other stakeholders to ensure that Oregon's coastal and ocean resources are managed, conserved, and developed consistent with statewide planning goals and the coastal zone management act.
Program Name	Natural Hazards program
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Tertiary Business Use	BU 16 - Sea Level Rise and Subsidence

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Tidegates and culverts in estuarine systems.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1		QL1B	
Update Frequency	4-5 years		2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter		The best horizontal accuracy achievable for the vertical accuracy I need	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Vertical Error	Up to 20 cm		Up to 30 cm	
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			No requirement for tide correction	
Cross sections and/or transects meet needs	Partial		Partial	
Cross section/transect requirement	Cross-shore coastal transects (for beaches and rocky shores), 10cm vertical accuracy, 1m sampling density along the transect, and no more than 100m between transects.		50m spacing.	

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable		Highly desirable			Nice to have
Entire AOI under same environmental conditions	Highly desirable		Highly desirable			Nice to have
Other	Required					
Other description	Prefer that tidal areas are collected during low tide windows					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Highly desirable			Nice to have
DEM for entire AOI needs to be seamless	Required		Highly desirable			Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to triple the required TVU at the 95% confidence level		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have		Not required	
DTM	Not required		Not required	
DEM	Required		Required	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Raw point cloud data	Not required		Not required	
Classified point cloud	Nice to have		Nice to have	
Edited/cube XYZ			Not required	
Full waveform	Not required		Not required	
Bathymetric Attributed Grid (BAG)			Not required	
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable		Not required	
Ground control/ground truthing	Highly desirable		Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Not required	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Highly desirable		Required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Nice to have	
Submerged features			Not required	
Subbottom characteristics			Not required	
Geologic and seismic data	Not required		Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological				
Currents			Not required	
Tide/wave heights			Highly desirable	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates	Highly desirable		Highly desirable	
Land use/land cover	Not required		Nice to have	
Wetlands	Highly desirable		Nice to have	
Estuaries			Nice to have	
Inland surface water features	Highly desirable		Nice to have	
Bridges/culverts	Highly desirable			
Landmark features	Not required		Not required	
Cultural resources	Not required		Not required	
Coastal and riverine structures	Highly desirable		Nice to have	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Oregon Lidar Consortium data circa 2008-2009, JALBTCX data from 2010, 2014, and USGS data from 2016		JALBTCX data from 2010, 2014	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes		Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				

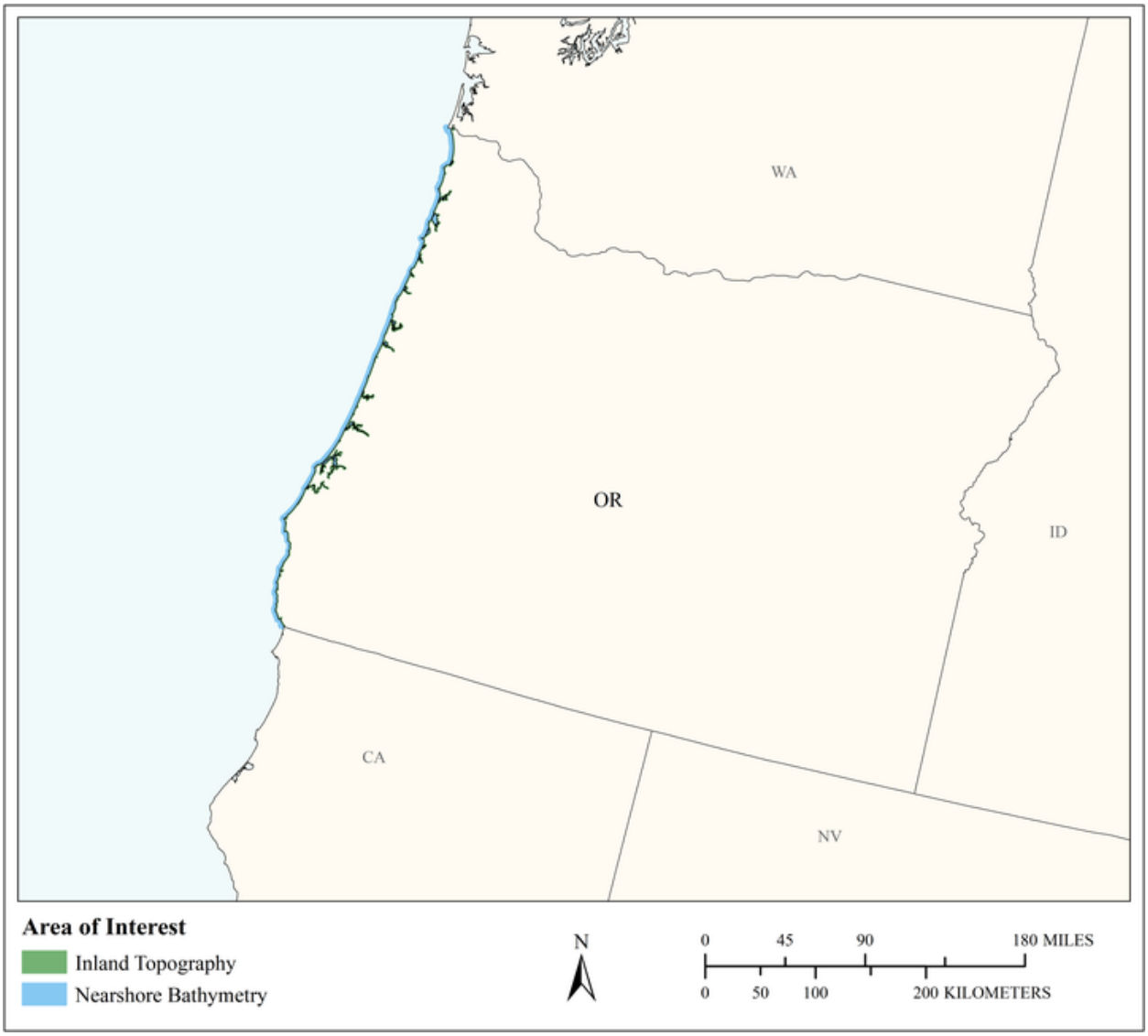
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Moderate	
Cost savings/cost reduction	Major		Major	
Cost avoidance	Major		Major	
Increased revenues	None		Moderate	
Mission-driven performance improvements	Major		Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		Moderate	
Improved response or timeliness	Major		Moderate	
Improved customer experience	Major		Moderate	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major		Minor	
Environmental	I don't know		Major	
Public safety, including life and property	Major		Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide					Major	Unable to provide				
Cost avoidance	Major	Unable to provide					Major	Unable to provide				
Increased revenues	Major	Unable to provide					Major	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide					Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$937,584					Annual dollars saved/ realized	$30,174			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide					Major	Unable to provide				
Improved customer experience	Major	Unable to provide					Major	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$163,909					Annual dollars saved/ realized	$51,044			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate						Major					
Environmental	Major						Major					
Public safety, including life and property	Major						Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	
Contours			Yes	
Hillshades	Yes		Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps				
Cross sections			Yes	
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Ocean Shore Management for Protection Structure Permitting and Recreation Access



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Highly desirable	
Geographic Area Requirements	Custom description		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements	1000-meter swath along Oregon's shoreline			

MCA Description	Response
Mission Critical Activity	Ocean shore management for protection structure permitting and recreation access. Shore management includes permitting for structures on the beach such as armoring (rip rap, other ways to protect property). Property owners have to apply for a permit. Recreation access – the public has a right to access the entire state shoreline, lidar helps manage access and areas that require access. A swath of data both onshore and nearshore is needed. Topographic data is required, topobathy is highly desirable.
MCA Title	Ocean Shore Management for Protection Structure Permitting and Recreation Access
MCA ID	21670
Organization Type	State or U.S. Territorial government
Organization Name	Oregon Parks and Recreation Department
Sub-Agency or Division	
Organization Mission	The mission of the Oregon Parks and Recreation Department is to provide and protect outstanding natural, scenic, cultural, historic and recreational sites for the enjoyment and education of present and future generations
Program Name	Oregon Parks and Recreation Department Stewardship Division
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Rock used for shoreline protection structures, approximately 30cm-100cm

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1		QL4B	
Update Frequency	4-5 years		4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Horizontal Error	Up to 1 meter		Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm		Up to 30 cm	
How far onshore needed			To cover the beach slope	
How far down the beach profile needed	To MLLW		To MLLW	
Tide correction requirement			No requirement for tide correction	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have		Nice to have			Highly desirable
Entire AOI under same environmental conditions	Nice to have		Nice to have			Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable		Highly desirable			Nice to have
DEM for entire AOI needs to be seamless	Highly desirable		Highly desirable			Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	>10cm manipulation		I don't know			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required		Required	
DTM	Required		Nice to have	
DEM	Required		Required	
Raw point cloud data	Not required		Not required	
Classified point cloud	Required		Required	
Edited/cube XYZ			Not required	
Full waveform	Nice to have		Not required	
Bathymetric Attributed Grid (BAG)			Not required	
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Required		Required	
Ground control/ground truthing	Required		Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Not required	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Not required		Highly desirable	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Not required	
Submerged features			Not required	
Subbottom characteristics			Not required	
Geologic and seismic data	Nice to have		Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Not required	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates	Required		Required	
Land use/land cover	Nice to have		Nice to have	
Wetlands	Nice to have		Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Not required	
Inland surface water features	Not required		Not required	
Bridges/culverts	Not required			
Landmark features	Not required		Not required	
Cultural resources	Not required		Not required	
Coastal and riverine structures	Required		Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Mix of USGS, state datasets, best available data		Bathymetric data from Oregon State University, ESRI	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes		Yes	
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Oregon			
Other	Yes		Yes	
Other description	Oregon State University, ESRI, State Data Center		Oregon State University, ESRI	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Moderate	
Cost savings/cost reduction	Major		Minor	
Cost avoidance	Major		Moderate	

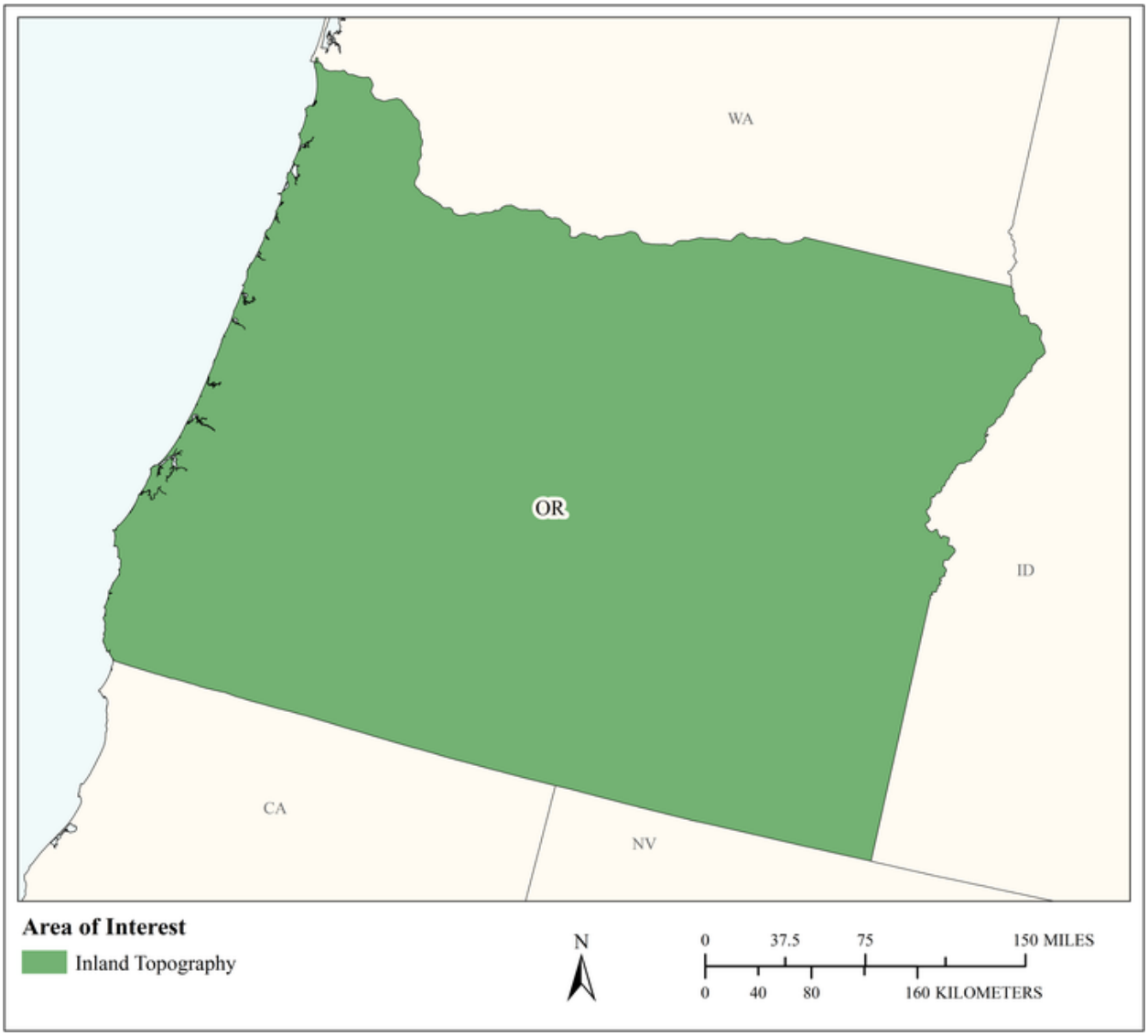
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	None		None	
Mission-driven performance improvements	None		None	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor		None	
Improved response or timeliness	Major		Minor	
Improved customer experience	Major		None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know		I don't know	
Environmental	Minor		Minor	
Public safety, including life and property	Minor		Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$14,472				Moderate	Annual dollars saved/realized	$14,472			
Time savings description	10 hrs/mo reduced data development time = 120 hrs/yr. 10 hrs/mo planning savings = 120 hrs/yr. 20 hrs/mo reduced field visit time = 240 hrs/yr.						10 hrs/mo reduced data development time = 120 hrs/yr. 20 hrs/mo reduced field visit time = 480 hrs/yr. 10 hrs/mo planning savings = 120 hrs/yr.					
Cost savings/cost reduction	Minor	Annual dollars saved/realized	$5,000				Minor	Annual dollars saved/realized	$5,000			
Cost savings/cost reduction description	Potential data acquisition savings.						Potential data acquisition savings.					
Cost avoidance	Minor	Unable to provide					Minor	Unable to provide				
Increased revenues	I don't know	Unable to provide					I don't know	Unable to provide				
Mission-driven performance improvements	Minor	Unable to provide					Minor	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$4,290					Annual dollars saved/ realized	$11,000			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide					Minor	Unable to provide				
Improved response or timeliness	Minor	Annual dollars saved/realized	$1,809				Minor	Annual dollars saved/realized	$1,809			
Improved response or timeliness description	5 hrs/mo in time savings = 60 hrs/yr.						5 hrs/mo in time savings = 60 hrs/yr.					
Improved customer experience	Minor	Unable to provide					Minor	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$2,330					Annual dollars saved/ realized	$49,272			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know						I don't know					
Environmental	Minor						Minor					
Environmental description	Possible reduction of shoreline armoring or increase in green infrastructure						Possible reduction of shoreline armoring or increase in green infrastructure					
Public safety, including life and property	I don't know						I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades	Yes		Yes	
Slope maps	Yes		Yes	
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes		Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes		Yes	
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Statewide Wildfire Management and Forest Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	All aspects of forestry and the supporting activities. Forest resources management; Timber harvests; Wildfire management; Homeland security, law enforcement, disaster response, and emergency management; Recreation; and Telecommunications (used for siting radio repeater sites across the state for self and other agencies. Topo is used for line of sight and coverage analysis). For forestry, Topographic Position Index (TPI) analysis is run on DEMs. This is a neighborhood analysis used to see the relationship of a cell to its neighbors; negative indicates a valley, positive is a ridge, neutral is flat. TPI is used to identify stream channels, valleys, draws, etc. It is used for fire documentation and enforcement of Oregon Forest Practice Act. The regulations are based on proximity to streams. High quality lidar data is critical for all aspects of our mission.
MCA Title	Statewide Wildfire Management and Forest Management
MCA ID	1360
Organization Type	State or U.S. Territorial government
Organization Name	Oregon Department of Forestry
Sub-Agency or Division	
Organization Mission	Forest Management and Fire Protection
Program Name	Enforcement of the Oregon Forest Practices Act
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	BU 17 - Wildfire Management, Planning, and Response
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Tree seedlings, small ditches, and small waterfalls

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Horizontal Error	Up to 30 cm			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed	To MHW			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial			
Cross section/transect requirement	Accurate positional locations of roads and streams. 5cm vertical.			

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Nice to have					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Stream channel locations are critical for enforcement of the Oregon Forest Practices Act. Best available from USGS, 10m DEMs, state, other partners			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Oregon			
Other	Yes			
Other description	Partners			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			

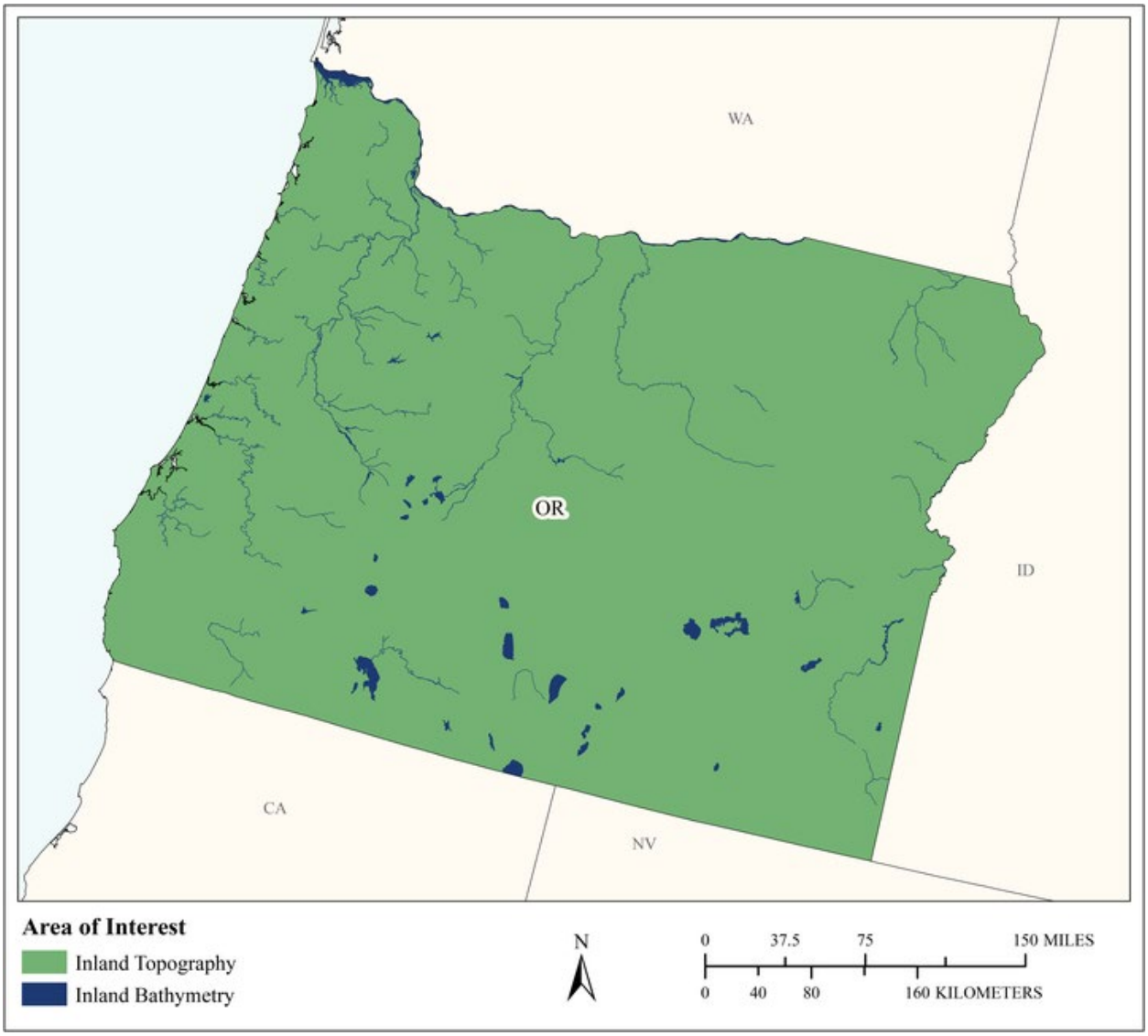
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Cost savings/cost reduction	Major			
Cost avoidance	Moderate			
Increased revenues	Minor			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Moderate			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$256,878									
Cost savings/cost reduction	Moderate	Annual dollars saved/realized	$10,000									
Cost avoidance	I don't know	Unable to provide										
Increased revenues	Major	Annual dollars saved/realized	$240,000									
Mission-driven performance improvements	Moderate	Annual percent improvement	6%									
Mission-driven performance improvements description	High quality lidar data is critical for all aspects of our mission.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Annual dollars saved/realized	$14,472									
Improved response or timeliness	Minor	Annual dollars saved/realized	$43,416									
Improved customer experience	Minor	Annual dollars saved/realized	$11,216									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Education or outreach description	Tree farmer education											
Environmental	Moderate											
Environmental description	Regulation enforcement											
Public safety, including life and property	Moderate											
Public safety, including life and property description	Fire protection											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			
Other (please specify)	Yes			
Other description	Topographic Position Index			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Natural Resources Conservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation engineering. Soils and wetlands mapping and characterization. Modeling of biological and ecological systems. Erosion control. Rainfall penetration studies, impervious surfaces. Assessment of blue carbon stocks.
MCA Title	Natural Resources Conservation
MCA ID	60351
Organization Type	State or U.S. Territorial government
Organization Name	State of Oregon
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B		
Update Frequency	4-5 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Highly desirable			Required	
Entire AOI under same environmental conditions	Required	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Required	Required		
Classified point cloud	Required	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Required		
Land use/land cover	Required	Required		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Moderate		
Increased revenues	Minor	Minor		
Mission-driven performance improvements	Major	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		

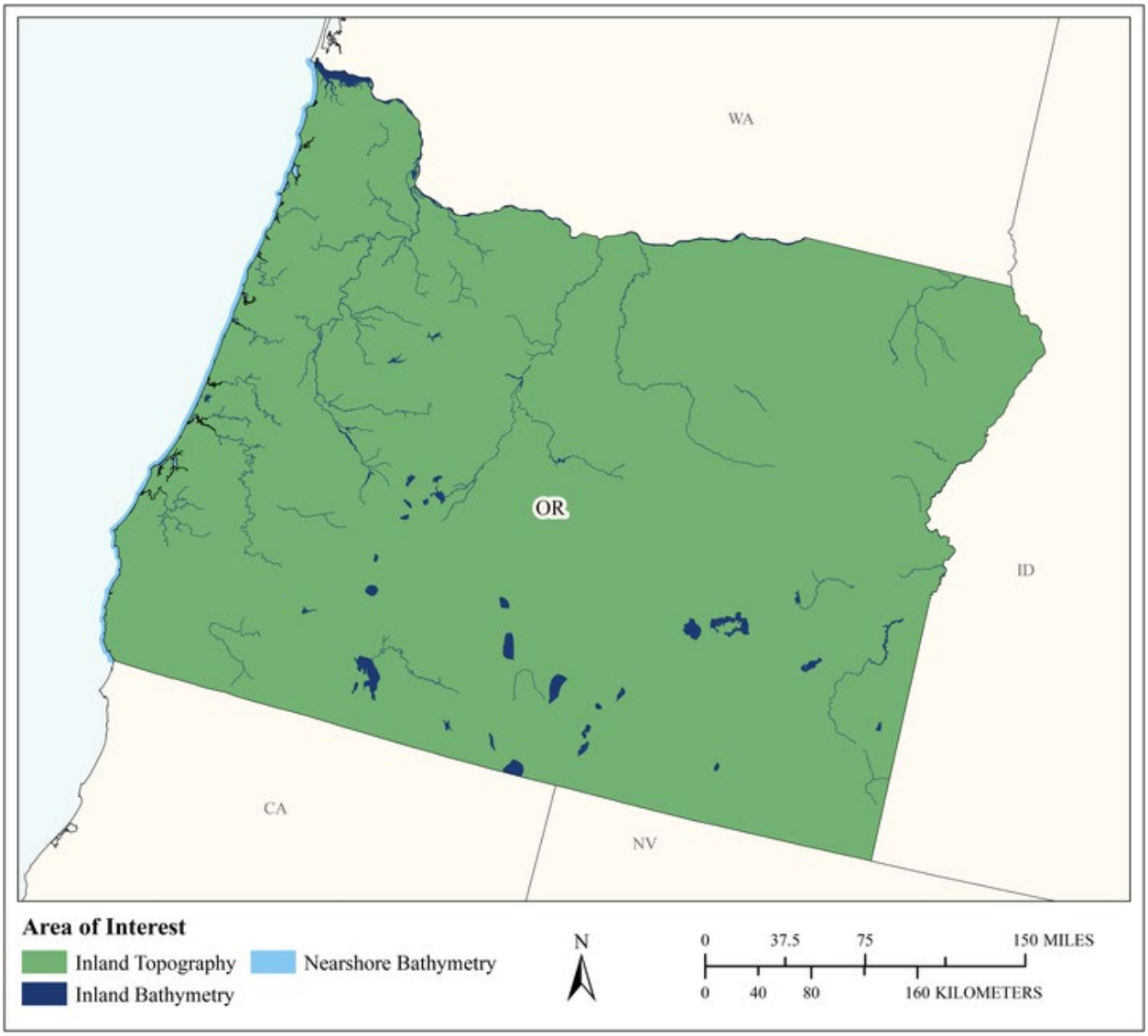
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major		
Improved customer experience	Major	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate		
Environmental	Major	Major		
Public safety, including life and property	Major	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$3,806,356		Annual dollars saved/ realized	$515,908						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$13,978,100		Annual dollars saved/ realized	$23,225						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Major			Major								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Wildlife and Habitat Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation planning for wildlife refuges and marine sanctuaries. Conservation of critical habitats. Management of diverse migratory bird habitats, coral reef and coral communities, marine mammals, protected fish species, and trust resources.
MCA Title	Wildlife and Habitat Management
MCA ID	60352
Organization Type	State or U.S. Territorial government
Organization Name	State of Oregon
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B	QL0B	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	
DTM	Highly desirable	Highly desirable	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Nice to have	Nice to have	
Classified point cloud	Highly desirable	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Nice to have	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Highly desirable	
Routes			Nice to have	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Highly desirable	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Nice to have	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Minor	
Cost savings/cost reduction	Major	Minor	Minor	
Cost avoidance	Major	Minor	Moderate	
Increased revenues	None	Minor	None	
Mission-driven performance improvements	Moderate	Moderate	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate	Minor	

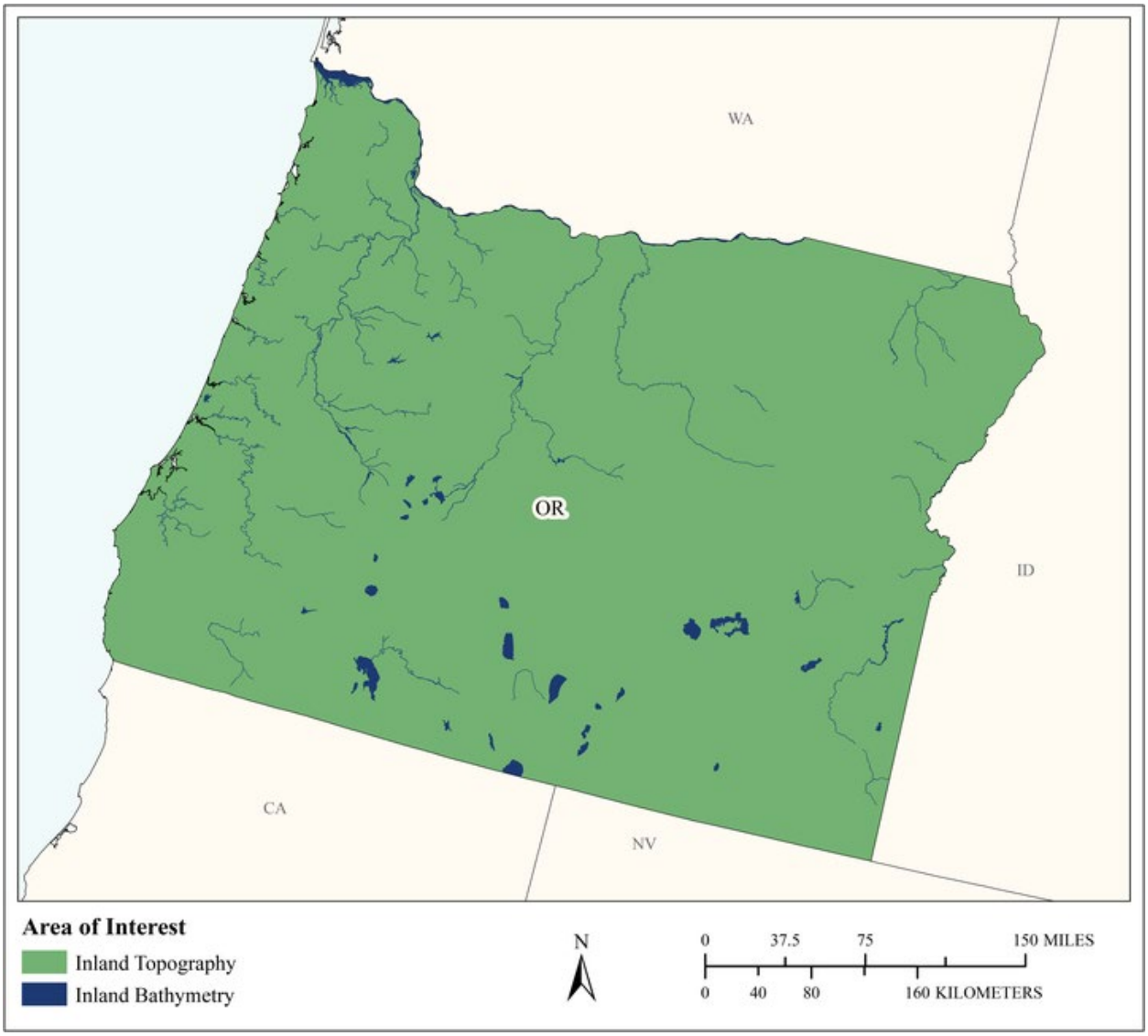
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Minor	Minor	Minor	
Improved customer experience	Minor	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Moderate	Minor	
Environmental	Moderate	Moderate	Moderate	
Public safety, including life and property	Minor	Minor	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$23,116		Annual dollars saved/ realized	$185,259		Annual dollars saved/ realized	$266			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$66,767		Annual dollars saved/ realized	$111,979		Annual dollars saved/ realized	$15			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate					
Environmental	Major			Moderate			Major					
Public safety, including life and property	Moderate			Moderate			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Agriculture and Precision Farming



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Farm pond design. Irrigation system design. Detailed site analysis to support precision farming. Analysis of farm sedimentation and runoff. Calibration of fertilizer application, fertilizer management, and irrigation planning. Optimized terraforming.
MCA Title	Agriculture and Precision Farming
MCA ID	60353
Organization Type	State or U.S. Territorial government
Organization Name	State of Oregon
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 08 - Agriculture and Precision Farming
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Nice to have
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL4B		
Update Frequency	2-3 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 10 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 50 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required			Not required	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Not required	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Not required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level			Up to double the required TVU at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Nice to have	Nice to have		
Edited/cube XYZ		Highly desirable		
Full waveform	Nice to have	Highly desirable		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Required	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Highly desirable		
Land use/land cover	Highly desirable	Required		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Nice to have	Required		
Cultural resources	Nice to have	Highly desirable		
Coastal and riverine structures	Highly desirable	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	None		
Cost savings/cost reduction	Major	I don't know		
Cost avoidance	Major	Moderate		
Increased revenues	None	I don't know		
Mission-driven performance improvements	Moderate	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None		

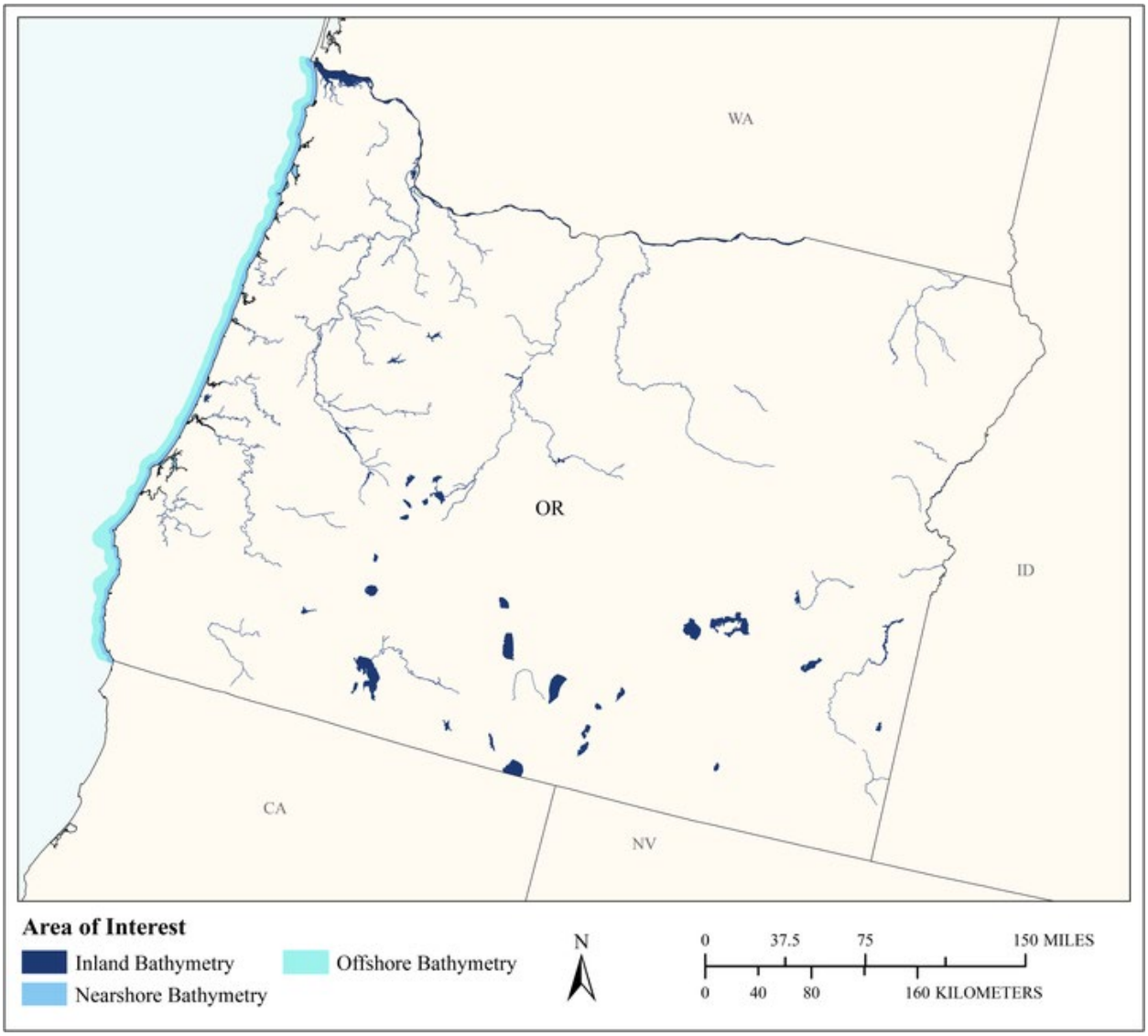
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	None		
Improved customer experience	Moderate	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	None		
Environmental	Major	I don't know		
Public safety, including life and property	Moderate	I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$112,356		Annual dollars saved/ realized	$196,849						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$89,072		Annual dollars saved/ realized	$89,072						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate								
Environmental	Major			Major								
Public safety, including life and property	Minor			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps				
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps		Yes		
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Fisheries Management and Aquaculture



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type		Required	Required	Required
Geographic Area Requirements		One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Management of fisheries. Sustainable aquaculture.
MCA Title	Fisheries Management and Aquaculture
MCA ID	60354
Organization Type	State or U.S. Territorial government
Organization Name	State of Oregon
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Nice to have
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order		QL0B	QL0B	Special Order
Update Frequency		6-10 years	6-10 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error		Up to 2 meters	Up to 2 meters	Up to 2 meters
Acceptable Vertical Error		Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season		Highly desirable	Nice to have	Nice to have		Nice to have
Entire AOI under same environmental conditions		Highly desirable	Highly desirable	Highly desirable		Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless		Highly desirable	Highly desirable	Highly desirable		Highly desirable
DEM for entire AOI needs to be seamless		Required	Highly desirable	Highly desirable		Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM		Highly desirable	Highly desirable	Required
DTM		Highly desirable	Highly desirable	Nice to have
DEM		Required	Required	Required
Raw point cloud data		Nice to have	Highly desirable	Nice to have
Classified point cloud		Nice to have	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform		Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Nice to have
Breaklines required for standard hydro-flattening		Highly desirable		
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Nice to have
Tide Predictions			Not required	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery		Nice to have	Highly desirable	Required
Ground control/ground truthing		Highly desirable	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Nice to have	Required
Acoustic imagery of the seafloor			Highly desirable	Required
Aerial and/or satellite imagery		Highly desirable	Highly desirable	Required
Underwater videography			Nice to have	Highly desirable
Bottom texture			Nice to have	Required
Bottom type			Highly desirable	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data		Nice to have	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Required
Floating observation/navigation systems			Nice to have	Required
Shorelines – current, historic, change rates		Highly desirable	Highly desirable	
Land use/land cover		Highly desirable	Nice to have	Nice to have
Wetlands		Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Highly desirable
Inland surface water features		Required	Nice to have	
Bridges/culverts		Highly desirable		
Landmark features		Nice to have	Nice to have	
Cultural resources		Nice to have	Not required	
Coastal and riverine structures		Highly desirable	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings		Major	Moderate	Moderate
Cost savings/cost reduction		Moderate	Major	Minor
Cost avoidance		Moderate	Minor	Minor
Increased revenues		Moderate	Minor	None
Mission-driven performance improvements		Major	Moderate	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services		Major	Minor	Moderate

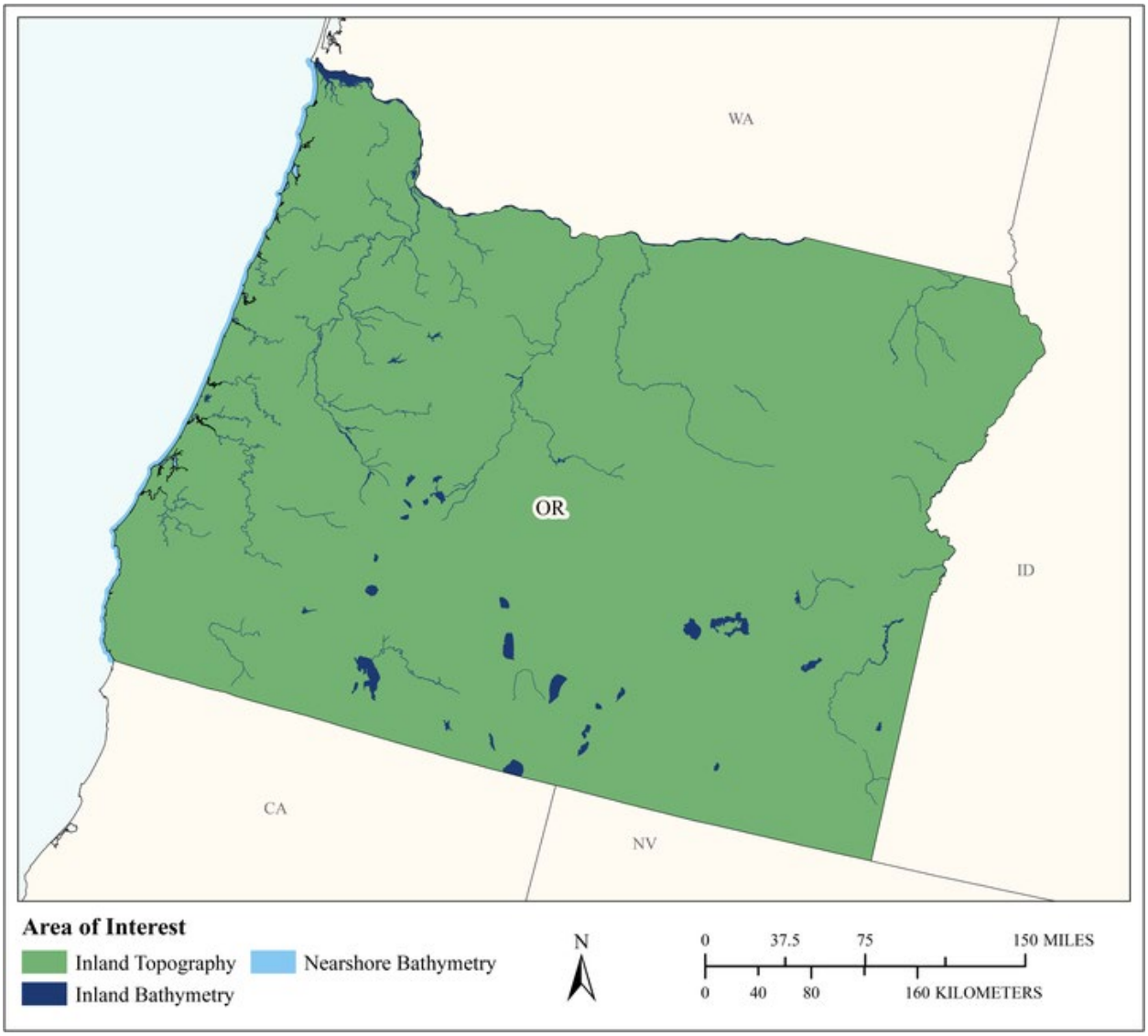
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness		Major	Moderate	Minor
Improved customer experience		Major	Minor	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach		Minor	Moderate	Moderate
Environmental		Moderate	Moderate	Minor
Public safety, including life and property		Minor	Minor	None

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings				Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Cost savings/cost reduction				Major	Unable to provide		Moderate	Unable to provide		None		
Cost avoidance				Major	Unable to provide		Moderate	Unable to provide		None		
Increased revenues				None			Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements				Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Future annual operational benefits added during validation					Annual dollars saved/ realized	$194,176		Annual dollars saved/ realized	$42,329			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services				Major	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Improved response or timeliness				Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Improved customer experience				Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Future annual customer service benefits added during validation					Annual dollars saved/ realized	$88,377		Annual dollars saved/ realized	$3,108			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach				Major			Moderate			Moderate		
Environmental				Major			Major			Moderate		
Public safety, including life and property				Moderate			Minor			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours		Yes	Yes	Yes
Hillshades		Yes	Yes	Yes
Slope maps			Yes	Yes
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geohazard Mitigation and Geologic Resource Identification and Mapping



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Area split by varying quality level or update frequency	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements	Oregon			

MCA Description	Response
Mission Critical Activity	Oregon Department of Geology and Mineral Industries operates the Oregon Lidar Consortium. The Oregon Lidar Consortium mission critical activity is to acquire, organize and distribute high resolution lidar and other remotely sensed imagery for the state. Geologic assessment and hazard mitigation, Geologic resource mining and extraction. Geologic mapping and resource identification. Bare earth and imagery together yield more accurate maps of bedrock and surficial geology. Elevation data are used to identify faults, tighten up GIS layers to follow contacts between formations, for geohazard mapping (e.g. landslide, liquefaction, floodplain delineation, channel migration zone mapping, etc.) Lidar are used to update the Mineral Information Layer (MILO) to show occurrences, prospects, and mine locations. The data are also used to locate historic mine sites, develop site descriptions, perform change detection and site characterization for active mines.
MCA Title	Geohazard Mitigation and Geologic Resource Identification and Mapping
MCA ID	1184
Organization Type	State or U.S. Territorial government
Organization Name	Oregon Dept. Geology and Mineral Industries
Sub-Agency or Division	
Organization Mission	Oregon Department of Geology and Mineral Industries provides earth science information and regulation to make Oregon safe and prosperous.
Program Name	Geological Survey and Services Program
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 11 - Geologic Resource Mining and Extraction
Tertiary Business Use	BU 23 - Urban and Regional Planning

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Rocks, geologic contacts, 1-meter size objects

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	(a) QL0 (b) QL2	QL1B	QL2B	
Update Frequency	(a) 4-5 years (b) 6-10 years	6-10 years	6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI	Lower QL and update frequency for large portions of Eastern Oregon Southeastern OR quadrant could use QL2 at 6-10 years			
Acceptable Horizontal Error	Less than 20 cm	Less than 50 cm	Up to 1 meter	
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 40 cm	
How far onshore needed			To the fall line	
How far down the beach profile needed	To MHW		To MHW	
Tide correction requirement			MSL	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Required	Required		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required		Required	Required
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Required
Other	Required					
Other description	Digital Surface Model					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Required	
DTM	Required	Required	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Not required	Not required	Not required	
Classified point cloud	Required	Required	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Highly desirable	Required	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Required	Highly desirable	Highly desirable	
Ground control/ground truthing	Required	Required	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Not required	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Required	Required	Highly desirable	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Highly desirable	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Not required	
Boundaries			Highly desirable	
Routes			Not required	
Offshore cadastral			Nice to have	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Highly desirable	Required	Not required	
Wetlands	Highly desirable	Highly desirable	Not required	
Estuaries			Not required	
Inland surface water features	Required	Required		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Nice to have	Highly desirable	
Cultural resources	Highly desirable	Nice to have	Nice to have	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Currently we acquire lidar through the Oregon Lidar Consortium. The Oregon Lidar Consortium collects data at QL 0. The data is collected piecemeal throughout Oregon which is due to lack of dedicated funding source for lidar.	Bathymetry data is collected by DOGAMI through the Oregon Lidar Consortium. This data is typically paid for by outside funds that tend to be federal in nature. Bathymetry data is also provided to DOGAMI from other agencies that collected bathymetry data in Oregon. The data is normally QL2B.	NOAA and USACE JALBTCX	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	Oregon Lidar Consortium - http://www.oregongeology.org/lidar/index.htm	Oregon Lidar Consortium		
Other			Yes	
Other description			USACE	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Major	
Cost savings/cost reduction	Major	Moderate	Major	
Cost avoidance	Major	Moderate	Major	
Increased revenues	Moderate	Minor	None	
Mission-driven performance improvements	Moderate	Minor	Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor	Major	
Improved response or timeliness	Major	Minor	Major	
Improved customer experience	Moderate	Minor	Major	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Major	
Environmental	Major	Major	Minor	
Public safety, including life and property	Major	Major	Major	

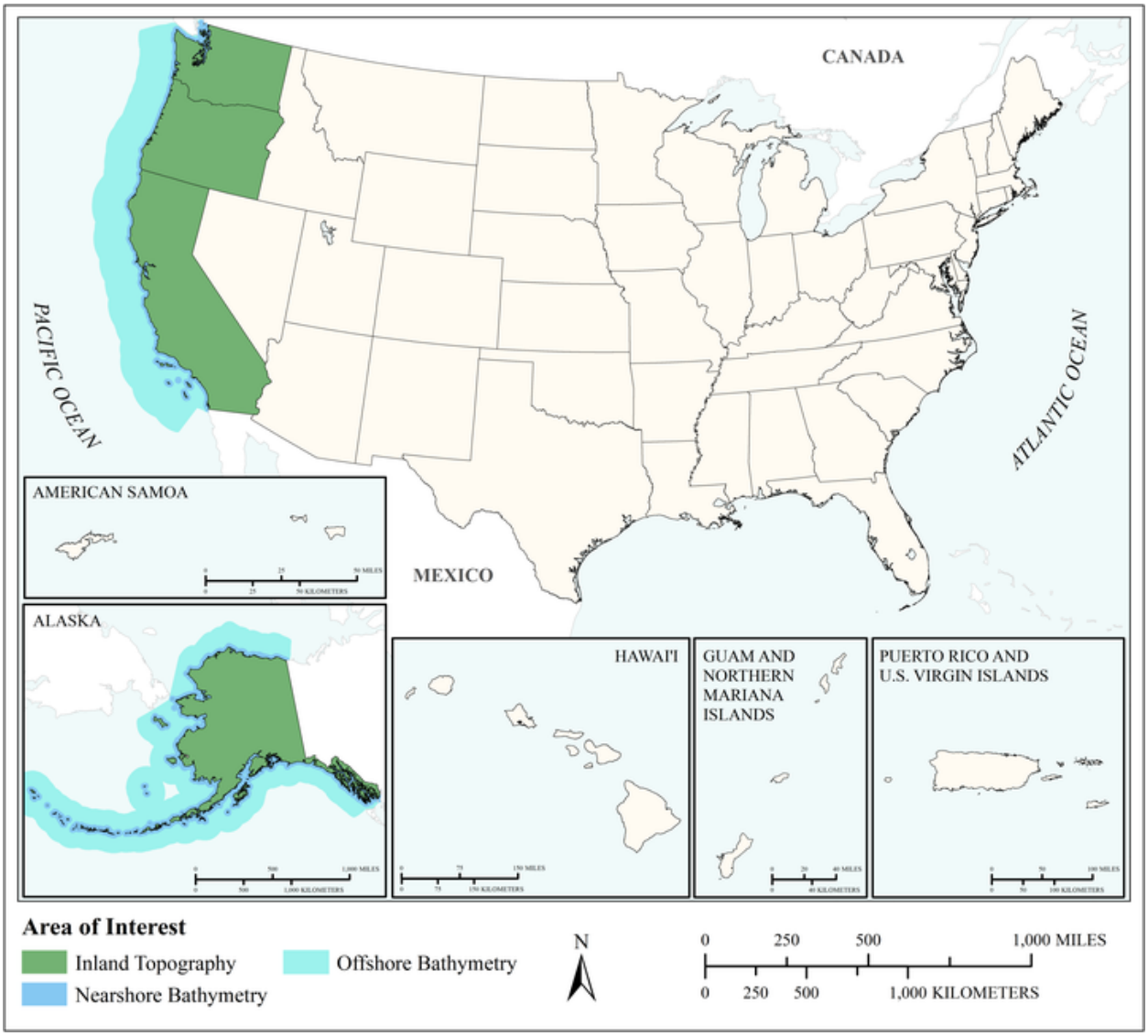
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$19,296	Major	Annual dollars saved/realized	$19,296	Major	Annual dollars saved/realized	$12,663			
Time savings description	Less time needed in field to walk transects and map faults and landslide areas. Better, more reliable modeling at a state level instead of sub-county level. Better quality data to use for assessing mining permits and mining regulation. Less office time tweaking lidar data for analysis.			Recollection of all waterbodies with the same projection/datum would greatly improve analysis work. Improved modeling and analysis with full bathymetric coverage of water bodies. Coastal community benefits would be enormous. Minimal improvement.			Less field surveying.					
Cost savings/cost reduction	Major	Annual dollars saved/realized	$150,000	Major	Annual dollars saved/realized	$1,500,000	Moderate	Annual dollars saved/realized	$100,000			
Cost savings/cost reduction description	Funding lidar collections and building consortium projects. Less time in the field for surveying.											
Cost avoidance	Major	Annual dollars saved/realized	$10,125,000	Moderate	Annual dollars saved/realized	$50,000	Major	Unable to provide				
Cost avoidance description	Less time in field for quality control surveying. Lidar based landslide mapping will assist in reducing potential loss of life and property.			Potential for reduced loss from flooding but cannot provide an annual estimate for the reduction of a rare event. This would be minimal. NHD updates and fixes would be reduced with this dataset.								
Increased revenues	Major	Annual dollars saved/realized	$200,000	None			None					
Increased revenues description	Additional lidar coverage will allow us to conduct more hazard mapping and analysis.											
Mission-driven performance improvements	Major	Annual percent improvement	20%	Moderate	Annual percent improvement	8%	Major	Annual percent improvement	14%			
Mission-driven performance improvements description	Hazard mitigation would greatly benefit from additional lidar coverage in Oregon. Standardized products, no need to adjust between datums or projections.						More data to feed into already produced modeling. Better model will provide better information to coastal communities who make land use decisions. Expanded coverage of hazard mapping to all coastal communities.					
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$6,030	Major	Annual dollars saved/realized	$1,000,000	Major	Annual dollars saved/realized	$100,000			
Value added to products or services description	Basically can produce more products and services where Oregon currently doesn't have lidar coverage. These products would only have minimal benefit to our agency needs.			Increased efficiency in flood hazard mapping, flood warnings and improved accuracy of levy construction.								
Improved response or timeliness	Major	Annual dollars saved/realized	$206,030	Major	Annual dollars saved/realized	$106,030	Major	Unable to provide				
Improved response or timeliness description	See above. Improved mapping for fire response and any other natural disaster. New data will improve resiliency and mitigation of natural disasters as well. Oregon would make data available to public to download, allowing all users to benefit from lightly accurate elevation information covering Oregon.			Better modeling and consistency would improve current modeling and allow for more modeling coverage in the state. Cheaper to produce from lidar then aerial imagery or by other means.								
Improved customer experience	Moderate	Annual dollars saved/realized	$6,512	Minor	Annual dollars saved/realized	$2,412	Moderate	Unable to provide				

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved customer experience description	Less time working on developing lidar collections and more time creating ways to make the lidar data more useful.	Easier to distribute to other state agencies and the public.		
Societal Benefits	**Benefits**	**Benefits**	**Benefits**	**Benefits**
Education or outreach	Moderate	Minor	Major	
Education or outreach description	Provide new images and maps showing lidar usefulness and importance in keeping Oregonians safe. STEM marketing.	Minimal impact to improving education and outreach		
Environmental	Major	Moderate	Moderate	
Environmental description	Hazard mitigation, beach and costal community health, forest fire prevention	Reduced water waste and improve understanding of fluvial geomorphology		
Public safety, including life and property	Major	Major	Major	
Public safety, including life and property description	Improved tsunami modeling along coast and improved earthquake vulnerability assessment for all Oregonian communities.	Improved flood studies will greatly improve public safety		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids		Yes	Yes	
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)		Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes	Yes	
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: State Infrastructure Resiliency



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	Required
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Custom description
Sub Area Requirements				Out to subduction zone (75-100 mi offshore)

MCA Description	Response
Mission Critical Activity	Increasing Oregon's level of preparedness and improving the resilience of Oregon's built infrastructure, bridges, highways, and slopes so that we make the state more resilient and ready to recover for the expected 9.0 Cascadia earthquake and ensuing tsunami.
MCA Title	State Infrastructure Resiliency
MCA ID	1246
Organization Type	State or U.S. Territorial government
Organization Name	Governor's Office, State of Oregon
Sub-Agency or Division	
Organization Mission	To protect, safeguard and enhance the lives of all Oregonians.
Program Name	Office of the State Resilience Officer
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 24 - Health and Human Services
Tertiary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Infrastructure is the main focus. Fiber optic cables on ocean floor.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2		QL4B	Order 1
Update Frequency	4-5 years		4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter		Up to 5 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm		Up to 1 meter	Up to 1 meter

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed			>1 kilometer inland	
How far down the beach profile needed	To MHHW		To MHHW	
Tide correction requirement			I don't know	I don't know
Cross sections and/or transects meet needs			Partial	
Cross section/transect requirement			Unsure, this is not my subject matter	

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable		Required	Required		Required
Entire AOI under same environmental conditions	Required		Highly desirable	Highly desirable		Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Highly desirable	Highly desirable		Highly desirable
DEM for entire AOI needs to be seamless	Required		Required	Required		Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know		I don't know	I don't know		I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required		Required	Required
DTM	Required		Required	Required
DEM	Required		Required	Required
Raw point cloud data	Highly desirable		Highly desirable	Highly desirable
Classified point cloud	Highly desirable		Highly desirable	
Edited/cube XYZ			Highly desirable	Highly desirable
Full waveform	Nice to have		Highly desirable	Highly desirable
Bathymetric Attributed Grid (BAG)			Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Required	Required
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery	Nice to have		Required	Required
Ground control/ground truthing	Highly desirable		Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required		Required	Required
Underwater videography			Required	Required
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Nice to have	Nice to have
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Required		Required	Required
Water column properties - Physical			Highly desirable	Highly desirable
Water column properties - Chemical			Highly desirable	Highly desirable
Water column properties - Biological			Highly desirable	Highly desirable
Currents			Highly desirable	Highly desirable
Tide/wave heights			Required	Required
Sea ice conditions			Nice to have	Nice to have
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Required	Required
Routes			Highly desirable	Highly desirable
Offshore cadastral			Required	Required
Lease areas			Required	Required
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required		Required	
Land use/land cover	Required		Highly desirable	Highly desirable
Wetlands	Required		Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required		Required	
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable		Highly desirable	
Cultural resources	Highly desirable		Required	
Coastal and riverine structures	Required		Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Unknown, I do not have any data on this		Not able to respond, not my subject matter. Best available from NOAA	Best available from NOAA
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	Yes
NCEI	Yes		Yes	Yes
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Oregon - DOGAMI			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Moderate	Moderate
Cost savings/cost reduction	Major		Moderate	Moderate
Cost avoidance	Moderate		Minor	Minor
Increased revenues	I don't know		I don't know	I don't know
Mission-driven performance improvements	Moderate		Major	Major

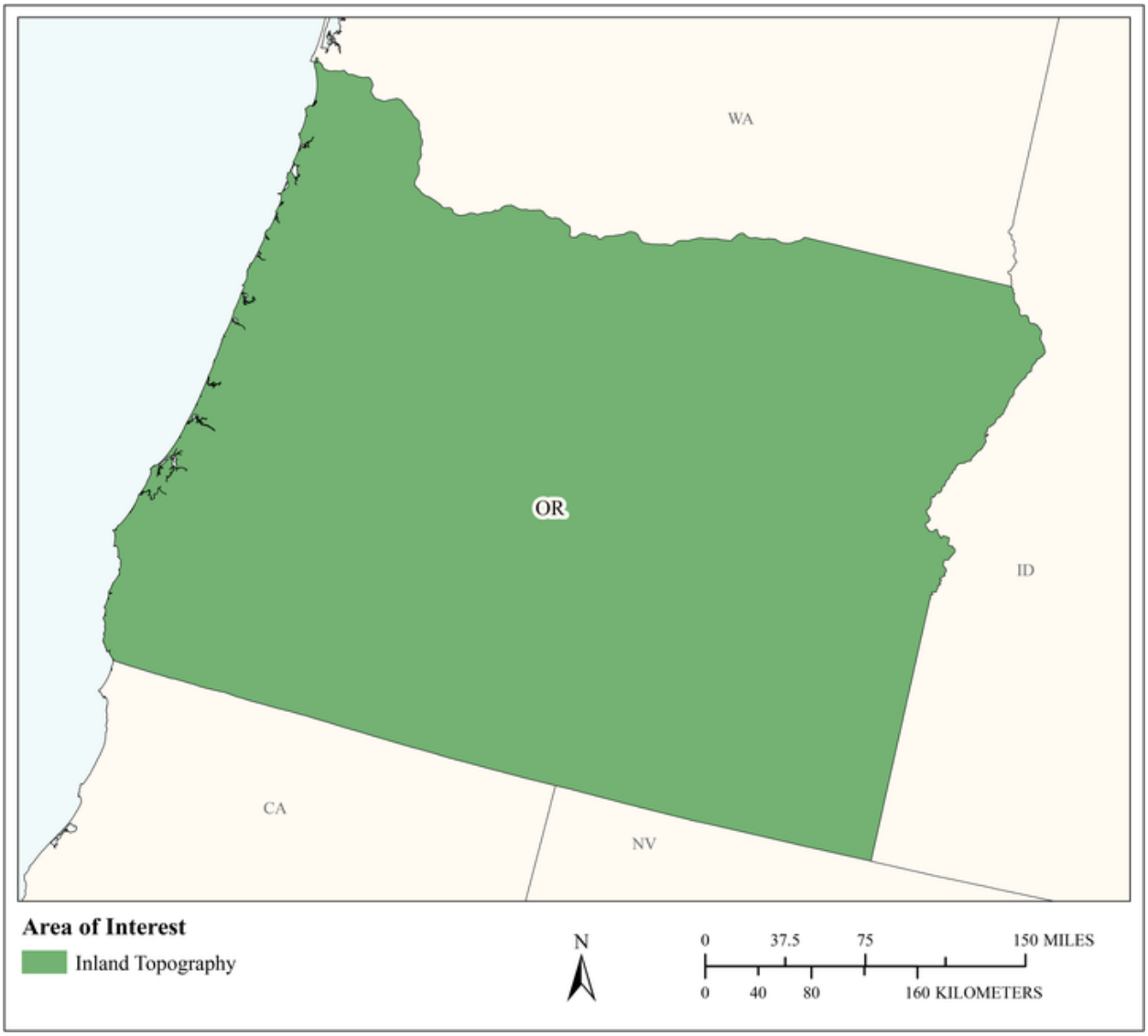
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate		Moderate	Moderate
Improved response or timeliness	Major		Major	Major
Improved customer experience	Moderate		Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major		Major	Major
Environmental	Major		Major	Major
Public safety, including life and property	Major		Major	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues	Moderate	Unable to provide					I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Mission-driven performance improvements description	Better data means better hazard mitigation plans and community engagement.						Better data means better hazard mitigation plans and community engagement.			Better data means better hazard mitigation plans and community engagement.		
Other operational benefits	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$10,242,526					Annual dollars saved/ realized	$10,390			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness description	Better preparation for natural disasters such as earthquake or tsunami.						Better preparation for natural disasters such as earthquake or tsunami.			Better preparation for natural disasters such as earthquake or tsunami.		
Improved customer experience	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$179,807					Annual dollars saved/ realized	$16,718			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major						Major			Major		
Education or outreach description	Better data tells a better story, encourages action						Better data tells a better story, encourages action			Better data tells a better story, encourages action		
Environmental	Major						Major			Major		
Public safety, including life and property	Major						Major			Major		
Public safety, including life and property description	Better preparation for natural disasters such as earthquake or tsunami						Better preparation for natural disasters such as earthquake or tsunami			Better preparation for natural disasters such as earthquake or tsunami		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections			Yes	Yes
Height-Above-Ground maps			Yes	Yes
Viewshed maps	Yes			
Hydrologic Flow Direction Grids			Yes	Yes
Hydrologic Flow Accumulation Grids			Yes	Yes
Hydrologic networks (e.g. streams, lakes)			Yes	Yes
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)			Yes	Yes
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Geologic Resource Mining and Extraction



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Onshore or offshore mineral extraction. Monitoring sand as a local resource. Seabed resources. Open mine volume computations. Stockpile analysis. Environmental impact assessment and site restoration.
MCA Title	Geologic Resource Mining and Extraction
MCA ID	60355
Organization Type	State or U.S. Territorial government
Organization Name	State of Oregon
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 11 - Geologic Resource Mining and Extraction
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			

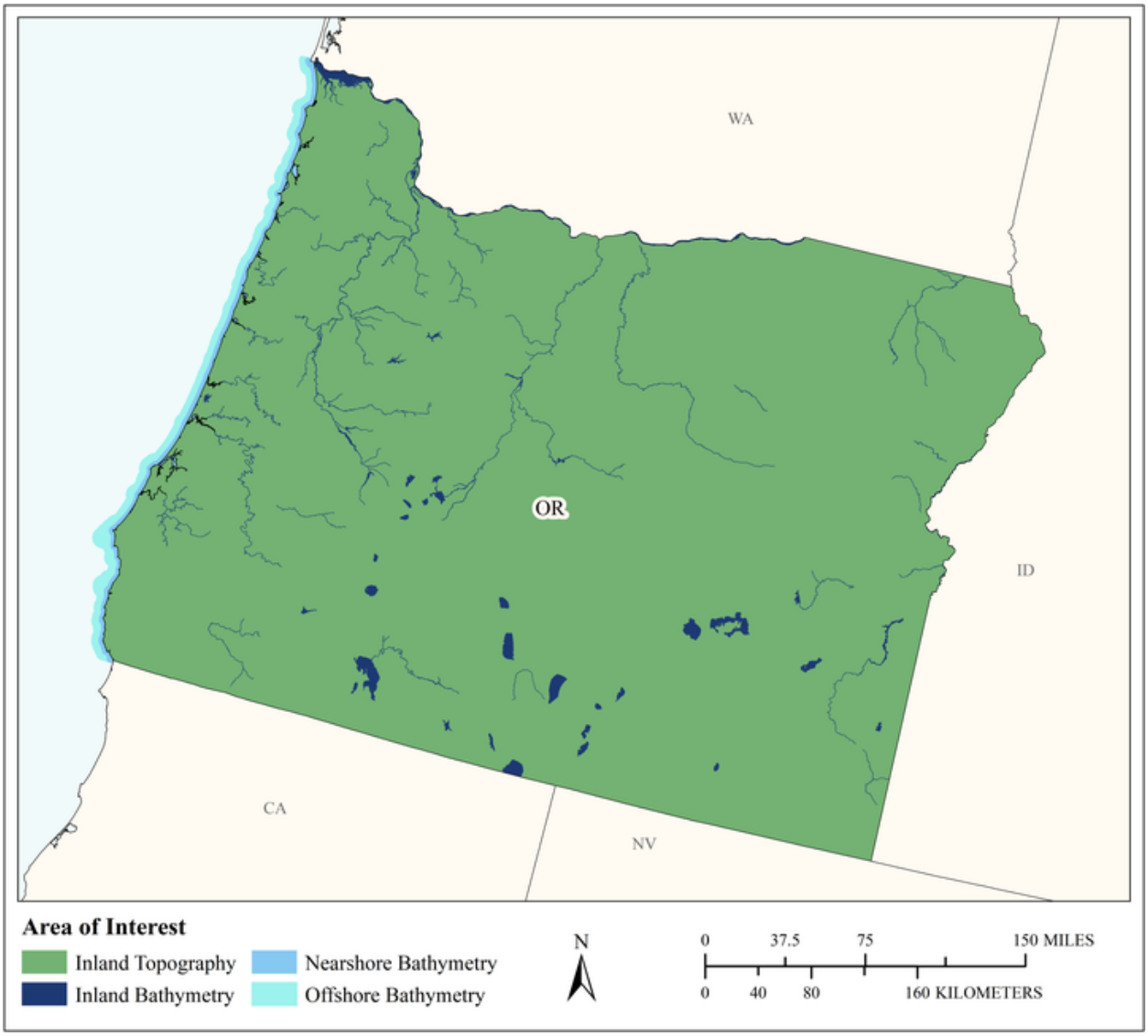
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Minor	Unable to provide										
Cost avoidance	Minor	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$23,705									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$15,724									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Renewable Energy Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Alternate energy development – solar, tidal, wind, wave, and ocean current. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Low head power potential for hydropower.
MCA Title	Renewable Energy Resources
MCA ID	60356
Organization Type	State or U.S. Territorial government
Organization Name	State of Oregon
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	I don't know
Rivers and Streams	
Less than 10 ft	I don't know
10 - 50 ft	I don't know
51 - 100 ft	I don't know
101 - 500 ft	I don't know
501 - 2,500 ft	I don't know
Greater than 2,500 ft	I don't know
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	I don't know
½ - 1 acre	I don't know
1.1 – 2 acres	I don't know
2.1 – 5 acres	I don't know

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	I don't know
Greater than 10 acres	I don't know

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	I don't know	I don't know	I don't know
Update Frequency	6-10 years	I don't know	I don't know	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	I don't know	I don't know	I don't know
Acceptable Vertical Error	Up to 20 cm	I don't know	I don't know	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					I don't know	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	I don't know	I don't know	I don't know	I don't know	I don't know
Entire AOI under same environmental conditions	Highly desirable	I don't know	I don't know	I don't know	I don't know	I don't know
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	I don't know	I don't know	I don't know	I don't know	I don't know
DEM for entire AOI needs to be seamless	Highly desirable	I don't know	I don't know	I don't know	I don't know	I don't know
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	I don't know	I don't know	I don't know
DTM	Required	I don't know	I don't know	I don't know
DEM	Required	I don't know	I don't know	I don't know
Raw point cloud data	Highly desirable	I don't know	I don't know	I don't know
Classified point cloud	Highly desirable	I don't know	I don't know	
Edited/cube XYZ		I don't know	I don't know	I don't know
Full waveform	Nice to have	I don't know	I don't know	I don't know
Bathymetric Attributed Grid (BAG)		I don't know	I don't know	I don't know
Breaklines required for standard hydro-flattening	Nice to have	I don't know		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			I don't know	I don't know
Tide Predictions			I don't know	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			I don't know	I don't know
Intensity imagery/sidescan imagery	Not required	I don't know	I don't know	I don't know
Ground control/ground truthing	Highly desirable	I don't know	I don't know	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			I don't know	I don't know
Nautical and/or navigation charts			I don't know	I don't know
Acoustic imagery of the seafloor			I don't know	I don't know
Aerial and/or satellite imagery	Highly desirable	I don't know	I don't know	I don't know
Underwater videography			I don't know	I don't know
Bottom texture			I don't know	I don't know
Bottom type			I don't know	I don't know
Submerged features			I don't know	I don't know
Subbottom characteristics			I don't know	I don't know
Geologic and seismic data	Not required	I don't know	I don't know	I don't know
Water column properties - Physical			I don't know	I don't know
Water column properties - Chemical			I don't know	I don't know
Water column properties - Biological			I don't know	I don't know
Currents			I don't know	I don't know
Tide/wave heights			I don't know	I don't know
Sea ice conditions			I don't know	I don't know
Habitat distribution and classification			I don't know	I don't know
Boundaries			I don't know	I don't know
Routes			I don't know	I don't know
Offshore cadastral			I don't know	I don't know
Lease areas			I don't know	I don't know
Fixed obstructions			I don't know	I don't know
Floating observation/navigation systems			I don't know	I don't know
Shorelines – current, historic, change rates	Nice to have	I don't know	I don't know	
Land use/land cover	Highly desirable	I don't know	I don't know	I don't know
Wetlands	Nice to have	I don't know	I don't know	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			I don't know	I don't know
Inland surface water features	Nice to have	I don't know	I don't know	
Bridges/culverts	Nice to have	I don't know		
Landmark features	Nice to have	I don't know	I don't know	
Cultural resources	Not required	I don't know	I don't know	
Coastal and riverine structures	Nice to have	I don't know	I don't know	
Overhead structures			I don't know	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	I don't know	I don't know	I don't know
Cost savings/cost reduction	Moderate	I don't know	I don't know	I don't know
Cost avoidance	Moderate	I don't know	I don't know	I don't know
Increased revenues	None	I don't know	I don't know	I don't know
Mission-driven performance improvements	Minor	I don't know	I don't know	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	I don't know	I don't know	I don't know

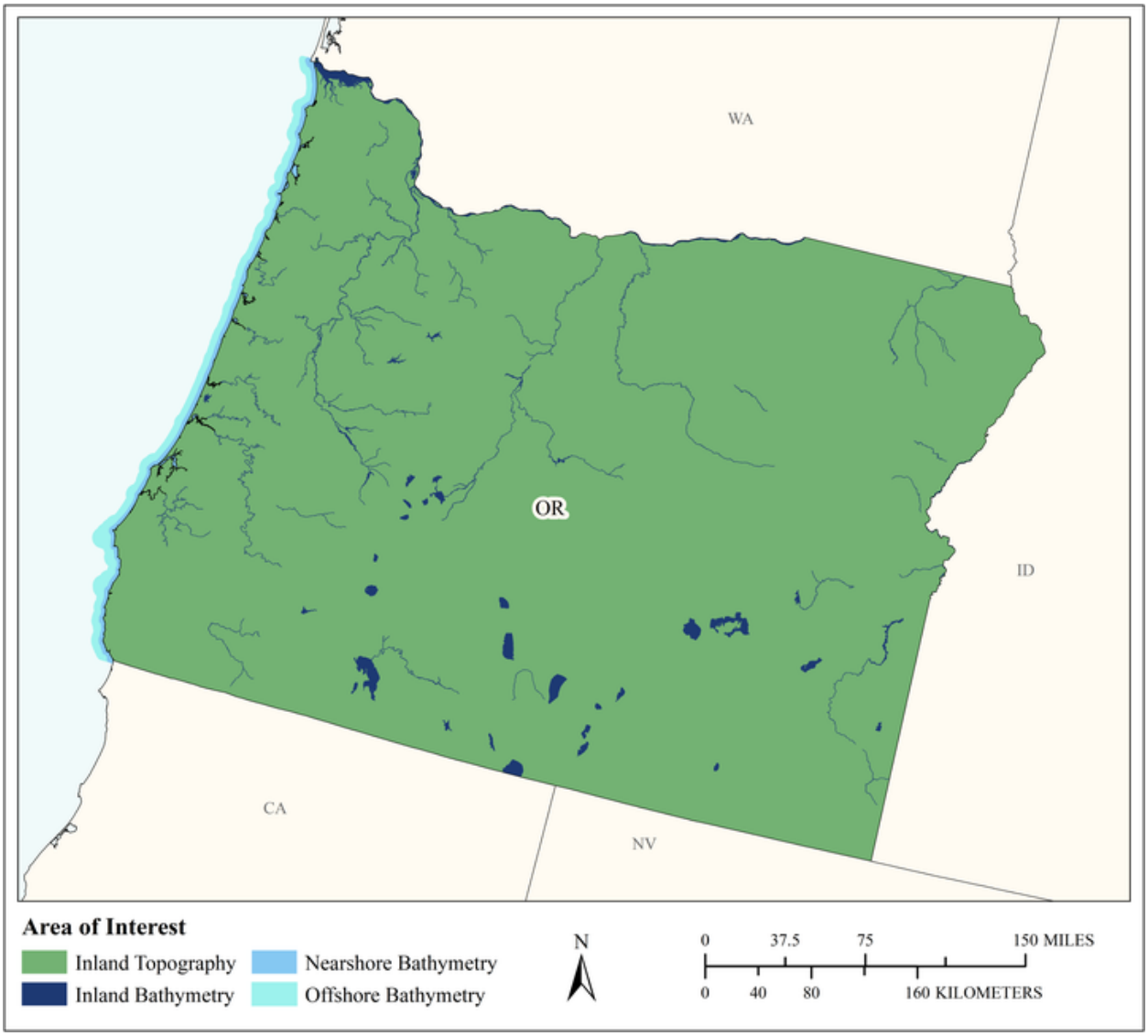
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor	I don't know	I don't know	I don't know
Improved customer experience	Minor	I don't know	I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	I don't know	I don't know	I don't know
Environmental	Minor	I don't know	I don't know	I don't know
Public safety, including life and property	Minor	I don't know	I don't know	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Minor	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			I don't know			I don't know			I don't know		
Environmental	Minor			I don't know			I don't know			I don't know		
Public safety, including life and property	None			I don't know			I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Statewide Cultural Resource Protection and Preservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Statewide cultural resource protection and preservation. Elevation data are used by archaeologists for review of projects done by others and for conducting in-house projects.
MCA Title	Statewide Cultural Resource Protection and Preservation
MCA ID	21672
Organization Type	State or U.S. Territorial government
Organization Name	Oregon Parks and Recreation Department
Sub-Agency or Division	
Organization Mission	The mission of the Oregon Parks and Recreation Department is to provide and protect outstanding natural, scenic, cultural, historic and recreational sites for the enjoyment and education of present and future generations
Program Name	State Historic Preservation Office
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	BU 27 - Recreation
Tertiary Business Use	BU 26 - Education K12 and Beyond, Basic Research

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Not required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Site level cultural features <100cm

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL3B	Order 1a
Update Frequency	4-5 years	6-10 years	6-10 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Up to 2 meters	The best horizontal accuracy achievable for the vertical accuracy I need	Up to 5 meters
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 40 cm	Less than 1 meter
How far onshore needed			To cover the beach slope	
How far down the beach profile needed	To MHW		To MHHW	
Tide correction requirement			No requirement for tide correction	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Nice to have	Not required	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Not required	Nice to have	Not required	Nice to have	Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Not required	Not required	Nice to have	Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Nice to have	Nice to have	Not required	Nice to have	Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Up to triple the required TVU at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Required	Required
DTM	Not required	Highly desirable	Nice to have	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Not required	Not required	Not required	Not required
Classified point cloud	Required	Nice to have	Required	
Edited/cube XYZ		Nice to have	Not required	Nice to have
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Nice to have	Not required	Highly desirable
Breaklines required for standard hydro-flattening	Not required	Not required		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Not required	Nice to have
Tide Predictions			Not required	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Highly desirable
Intensity imagery/sidescan imagery	Required	Highly desirable	Required	Highly desirable
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Not required	Required
Nautical and/or navigation charts			Not required	Required
Acoustic imagery of the seafloor			Not required	Required
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Highly desirable	Nice to have
Underwater videography			Not required	Not required
Bottom texture			Not required	Highly desirable
Bottom type			Not required	Highly desirable
Submerged features			Required	Required
Subbottom characteristics			Not required	Nice to have
Geologic and seismic data	Not required	Highly desirable	Not required	Highly desirable
Water column properties - Physical			Not required	Highly desirable
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Not required	Nice to have
Tide/wave heights			Not required	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Not required	Nice to have
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Not required	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Required
Floating observation/navigation systems			Not required	Required
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Not required	Highly desirable	Not required	Highly desirable
Wetlands	Not required	Highly desirable	Not required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Not required	Highly desirable
Inland surface water features	Nice to have	Highly desirable	Nice to have	
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Nice to have	Highly desirable	Nice to have	
Cultural resources	Nice to have	Highly desirable	Required	
Coastal and riverine structures	Nice to have	Highly desirable	Nice to have	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Cooperatively acquired QL1 data, various dates.		Oregon State University, ESRI	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes			
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes		Yes	
Other description	Cooperative contracts		Oregon State University, ESRI	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know	Major	I don't know	Moderate
Cost savings/cost reduction	None	Minor	I don't know	Minor
Cost avoidance	I don't know	Minor	I don't know	Minor
Increased revenues	None	Minor	None	None

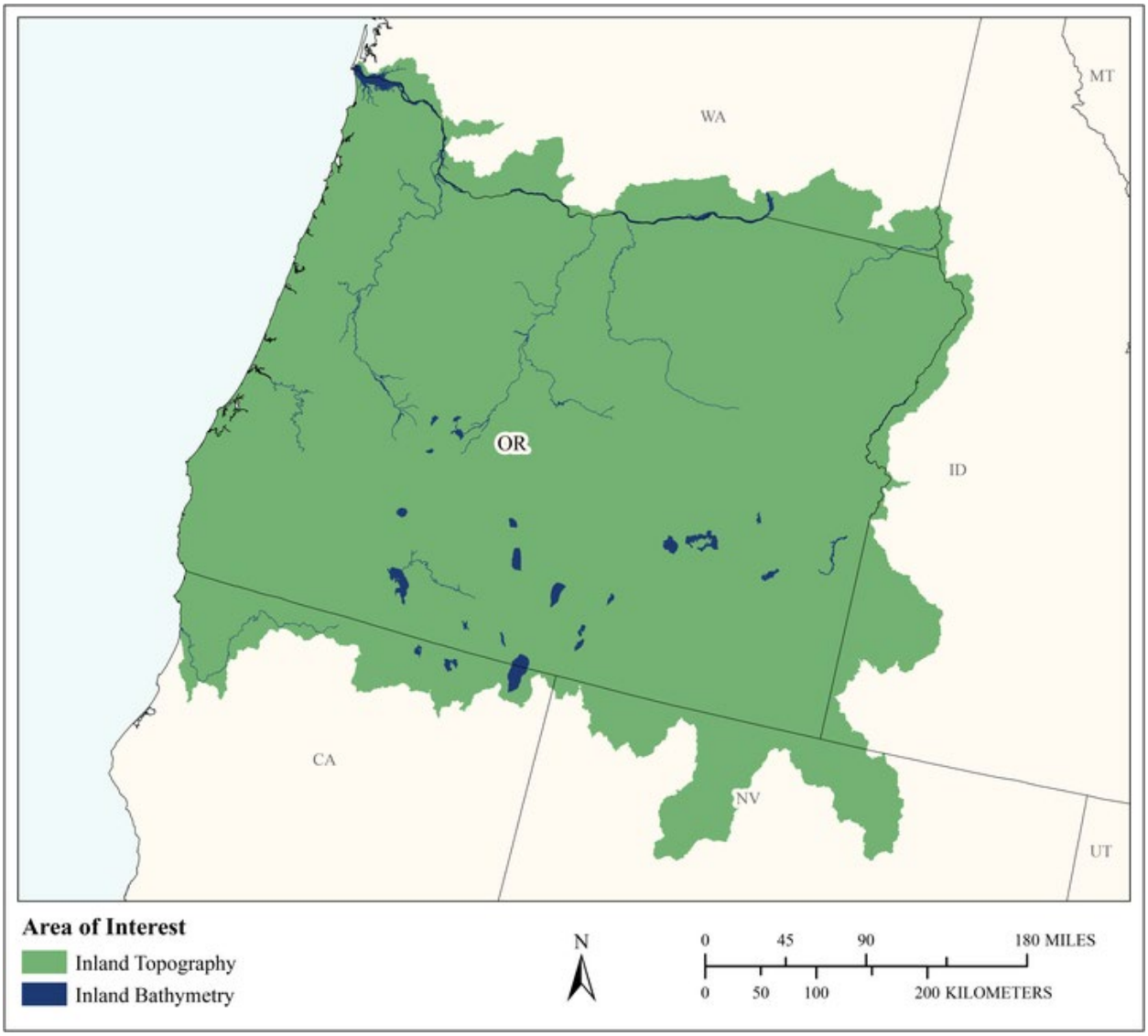
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Mission-driven performance improvements	Moderate	Moderate	Moderate	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None	Minor	None	Minor
Improved response or timeliness	I don't know	Major	I don't know	Moderate
Improved customer experience	I don't know	Moderate	I don't know	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	Minor	Minor
Environmental	I don't know	Moderate	I don't know	Moderate
Public safety, including life and property	I don't know	Moderate	I don't know	Minor
Other Current Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other	Moderate			
Other description	Cultural resource protection/preservation			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide	
Time savings description	Fairly significant benefits can be realized by modeling or analyzing data with higher accuracy and resolution.											
Cost savings/cost reduction	None			Moderate	Unable to provide		I don't know	Unable to provide		Minor	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide		Major	Unable to provide	
Cost avoidance description	Improved data can reduce costs associated with resource conflicts, difficult to quantify.											
Increased revenues	None			None			I don't know	Unable to provide		None		
Mission-driven performance improvements	Moderate	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide		Major	Unable to provide	
Mission-driven performance improvements description	Improvement in ability to inventory and assess cultural resources.											
Future annual operational benefits added during validation		Annual dollars saved/ realized	$17,787		Annual dollars saved/ realized	$42,655		Annual dollars saved/ realized	$771		Annual dollars saved/ realized	$2,529
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		Minor	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide	
Improved customer experience	None			Minor	Unable to provide		I don't know	Unable to provide		Minor	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$15,551									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Moderate			I don't know			Minor		
Environmental	None			Minor			I don't know			Moderate		
Public safety, including life and property	None			Minor			I don't know			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes		Yes
Contours		Yes		Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes		Yes	
Aspect maps	Yes		Yes	
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				Yes

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Dam Safety Analysis, Flood Risk Modeling, and Mapping



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more Hydrologic Units (HUC8s)	One or more Hydrologic Units (HUC8s)		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Dam safety analysis, flood risk modeling and mapping for dam safety (not FIRMs). Identify structures at risk and save lives. Elevation data are used for H&H modeling. Hydroelectric dam licensing is covered by another group.
MCA Title	Dam Safety Analysis, Flood Risk Modeling, and Mapping
MCA ID	1306
Organization Type	State or U.S. Territorial government
Organization Name	Oregon Water Resources Dept.
Sub-Agency or Division	
Organization Mission	OWRD 's mission is to serve the public by practicing and promoting responsible water management through two key goals: 1) to directly address Oregon's water supply needs; and, 2) to restore and protect streamflows and watersheds in order to ensure the long-term sustainability of Oregon's ecosystems, economy, and quality of life.
Program Name	Oregon Dam Safety Program
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 01 - Water Supply and Quality
Tertiary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Edges/corners of structures Identify houses in the path of dam failure.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL0B		
Update Frequency	As long as data is an accurate representation of the site, it is acceptable.	Only if the bathymetry has changed.		
Event type(s)				
Quality Level and/or update frequency variability across AOI	Areas of rapid development would need more recent data. Channel changes would alter flow.			
Acceptable Horizontal Error	Less than 20 cm	Less than 50 cm		
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm		
How far onshore needed				
How far down the beach profile needed	To MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Nice to have	Nice to have			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Not required	Highly desirable		
Classified point cloud	Not required	Highly desirable		
Edited/cube XYZ		Highly desirable		
Full waveform	Not required	Highly desirable		
Bathymetric Attributed Grid (BAG)		Highly desirable		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Highly desirable		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required	Required		
Land use/land cover	Required	Required		
Wetlands	Not required	Required		
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Required	Required		
Cultural resources	Nice to have	Not required		
Coastal and riverine structures	Required	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Primarily using Oregon Lidar Consortium (OLC) project data which conforms to QL0 (RMSEz ≤ 5 cm and aggregate nominal pulse density ≥8 points/square meter).	We collect bathymetric data for reservoirs when time permits. Data are included in permits from applicants. Independent verification is done for high hazard dams.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				

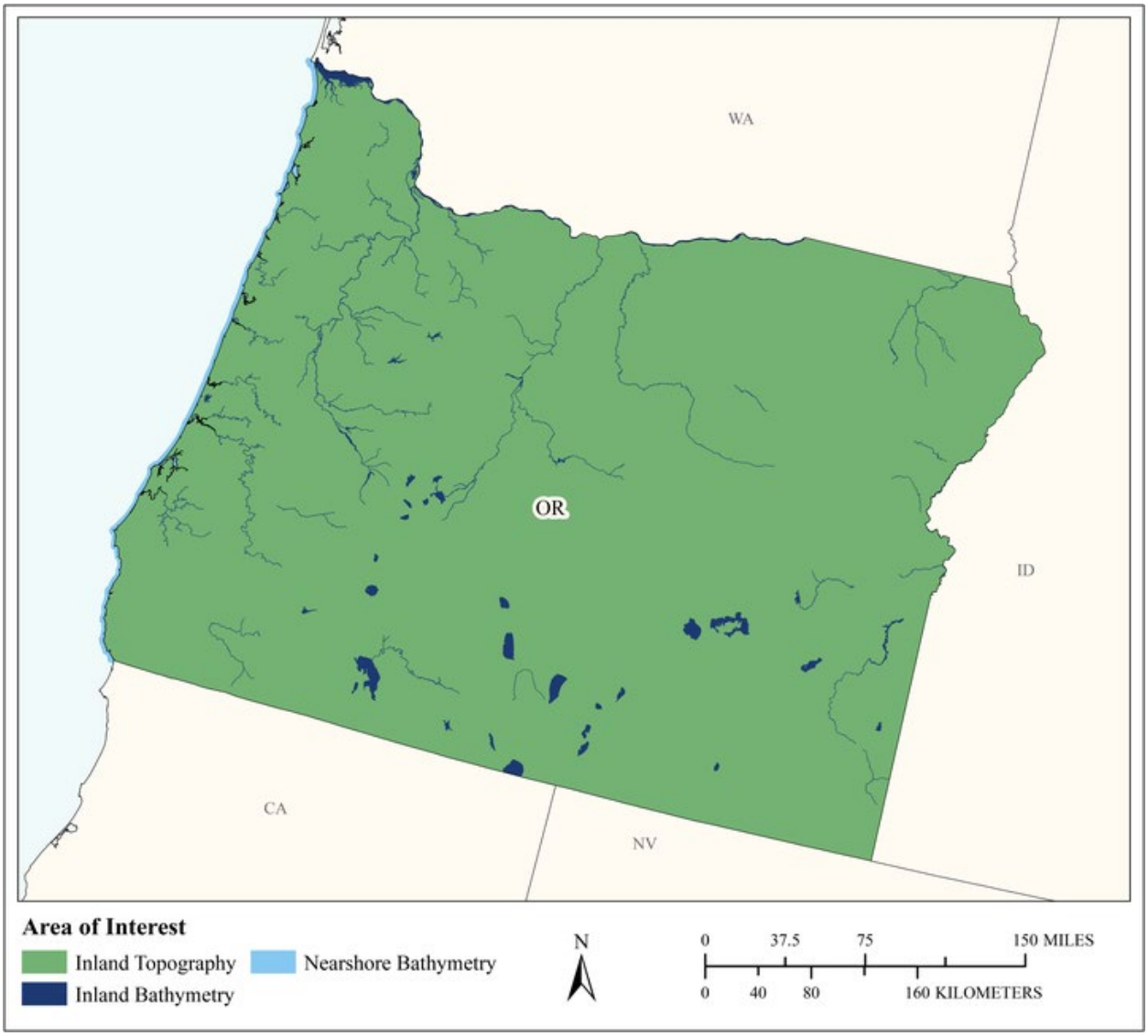
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	None		
Cost savings/cost reduction	Major	None		
Cost avoidance	Major	None		
Increased revenues	Major	None		
Mission-driven performance improvements	None	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None		
Improved response or timeliness	None	None		
Improved customer experience	I don't know	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	None		
Environmental	Major	None		
Public safety, including life and property	None	None		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Annual dollars saved/realized	$7,236						
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide							
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide							
Increased revenues	I don't know	Unable to provide		None								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Other operational benefits				Major	Unable to provide							
Other operational benefits description												
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		None								
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			None								
Environmental	None			None								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	1
Update frequency	3

MCA Title: Sea Level Rise and Subsidence



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Modeling and mapping the effects of sea level rise or subsidence. Population and economic vulnerability assessments. Coastal inundation and infrastructure assessment.
MCA Title	Sea Level Rise and Subsidence
MCA ID	60357
Organization Type	State or U.S. Territorial government
Organization Name	State of Oregon
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 16 - Sea Level Rise and Subsidence
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL1B	QL2B	
Update Frequency	4-5 years	4-5 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Required	Required		Highly desirable	Required
Entire AOI under same environmental conditions	Highly desirable	Required	Required		Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Required		Highly desirable	Required
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have	Highly desirable	
DTM	Required	Required	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Highly desirable	Nice to have	
Classified point cloud	Required	Nice to have	Highly desirable	
Edited/cube XYZ		Not required	Not required	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Not required	Not required	
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Highly desirable	
Ground control/ground truthing	Required	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Required	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Required	Required	Highly desirable	
Wetlands	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Required	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes	Yes	Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Major	
Cost savings/cost reduction	Major	Major	Major	
Cost avoidance	Major	Major	Major	
Increased revenues	None	Minor	Minor	
Mission-driven performance improvements	Major	Major	Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	

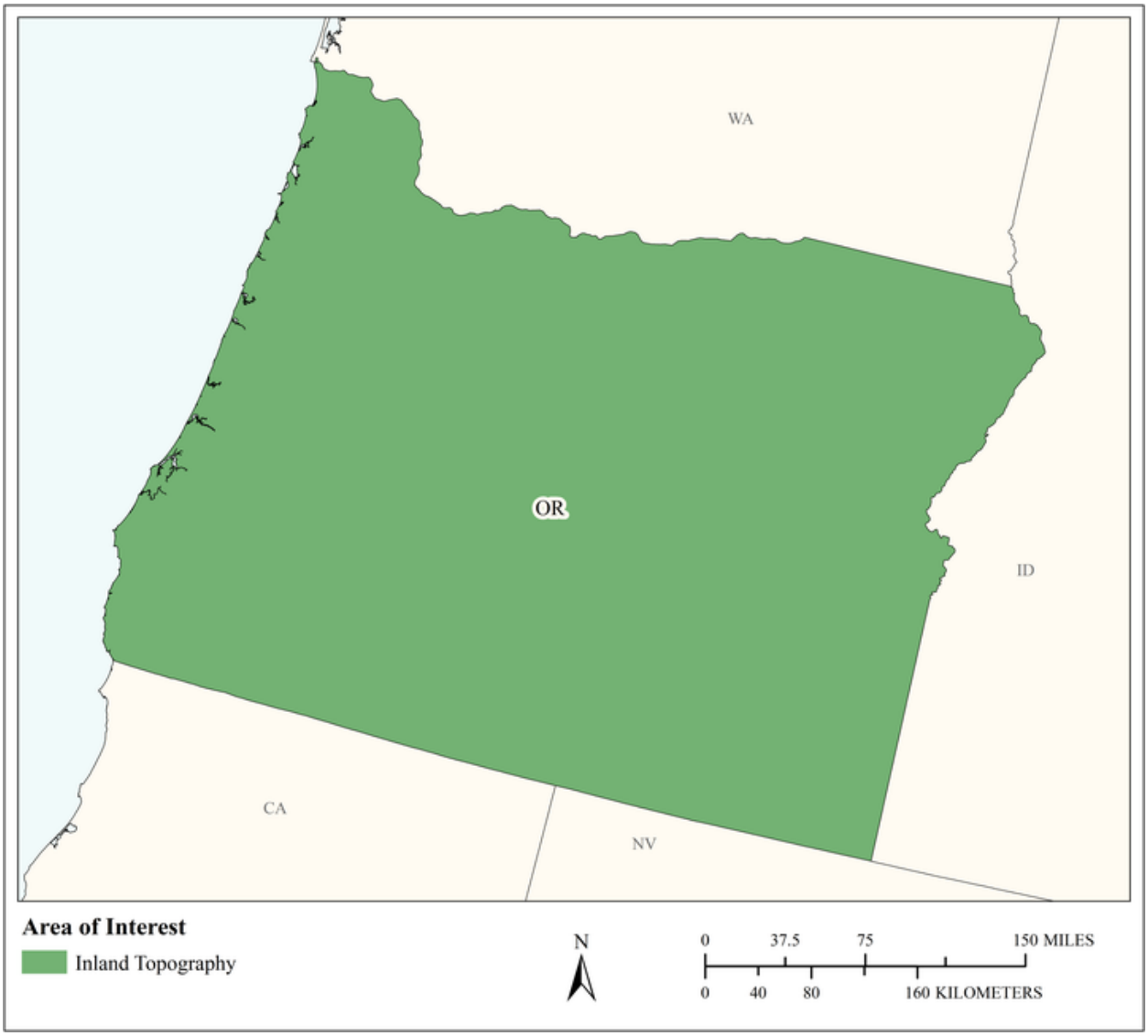
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Minor	Major	
Improved customer experience	Moderate	Moderate	Major	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Major	
Environmental	Moderate	Moderate	Major	
Public safety, including life and property	Major	Moderate	Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Increased revenues	Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$5,109,129									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Major					
Environmental	Moderate			Major			Major					
Public safety, including life and property	Moderate			Major			Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Wildfire Management, Planning, and Response



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of forest fuel and fire susceptibility. Fire behavior modeling to support wildfire suppression activities. Wildland/urban interface building identification. Post fire analysis to determine landslide prone areas.
MCA Title	Wildfire Management, Planning, and Response
MCA ID	60358
Organization Type	State or U.S. Territorial government
Organization Name	State of Oregon
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 17 - Wildfire Management, Planning, and Response
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

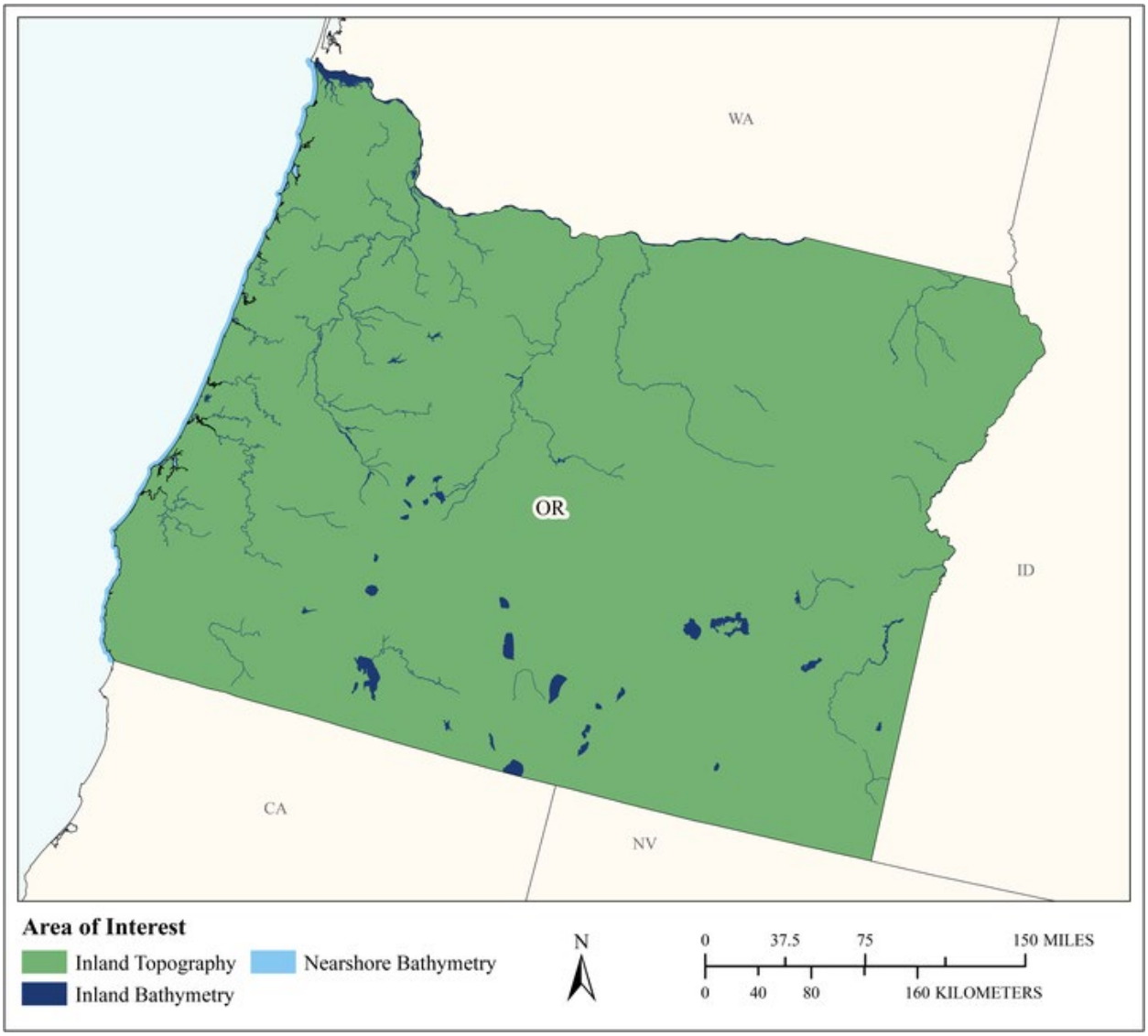
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$521,404									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Homeland Security, Law Enforcement, Disaster Response, and Emergency Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Infrastructure and border protection. Coastal search and rescue. Population dynamics. Emergency fuel supply and movement. Line of sight analysis in urban areas. Disaster response. Flood risk analysis resulting from acts of terrorism.
MCA Title	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
MCA ID	60359
Organization Type	State or U.S. Territorial government
Organization Name	State of Oregon
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B	QL1B	
Update Frequency	4-5 years	4-5 years	6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable		Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Required	
DTM	Required	Highly desirable	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Highly desirable	Highly desirable	
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Highly desirable	Highly desirable	
Full waveform	Nice to have	Nice to have	Highly desirable	
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Highly desirable	
Ground control/ground truthing	Required	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Required	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Highly desirable	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Nice to have	
Boundaries			Highly desirable	
Routes			Highly desirable	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	
Cost savings/cost reduction	Major	Major	Major	
Cost avoidance	Major	Moderate	Moderate	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	Moderate	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Minor	

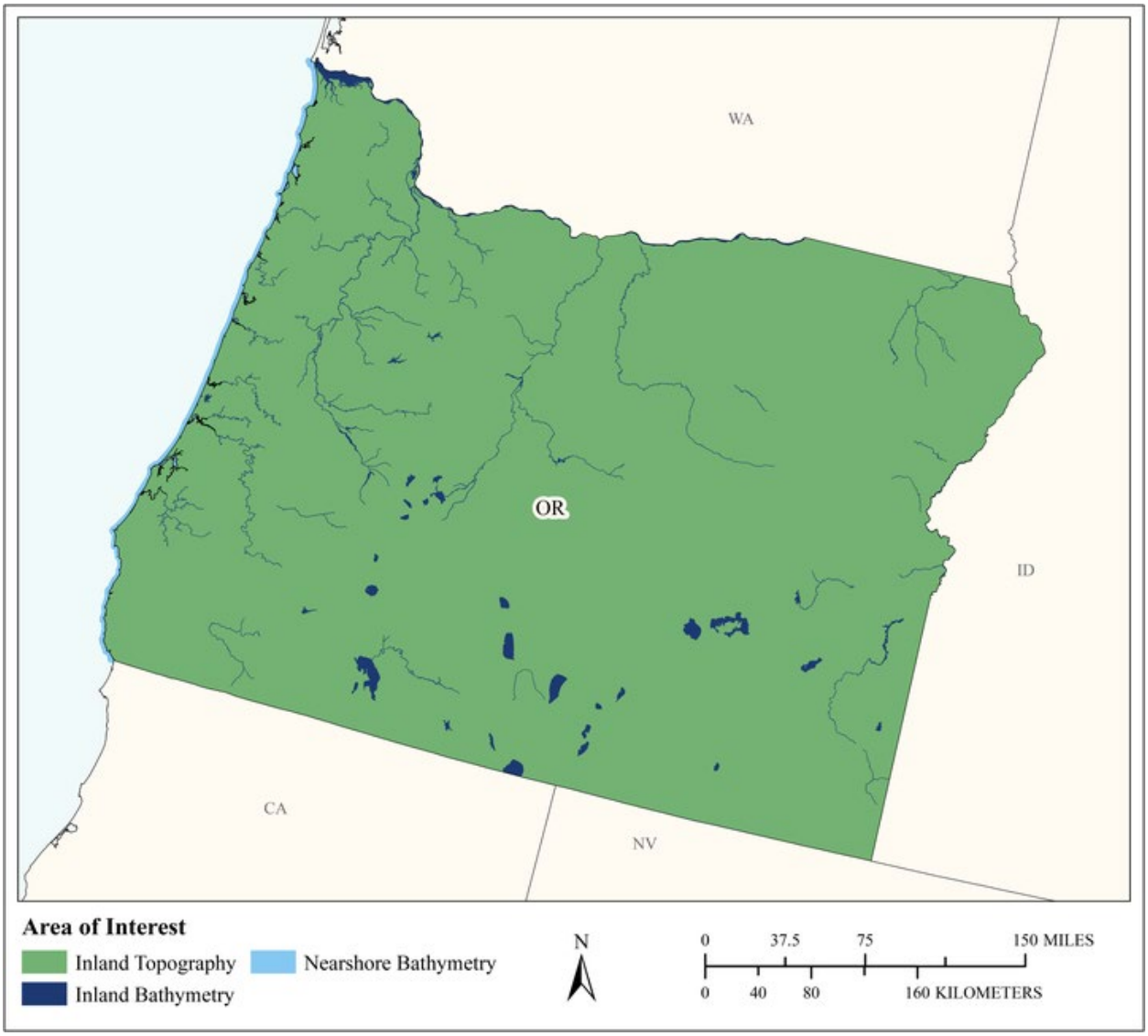
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major	Minor	
Improved customer experience	Major	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	Minor	
Environmental	Minor	Moderate	Minor	
Public safety, including life and property	Major	Major	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,862,820		Annual dollars saved/ realized	$806,243		Annual dollars saved/ realized	$2,482			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$50,599		Annual dollars saved/ realized	$51,439		Annual dollars saved/ realized	$71			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate					
Environmental	Moderate			Moderate			Moderate					
Public safety, including life and property	Major			Major			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Transportation Engineering



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	We have many mission critical activities throughout the transportation engineering process. They cover many of the business uses and MCAs. Stream channel analysis and mapping. Environmental Management. Land use and environmental planning. Geologic mapping and analysis. Identification of geomorphologic units. Landslide hazard mapping and assessment. Site protection and preservation planning. Discovery and analysis of Native American and other historical cultural sites and subsistence activities. Post-fire analysis to determine landslide-prone areas. Road and railroad route selection and maintenance. Slope analysis for autonomous cars. GPS navigation visualization. Bridge design and construction. Engineering and construction of dams, levees, dikes, reservoirs, and coastal structures. Shipyard and port construction. Water, sewer, or power line planning and vegetation analysis. Pump, drain, and well placement. Storm water modeling. Cut and fill analysis for earth-moving. Building site analysis. Road infrastructure. Infrastructure hardening or mitigation for climate change effects Land development and zoning. Delimitation of legal and other coastal boundaries, inland boundaries, and ordinary high water lines (OHWL). BU 20 – Marine and Riverine Navigation and Safety would be an additional Business Use.
MCA Title	Transportation Engineering
MCA ID	21870
Organization Type	State or U.S. Territorial government
Organization Name	Oregon Department of Transportation
Sub-Agency or Division	
Organization Mission	To provide safe reliable transportation for those traveling within Oregon.
Program Name	The program within Oregon is the Oregon Lidar Consortium (OLC). ODOT uses data collected under OLC and specific contracts managed by ODOT.
Total Annual Program Budget	
Primary Business Use	BU 19 - Land Navigation and Safety
Secondary Business Use	BU 22 - Infrastructure and Construction Management
Tertiary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.

General Geographic Area and Size	
Description of smallest 3D features	Signs, bridge components, curb, striping, individual rocks.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	
Update Frequency	2-3 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Up to 1 meter	Up to 1 meter	
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed			1 kilometer inland	
How far down the beach profile needed	To MLLW		None	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs		Partial	Partial	
Cross section/transect requirement		Vertical accuracy would be up to 30 cm. Longitudinal sampling should be every 5-8 meters		

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Nice to have	Highly desirable		Required	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Required	Required	Required	
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Highly desirable	Highly desirable	
Full waveform	Required	Highly desirable	Highly desirable	
Bathymetric Attributed Grid (BAG)		Highly desirable	Required	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Required	
Intensity imagery/sidescan imagery	Required	Required	Required	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Highly desirable	Required	Highly desirable	
Underwater videography			Not required	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Required	Required	Highly desirable	
Water column properties - Physical			Highly desirable	
Water column properties - Chemical			Highly desirable	
Water column properties - Biological			Highly desirable	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Highly desirable	
Routes			Highly desirable	
Offshore cadastral			Highly desirable	
Lease areas			Highly desirable	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Required	Highly desirable	
Land use/land cover	Required	Required	Highly desirable	
Wetlands	Highly desirable	Required	Highly desirable	
Estuaries			Highly desirable	
Inland surface water features	Highly desirable	Required	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Required	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Highly desirable	Required		
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	A majority of the data we're using is QL1 collected between 2008 and 2017.	QL1 quality data	QL2 – whatever has been provided by USGS and NOAA	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast		Yes	Yes	
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Oregon Lidar Consortium			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Minor	

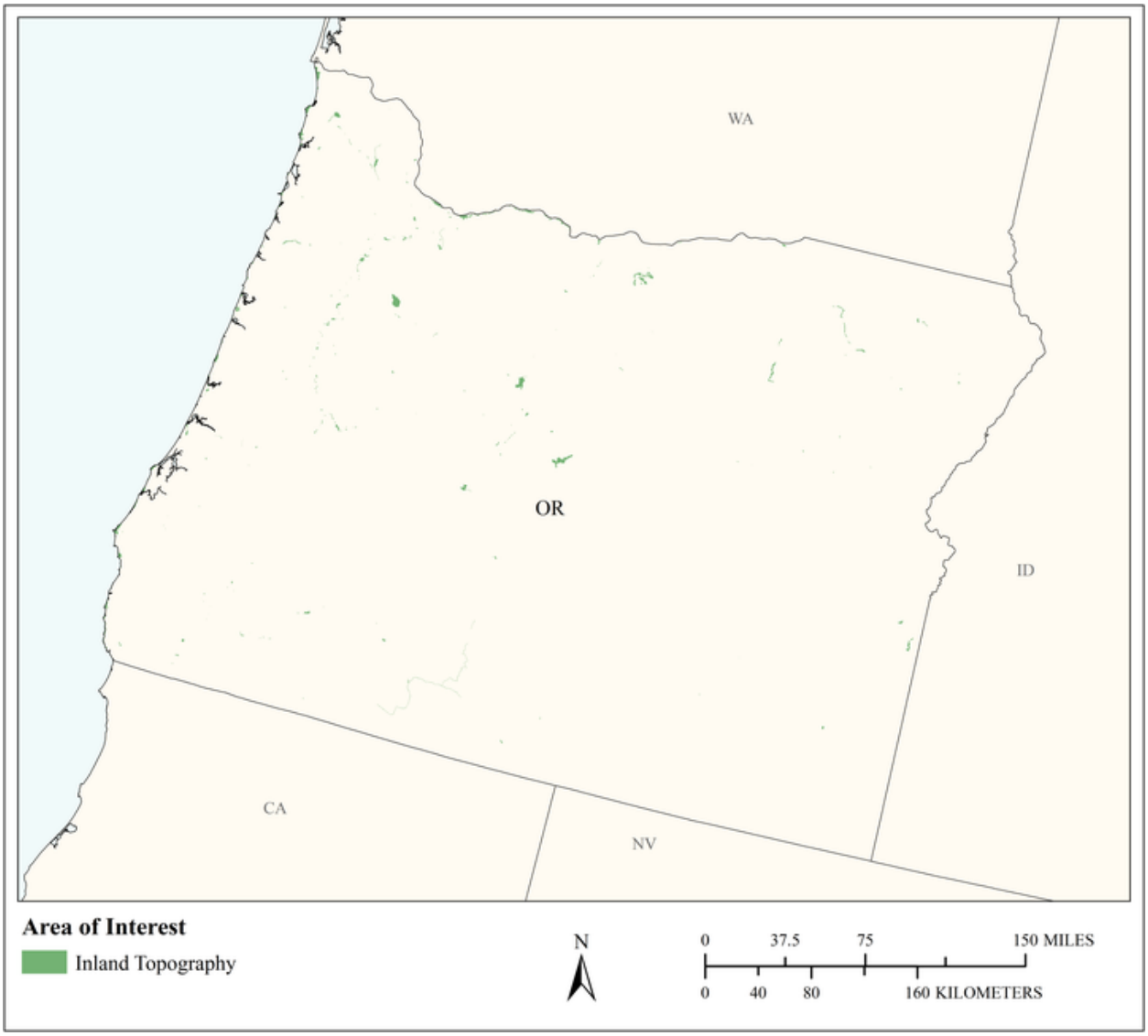
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Cost savings/cost reduction	Moderate	Minor	Minor	
Cost avoidance	Moderate	Minor	Minor	
Increased revenues	I don't know	None	None	
Mission-driven performance improvements	Major	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Minor	
Improved response or timeliness	Major	Moderate	Minor	
Improved customer experience	Major	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	Minor	Minor	
Environmental	Moderate	Moderate	Moderate	
Public safety, including life and property	I don't know	Moderate	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Time savings description	It's hard to truly say how much is saved, but the amount is significant.											
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Cost savings/cost reduction description	Our lidar needs are typically project based and are scheduled around budget or an event in which case 3DEP data may or may not be useful.											
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Increased revenues	None			Minor	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements description	Statewide data covering our transportation network could help the effectiveness of highway design and maintenance. Morphological modeling is important in Oregon and aerial lidar is a key component to making better decisions.											
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,257,147		Annual dollars saved/ realized	$53,622						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$101,520		Annual dollars saved/ realized	$554						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			I don't know			Minor					
Environmental	Major			Major			Minor					
Public safety, including life and property	Major			Major			Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections		Yes	Yes	
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes	Yes	Yes	
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes	Yes	
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Engineering and Facilities Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Respondent provided own shapefile, KML, or geodatabase			
Sub Area Requirements	Oregon State Parks			

MCA Description	Response
Mission Critical Activity	Engineering and facilities management. Site planning and infrastructure development, Engineering and facilities management. Site design and planning for infrastructure projects including utilities (power, water, wastewater), buildings, roads.
MCA Title	Engineering and Facilities Management
MCA ID	21664
Organization Type	State or U.S. Territorial government
Organization Name	Oregon Parks and Recreation Department
Sub-Agency or Division	
Organization Mission	The mission of the Oregon Parks and Recreation Department is to provide and protect outstanding natural, scenic, cultural, historic and recreational sites for the enjoyment and education of present and future generations
Program Name	Park Development
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Curbs, manholes, electrical transformers, transformers

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed	To MHW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Highly desirable
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Nice to have					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Nice to have			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Existing QL1 lidar, photogrammetric mass points/surfaces (SfM), terrestrial laser scanning data, traditional topographic survey data, Dominant source is QL1 lidar. Secondary sources include mass points from photogrammetry (SfM), terrestrial laser scanning and traditional topographic surveying.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes			
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				

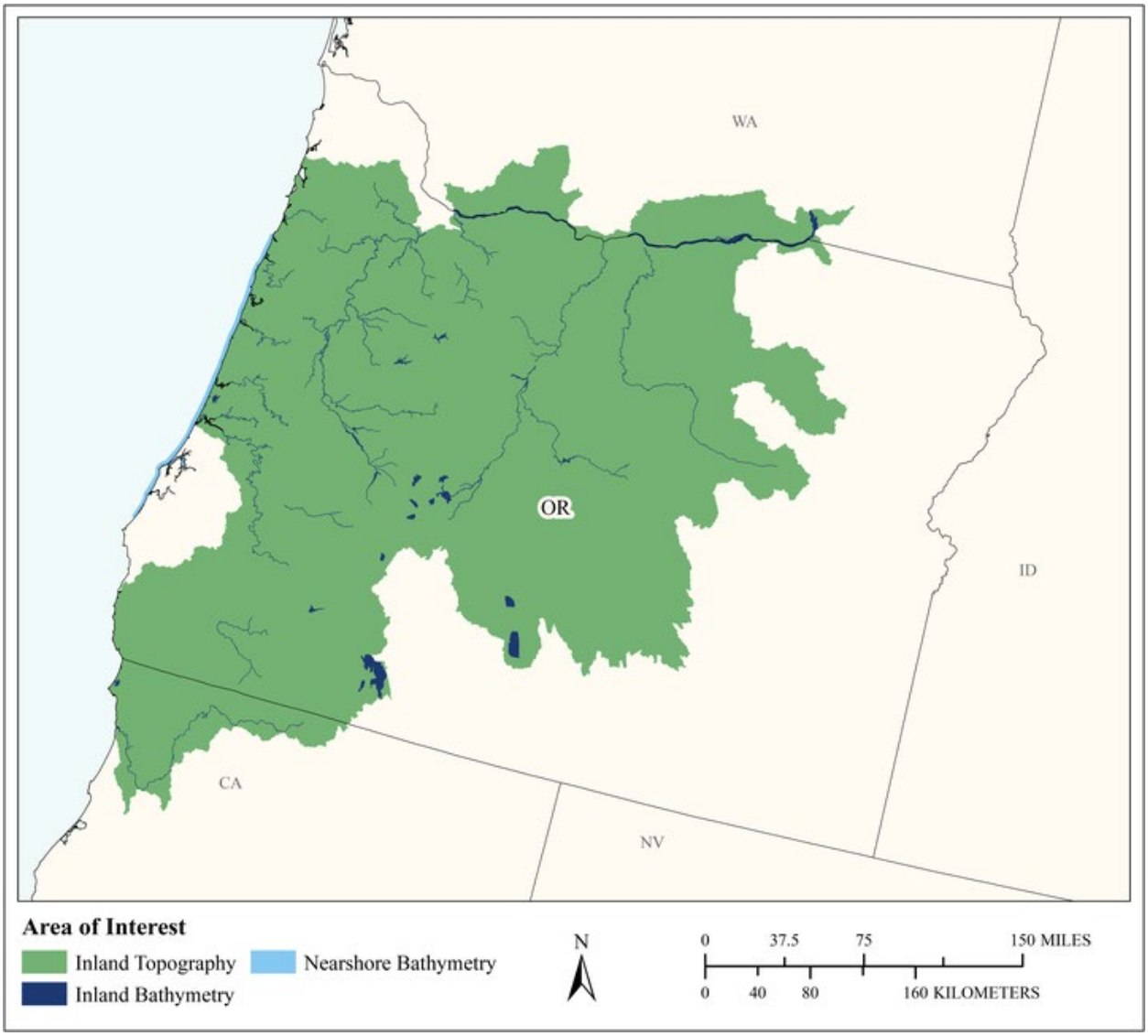
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State repositories used				
Other	Yes			
Other description	Contracted, Cooperative acquisition,			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Minor			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			
Improved response or timeliness	Moderate			
Improved customer experience	None			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	Moderate			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$21,708									
Time savings description	40 hrs/mo reduced data developemnt time = 480 hrs/yr. 20 hrs/mo reduced field visit time = 240 hrs/yr.											
Cost savings/cost reduction	Moderate	Annual dollars saved/realized	$40,000									
Cost savings/cost reduction description	Acquisition reduction and/or reduced contracting costs.											
Cost avoidance	Minor	Unable to provide										
Cost avoidance description	Cost reduction due to using inferior (lower accuracy) data.											
Increased revenues	None											
Mission-driven performance improvements	Minor	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	None											
Improved response or timeliness	None											
Improved customer experience	None											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None											
Environmental	None											
Public safety, including life and property	None											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Regional GIS and Data Services



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Area split by varying quality level or update frequency	Custom description	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements	HUC8s that cover Oregon Council of Governments	HUC8s that cover Oregon Council of Governments	Lane, Lincoln, Coos, and Douglas Counties, OR	

MCA Description	Response
Mission Critical Activity	Oregon's Councils of Governments provide data acquisition and development, data analysis, and planning services for a diverse set of agencies. The mission critical activities fall primarily into BU 23 (Urban and Regional Planning) and 25 (Real Estate) and related cases. Individual agencies provide data back as well. Elevation data are needed for ecosystem management for electric utilities, drinking water, data sharing consortium, and real estate/property management. Bathymetry in reservoirs is used for river dynamics.
MCA Title	Regional GIS and Data Services
MCA ID	21615
Organization Type	Regional, County, City, or other local government
Organization Name	Oregon Councils of Government
Sub-Agency or Division	
Organization Mission	By direction of member agencies, LCOG identifies future trends and coordinates, promotes, plans and provides efficient intergovernmental and specialized services to local governments, other agencies and citizens.
Program Name	Geographic Information Systems and Data Services
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 25 - Real Estate, Banking, Mortgage, and Insurance
Tertiary Business Use	BU 02 - Riverine Ecosystem Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Our municipal and utility partners are interested in curbs, utility access (man holes), power lines, and related structures on the fine end of scale.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	(a) QL1 HD (b) QL2	QL1B	QL1B	
Update Frequency	(a) 2 years (b) 2-4 years	2-3 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI	Urban areas need greater frequency and higher standards than rural areas, in general. Greater metro area of Eugene, Coburg, and Springfield at QL1 HD every 2 years, elsewhere QL2 every 2-4 years.		Lane County coastline	
Acceptable Horizontal Error	Up to 30 cm	Up to 1 meter	Up to 1 meter	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed			To Mean Lower Low Water (MLLW)	
How far down the beach profile needed	Not applicable		None	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Nice to have	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Required	
DTM	Required	Highly desirable	Required	
DEM	Required	Highly desirable	Required	
Raw point cloud data	Required	Nice to have	Highly desirable	
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Not required	Nice to have	
Full waveform	Nice to have	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Not required	Not required	
Breaklines required for standard hydro-flattening	Not required	Not required		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Not required	
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Not required	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Not required	
Submerged features			Not required	
Subbottom characteristics			Not required	
Geologic and seismic data	Highly desirable	Highly desirable	Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Not required	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Not required	
Land use/land cover	Highly desirable	Highly desirable	Not required	
Wetlands	Highly desirable	Highly desirable	Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Not required	
Inland surface water features	Required	Highly desirable	Not required	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have	Not required	
Cultural resources	Nice to have	Nice to have	Not required	
Coastal and riverine structures	Nice to have	Highly desirable	Not required	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We have a variety of dates available from old USGS to 2016 Lidar information (point cloud and derivative products) through Oregon DOGAMI.	We have limited amounts of bathymetric data on the McKenzie and Middle Fork Willamette.	None at this time.	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes	Yes	Yes	
Other description	Oregon Lidar Consortium	Contracted flights	None	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	I don't know	

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Cost savings/cost reduction	Major	Minor	I don't know	
Cost avoidance	Moderate	Minor	I don't know	
Increased revenues	Moderate	Minor	I don't know	
Mission-driven performance improvements	Major	Minor	I don't know	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor	I don't know	
Improved response or timeliness	Minor	None	I don't know	
Improved customer experience	Moderate	Minor	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	I don't know	I don't know	
Environmental	Major	Minor	I don't know	
Public safety, including life and property	Moderate	Minor	I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Moderate	Annual dollars saved/realized	$5,927,432	Moderate	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction description	$490/square mile acquisition costs saved * COG square miles divided by 2.5 for update frequency.											
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Increased revenues	None			None			None					
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$8,376,760		Annual dollars saved/ realized	$582,584		Annual dollars saved/ realized	$25,870			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,651,425		Annual dollars saved/ realized	$737,019		Annual dollars saved/ realized	$27,291			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			I don't know					
Environmental	Moderate			Moderate			I don't know					
Public safety, including life and property	I don't know			Moderate			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

Pennsylvania

Current status of elevation data for Pennsylvania

Pennsylvania is a highly diverse state, encompassing 46,055 square miles, including portions of six major physiographic provinces and six major watersheds. Both the northeastern and northwestern tiers of the state were historically glaciated, resulting in the formation of lakes and glacial deposits. Pennsylvania is home to vast acreages of preserved mountainous wilderness and parklands, two major metropolitan areas (Philadelphia and Pittsburgh) on opposite ends of the state, and portions of two very different types of coastal zones. These coastal zones include part of Lake Erie in northwestern Pennsylvania, which is one of the five Great Lakes of the U.S., and a portion of the Delaware Estuary in southeastern Pennsylvania, which as a whole, comprises the largest freshwater port in the world. In addition, Pennsylvania comprises over a third of the Chesapeake Bay watershed and contains the Susquehanna River, which is the largest tributary to the bay. A state with such diversity of natural resources, terrain, and urban and rural population centers, values dependable terrestrial and bathymetric elevation data for management of natural resources, hazard mitigation planning (for example, floods and landslides), infrastructure maintenance, and coastal zone management.

Pennsylvania was one of the first states to have a comprehensive statewide elevation program, called PAMAP. The PAMAP data were created between 2006 and 2008 and include 2-foot contours, DEMs, hillshades, breaklines, and LAS files. However, there has not been updated statewide elevation data since the end of the PAMAP Program in 2008. There are multiple regional and local initiatives that have filled some of the gaps in data since that time. These regional initiatives include: lidar data developed by the Delaware Valley Regional Planning Commission (2005, 2015); the City of Philadelphia lidar and elevation data (2004, 2008, 2010, 2015, 2018); Allegheny County (2015); lidar data developed in response to Hurricane Sandy (2014); data developed for specific purposes such as the data from Lake Erie funded by PA Department of Environmental Protection (DEP) (2015); and local lidar and data funded by the 3DEP program for areas such as Allentown. The National Elevation Dataset (NED), historic data such as USGS 10-meter and 30-meter data, the Shuttle Radar Topography Mission (SRTM) data, and USGS Digital Raster Graphics are commonly used as well.

Most recently, NRCS and USGS developed lidar data for the Chesapeake Bay Region, which includes parts of central and southeastern Pennsylvania. This data covers 13 counties in Pennsylvania that fall within the Bay region. Lidar data were acquired in 2019 for 22 counties in eastern and central Pennsylvania through 3DEP, funded by a partnership of state (Department of Conservation and Natural Resources (DCNR), Pennsylvania Emergency Management Agency, DEP, Department of Transportation, Turnpike Commission, Susquehanna River Basin Commission) and federal (FEMA, USGS, NRCS) agencies. Plans are to collect lidar in the western part of the commonwealth with NRCS funding in FY2020. The Pennsylvania Geospatial Coordinating Board LIDAR Working Group is actively engaged in building partnerships and acquiring funding to develop more data. Pennsylvania organizations are also creating their own data for in house use. This data is collected via field surveys or the use of technology such as sonar or drones.

Importance of elevation data to Pennsylvania

Elevation data are vital to the commonwealth. Survey respondents state that the data are being used for purposes as varied as mining permitting to flood risk management, education, and land conservation. One example of the impact of elevation data is in the area of flood risk management. Flooding in Pennsylvania is the most frequent and damaging natural disaster that occurs throughout the commonwealth. Higher quality elevation data are key to assessing flood risk across the commonwealth. In addition, it is clear that lidar data are necessary for many of the state agencies including the DEP, DCNR, and intergovernmental

organizations including river basin commission to meet the goals of their missions to protect the environment, support business functions, and monitor the health of the region's water resources.

Although terrestrial quality level (QL) 2 elevation data are on schedule to be available for the entire state in 2021, Pennsylvania currently has little to no QL 1 terrestrial elevation or bathymetric data available. QL 1 terrestrial elevation data are especially vital for planning in urban metropolitan areas, such as Philadelphia and Pittsburgh. Also, bathymetry data for nearshore areas are currently fragmented and acquired for specific projects, rather than in a coordinated regional manner. Nearshore bathymetric data are an important need for Pennsylvania's Next Generation 911 program and management of the state's lakes and diverse coastal zones previously described.

High-level summary of elevation data requirements

There are varying degrees of requirements related to elevation data. The majority of the respondents preferred Quality Level 2 data if available. This is of particular importance for respondents in state agencies who were engaged in environmental and conservation activities. Higher quality lidar is of interest to many of the respondents but not a requirement. Bathymetry data for the commonwealth is limited. There are pockets of data available around Lake Erie/Presque Isle for example, but for lakes and rivers this data is limited and should be considered an area of opportunity. The Pennsylvania Geological Survey collects and publishes bathymetry data for state park lakes, while the U.S. Army Corps of Engineers maintains and makes available bathymetric data for the recreational areas of their lakes, and the inland commercially navigable waterways throughout the Commonwealth.

Pennsylvania's Coastal Resources Management Program continues to provide coordinated resource management, protection and development oversight to its two widely separated Lake Erie and Delaware Estuary coastal zones. The 77-mile long Lake Erie coastal zone is located in the northwest corner of Pennsylvania between the Ohio and New York state lines. Three hundred and fifty miles away on the southeast border of Pennsylvania is the 112-mile Delaware Estuary coastal zone, stretching from the borough of Morrisville in the north to the borough of Marcus Hook in the south.

These two coastal zones each host an international port facility (Ports of Erie and Philadelphia) and provide access to recreational opportunities among unique natural and historic resources. Concurrently, each area poses unique shoreline management challenges such as bluff and shoreline erosion within the Lake Erie coastal zone and floodplain/storm water management and wetlands protection throughout the densely populated Delaware Estuary coastal zone.

Pennsylvania's Coastal Program supports activities such as: science and technical support; monitoring, preserving and protecting coastal wetlands; managing water quality; monitoring bluff recession; and providing sub-grants to non-profits, universities and state agencies. The program is also building capacity to facilitate climate adaptation planning and community resiliency.

The data sets of greatest value required by the most respondents are: DEMs, contours, breaklines, hillshades, slope/aspect, and point cloud data. Most respondents found the structural data of interest but not required, though several found this highly desirable.

The data formats of greatest interest and need are shapefiles, geodatabases, GeoTiff, Tiff, and LAS. Open source formats were not listed as being necessary although this is an area of growing interest in the wider GIS community. Data services and access methods responses listed downloads as the most significant method with services as a secondary option.

High-level summary of benefits that would come from higher resolution elevation data

It was clear that the respondents felt that higher quality data and more updated data would be of great benefit to their work. Most respondents stated that higher quality data and access to more data would save them time and money and allow them to do their work with greater accuracy, speed, and efficiency.

All of the data discussed above is available for free to the public via Pennsylvania Spatial Data Access (PASDA, http://www.pasda.psu.edu), the GIS data portal for the commonwealth.

The Commonwealth of Pennsylvania has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

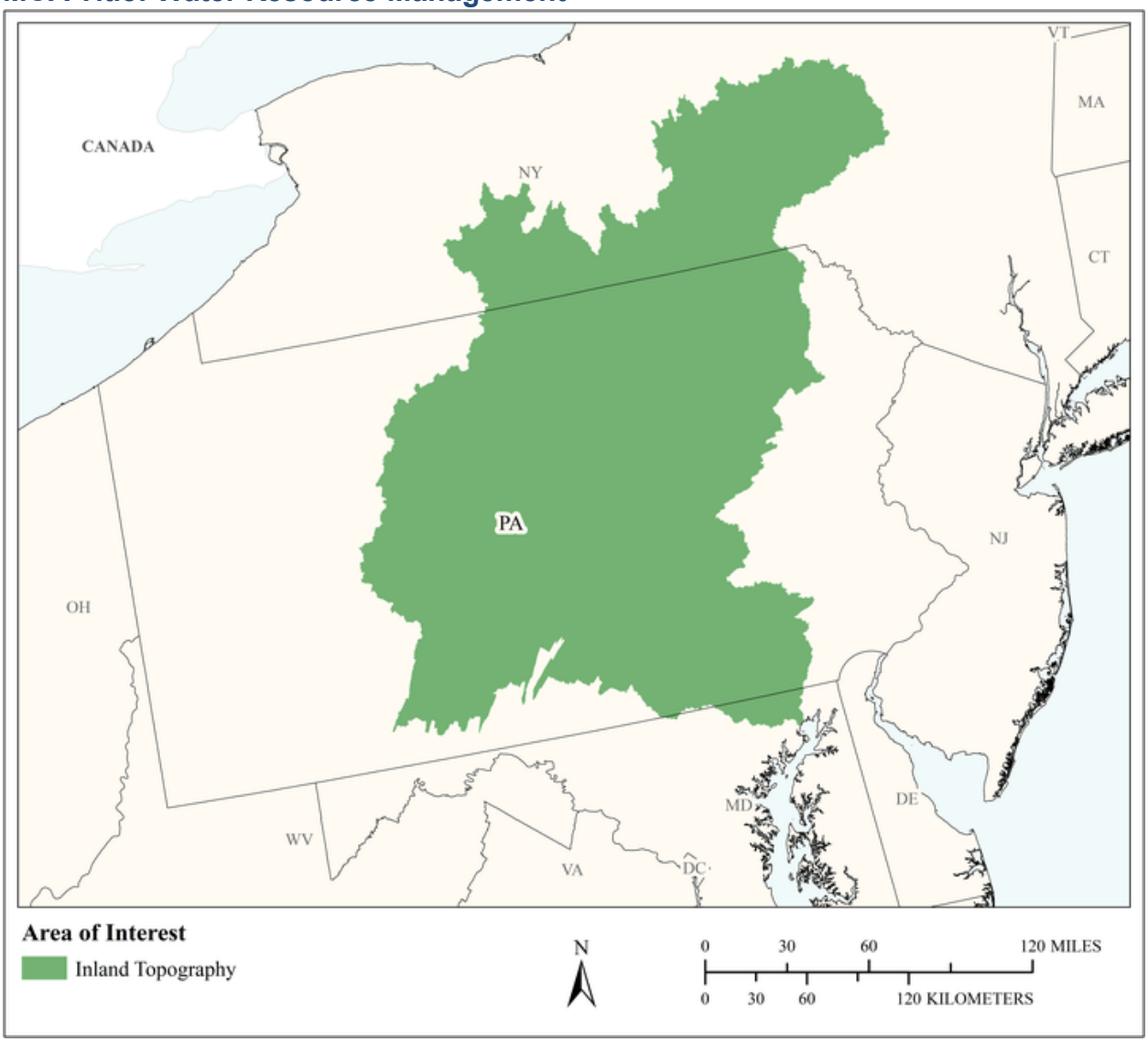
Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	Susquehanna River Basin Commission	11473	Water Resource Management	Inland Topo	QL2	No requirement for this	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
BU 01 – Water Supply and Quality	Delaware River Basin Commission	21585	Comprehensive Watershed Management	Inland Topo	QL2	2-3 years	Unable to quantify	$1,206	None	Minor	None
				Inland Bathy	Coarser bathymetric data satisfies my needs	6-10 years	Unable to quantify	Unable to quantify	None	None	None
				Nearshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 01 – Water Supply and Quality	Pennsylvania Department of Environmental Protection	21767	Environmental Protection of Air, Land, and Water	Inland Topo	QL2	2-3 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	Coarser bathymetric data satisfies my needs	4-5 years	Unable to quantify	Unable to quantify	Major	Moderate	Minor
				Nearshore Bathy	I don't know	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 04 – Forest Resource Management	PA Department of Conservation and Natural Resources (DCNR) - Bureau of Forestry	22182	Forest and Ecosystem Management	Inland Topo	QL1	2-3 years	Unable to quantify	Unable to quantify	Minor	Major	Minor
BU 07 – Wildlife and Habitat Management	Commonwealth of Pennsylvania	60360	Wildlife and Habitat Management	Inland Topo	QL2	4-5 years	$10,790	$31,166	Moderate	Major	Moderate
				Inland Bathy	QL2B	4-5 years	$86,479	$52,271	Moderate	Moderate	Moderate
				Nearshore Bathy	QL0B	4-5 years	$72	$4	Moderate	Major	Moderate
				Offshore Bathy	Special Order	4-5 years	$639	$44	Moderate	Major	Major
BU 08 – Agriculture	Commonwealth of Pennsylvania	60361	Agriculture and Precision Farming	Inland Topo	QL2	2-3 years	$52,448	$41,578	Major	Major	Minor
				Inland Bathy	QL4B	4-5 years	$91,889	$41,578	Moderate	Major	Major
BU 09 – Fisheries Management and Aquaculture	Commonwealth of Pennsylvania	60362	Fisheries Management and Aquaculture	Inland Topo	QL2	2-3 years	$46,306	$100,580	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	6-10 years	$90,641	$41,254	Major	Major	Moderate
				Nearshore Bathy	QL0B	6-10 years	$11,540	$847	Moderate	Major	Minor

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 10 – Geologic Assessment	PA Geological Survey	1447	Geologic Mapping	Inland Topo	QL2	6-10 years	$19,296	$2,261	Moderate	Major	Major
				Inland Bathy	QL1B	Event driven	$12,260	Unable to quantify	Minor	None	Minor
				Nearshore Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Minor
				Offshore Bathy	Special Order	6-10 years	Unable to quantify	Unable to quantify	Moderate	None	None
BU 10 – Geologic Assessment	PA DEP Bureau of Abandoned Mine Reclamation & Bureau of Mining Programs	22432	Mine Permitting, Compliance, and Reclamation	Inland Topo	QL1	4-5 years	Unable to quantify	Unable to quantify	I don't know	Major	I don't know
				Inland Bathy	QL1B	Event driven	Unable to quantify	Unable to quantify	I don't know	Major	Major
				Nearshore Bathy	I don't know	Event driven	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 12 – Renewable Energy Resources	Commonwealth of Pennsylvania	60363	Renewable Energy Resources	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	None
				Inland Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Offshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 14 – Cultural Resource Management	Commonwealth of Pennsylvania	60364	Cultural Resources Preservation and Management	Inland Topo	QL1	4-5 years	$8,303	$7,259	Minor	Minor	Minor
				Inland Bathy	QL0B	6-10 years	$19,911	Unable to quantify	Moderate	Minor	Minor
BU 19 – Land Navigation	Commonwealth of Pennsylvania	60365	Land Navigation and Safety	Inland Topo	QL0	2-3 years	$586,837	$47,390	Minor	Major	Major
				Inland Bathy	QL0B	2-3 years	$25,031	$258	Minor	Moderate	Moderate
				Nearshore Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	None	Moderate	Moderate
BU 20 – Marine and Riverine Navigation	Commonwealth of Pennsylvania	60366	Marine and Riverine Navigation and Safety	Inland Topo	QL0 HD	2-3 years	$1,735,377	Unable to quantify	None	None	Minor
				Inland Bathy	QL0B	2-3 years	$826,315	$108,752	Moderate	Moderate	Moderate
				Nearshore Bathy	QL0B	2-3 years	$56,313	$1,906	Minor	Major	Major
BU 21 – Aviation Navigation	Commonwealth of Pennsylvania	60367	Aviation Navigation and Safety	Inland Topo	QL1 HD	Annually	$153,139	$190,730	Minor	Moderate	Moderate
				Inland Bathy	QL0B	Annually	$30,494	Unable to quantify	Moderate	Major	Major
				Nearshore Bathy	I don't know	Annually	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 22 – Infrastructure Management	Commonwealth of Pennsylvania	60368	Infrastructure and Construction Management	Inland Topo	QL0 HD	4-5 years	$2,035,783	$5,990,900	Minor	Moderate	Major
				Inland Bathy	QL0B	4-5 years	$685,888	$71,221	Minor	Moderate	Moderate

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 23 – Urban and Regional Planning	Southwestern PA Commission	21586	Transportation Planning	Inland Topo	QL1 HD	4-5 years	Unable to quantify	Unable to quantify	Minor	Minor	Moderate
BU 23 – Urban and Regional Planning	Delaware Valley Regional Planning Commission	21719	Regional Planning for Citizens of Pennsylvania	Inland Topo	QL2	Unlike our aerial imagery, we have no set update cycle for LiDAR-derived data	$501,206	Unable to quantify	I don't know	I don't know	I don't know
BU 23 – Urban and Regional Planning	Natural Lands Trust	22066	Land Conservation and Planning	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 28 – Telecom-munications	Commonwealth of Pennsylvania	60369	Telecommunications	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Inland Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	Major

MCA Title: Water Resource Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Water resource management
MCA Title	Water Resource Management
MCA ID	11473
Organization Type	Federal Agencies and Commissions
Organization Name	Susquehanna River Basin Commission
Sub-Agency or Division	GIS Section
Organization Mission	The mission of the Commission, which is defined in the Compact, is to enhance public welfare through comprehensive planning, water supply allocation, and management of the water resources of the Susquehanna River Basin. To accomplish this mission, the Commission works to: reduce damages caused by floods; provide for the reasonable and sustained development and use of surface and ground water for municipal, agricultural, recreational, commercial and industrial purposes; protect and restore fisheries, wetlands and aquatic habitat; protect water quality and instream uses; and ensure future availability of flows to the Chesapeake Bay.
Program Name	Project Review and Planning
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 02 - Riverine Ecosystem Management

What Needs to be Measured in 3D	Response
Bare earth ground	Nice to have
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	Building, small watershed

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	No requirement for this			
Event type(s)				
Quality Level and/or update frequency variability across AOI	We work with what is available			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required			
DTM	Highly desirable			
DEM	Highly desirable			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	PAMAP LiDAR, 2006-2008, 3.2 ft, QL3 10m NED			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	PA Spatial Data Access - PASDA			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	None			
Cost avoidance	None			
Increased revenues	None			

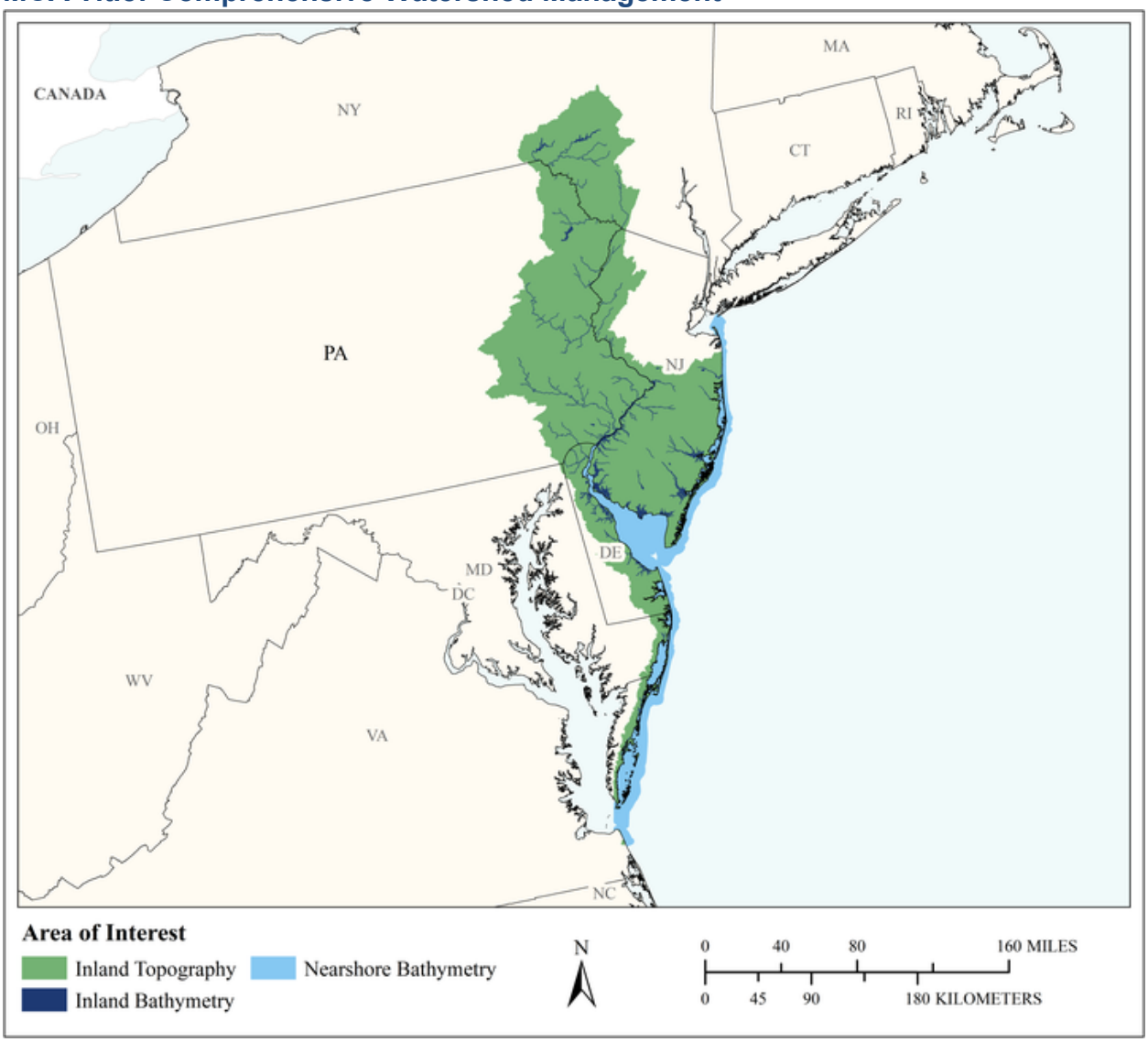
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			
Improved response or timeliness	Minor			
Improved customer experience	None			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Moderate			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Time savings description	Enhanced water storage options, enhanced flood inundation mapping. Nice to have seamless LiDAR across state lines.											
Cost savings/cost reduction	Moderate	Unable to provide										
Cost savings/cost reduction description	More accurate water storage capacity estimates.											
Cost avoidance	Moderate	Unable to provide										
Cost avoidance description	Enhanced flood inundation mapping.											
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Moderate	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Moderate											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Comprehensive Watershed Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)	One or more Hydrologic Units (HUC4s)	Nearshore areas along the coast (including the Great Lakes) off one or more Hydrologic Units (HUC4s)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Commission programs include water quality protection, water supply allocation, water conservation initiatives, watershed planning, drought management, and flood loss reduction.
MCA Title	Comprehensive Watershed Management
MCA ID	21585
Organization Type	Regional, County, City, or other local government
Organization Name	Delaware River Basin Commission
Sub-Agency or Division	
Organization Mission	Provide comprehensive watershed management. Act as stewards of the Basin's water resources particularly with respect to: Surface water quality, including both point and non-point sources of pollution; Ground and surface water quantity, including water demands, water withdrawals, water allocations, water conservation, and protected areas; Drought management; and In-stream flow management Promote effective inter-agency coordination to prevent duplication of efforts. Seek increased public involvement.
Program Name	Water Supply Program
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	Watershed areas, i.e. HUC 12 levels, ~50 square miles

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have

Inland Bathy Feature Size Requirements	Response
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	Coarser bathymetric data satisfies my needs	I don't know	
Update Frequency	2-3 years	6-10 years	I don't know	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	
Acceptable Vertical Error	I don't know	Up to 1 meter	I don't know	
How far onshore needed			I don't know	
How far down the beach profile needed	Below MLLW		I don't know	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Not required	Not required		Not required	Not required
Entire AOI under same environmental conditions	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Not required	Not required		Not required	Not required
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Nice to have	
DTM	Nice to have	Nice to have	Nice to have	
DEM	Highly desirable	Highly desirable	Highly desirable	
Raw point cloud data	Not required	Not required	Not required	
Classified point cloud	Not required	Not required	Not required	
Edited/cube XYZ		Not required	Not required	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Not required	Not required	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Not required	Not required		
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)			Not required	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Not required	Nice to have	Nice to have	
Ground control/ground truthing	Nice to have	Nice to have	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Nice to have	
Underwater videography			Nice to have	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Nice to have	
Subbottom characteristics			Not required	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Highly desirable	
Water column properties - Chemical			Highly desirable	
Water column properties - Biological			Highly desirable	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have	Nice to have	Nice to have	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	
Estuaries			Highly desirable	
Inland surface water features	Highly desirable	Highly desirable	Highly desirable	
Bridges/culverts	Highly desirable	Nice to have		
Landmark features	Not required	Not required	Not required	
Cultural resources	Not required	Not required	Not required	
Coastal and riverine structures	Nice to have	Nice to have	Nice to have	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	USGS 10 Meter DEM	NOAA Bathymetry	NOAA Bathymetry	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast		Yes	Yes	
NCEI				
Open Topography				
NOAA nautical charts		Yes	Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	I don't know	
Cost savings/cost reduction	Major	Major	I don't know	
Cost avoidance	Major	Major	I don't know	
Increased revenues	None	None	I don't know	

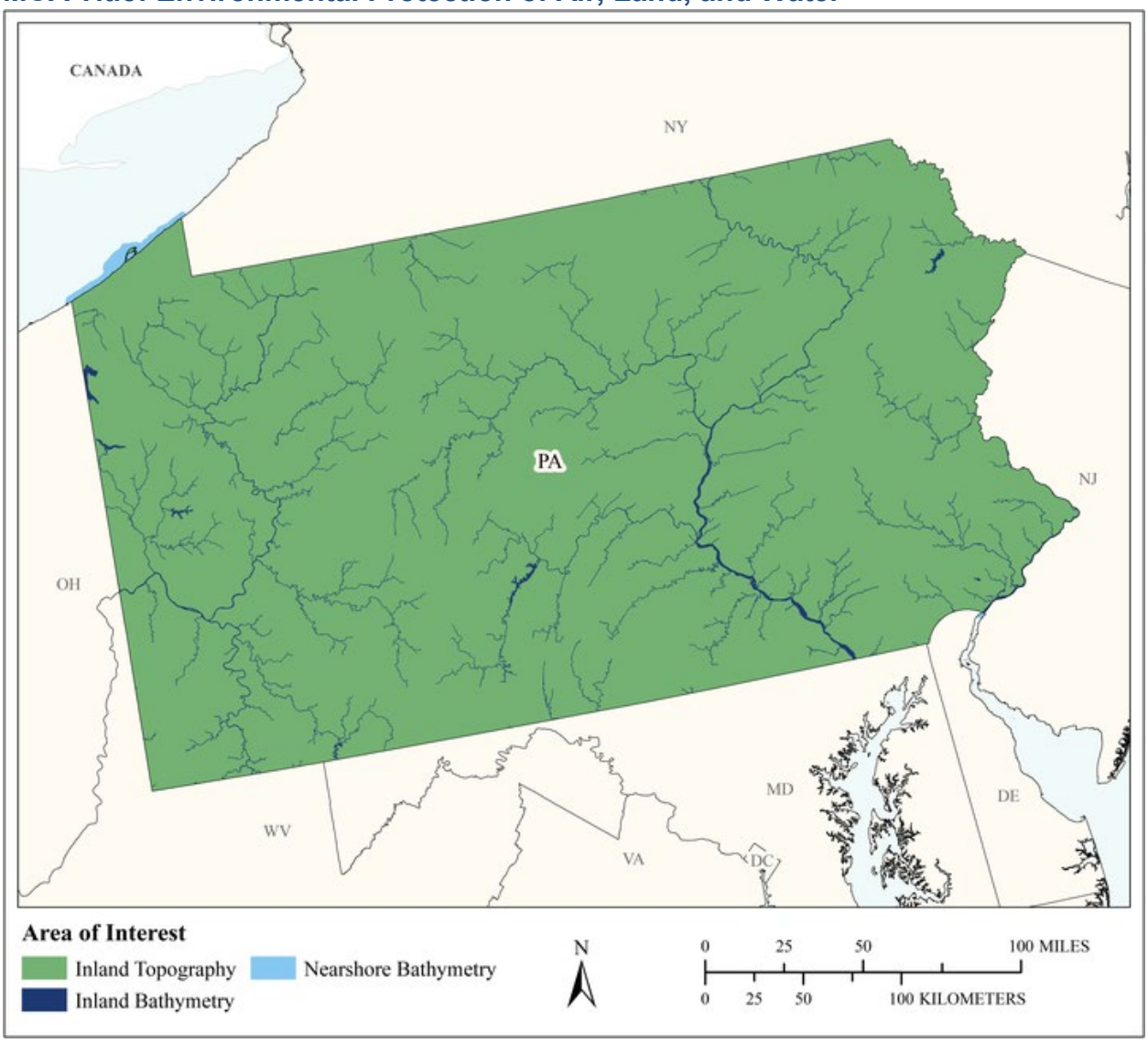
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Mission-driven performance improvements	Minor	None	I don't know	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	Minor	I don't know	
Improved response or timeliness	Minor	None	I don't know	
Improved customer experience	Minor	None	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	I don't know	
Environmental	Minor	Moderate	I don't know	
Public safety, including life and property	None	None	I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Minor	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide				
Cost savings/cost reduction	None			Minor	Unable to provide		I don't know	Unable to provide				
Cost avoidance	I don't know	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide				
Increased revenues	None			None			I don't know	Unable to provide				
Mission-driven performance improvements	Minor	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide				
Other operational benefits	Minor	Unable to provide										
Other operational benefits description												
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness	Minor	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide				
Improved customer experience	Minor	Annual dollars saved/realized	$1,206	Minor	Unable to provide		I don't know	Unable to provide				
Improved customer experience description	One place to look for data.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			None			I don't know					
Environmental	Minor			None			I don't know					
Public safety, including life and property	None			None			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Environmental Protection of Air, Land, and Water



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Mine subsidence mapping, oil and gas mapping, water quality mapping, forestry mapping
MCA Title	Environmental Protection of Air, Land, and Water
MCA ID	21767
Organization Type	State or U.S. Territorial government
Organization Name	Pennsylvania Department of Environmental Protection
Sub-Agency or Division	
Organization Mission	To protect Pennsylvania's Air, Land and Water from pollution and to provide for the health and safety of its citizens through a cleaner environment.
Program Name	Bureau of Oil and Gas Program Management, Bureau of Abandoned Mines, Bureau of Clean Water, Bureau of Forestry
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 13 - Oil and Gas Resources
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Trees, sinkholes, subsidence events, wells

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	Coarser bathymetric data satisfies my needs	I don't know	
Update Frequency	2-3 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	I don't know	I don't know	I don't know	
Acceptable Vertical Error	I don't know	I don't know	I don't know	
How far onshore needed			To cover the beach slope	
How far down the beach profile needed	Not applicable		None	
Tide correction requirement			No requirement for tide correction	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required	Not required		Not required	Not required
Entire AOI under same environmental conditions	Required	Required	Highly desirable		Required	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Nice to have	Nice to have		Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Nice to have	Nice to have		Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Nice to have	
DTM	Highly desirable	Highly desirable	Nice to have	
DEM	Required	Required	Nice to have	
Raw point cloud data	Required	Not required	Nice to have	
Classified point cloud	Required	Not required	Nice to have	
Edited/cube XYZ		Not required	Not required	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Nice to have	
Ground control/ground truthing	Nice to have	Nice to have	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Not required	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required	Required	Not required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Not required	
Submerged features			Not required	
Subbottom characteristics			Not required	
Geologic and seismic data	Not required	Required	Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Not required	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates	Nice to have	Required	Nice to have	
Land use/land cover	Required	Required	Nice to have	
Wetlands	Highly desirable	Required	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Nice to have	
Inland surface water features	Required	Required	Nice to have	
Bridges/culverts	Highly desirable	Required		
Landmark features	Highly desirable	Nice to have	Not required	
Cultural resources	Not required	Nice to have	Not required	
Coastal and riverine structures	Nice to have	Highly desirable	Nice to have	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	PAMAP data PASDA	PAMAP data PASDA Data collected by DCNR	None currently used	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	PAMAP data PASDA	PAMAP data PASDA Data collected by DCNR		
Other			Yes	
Other description			None	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	I don't know	I don't know	
Cost savings/cost reduction	Major	I don't know	I don't know	
Cost avoidance	Minor	I don't know	I don't know	
Increased revenues	None	I don't know	I don't know	

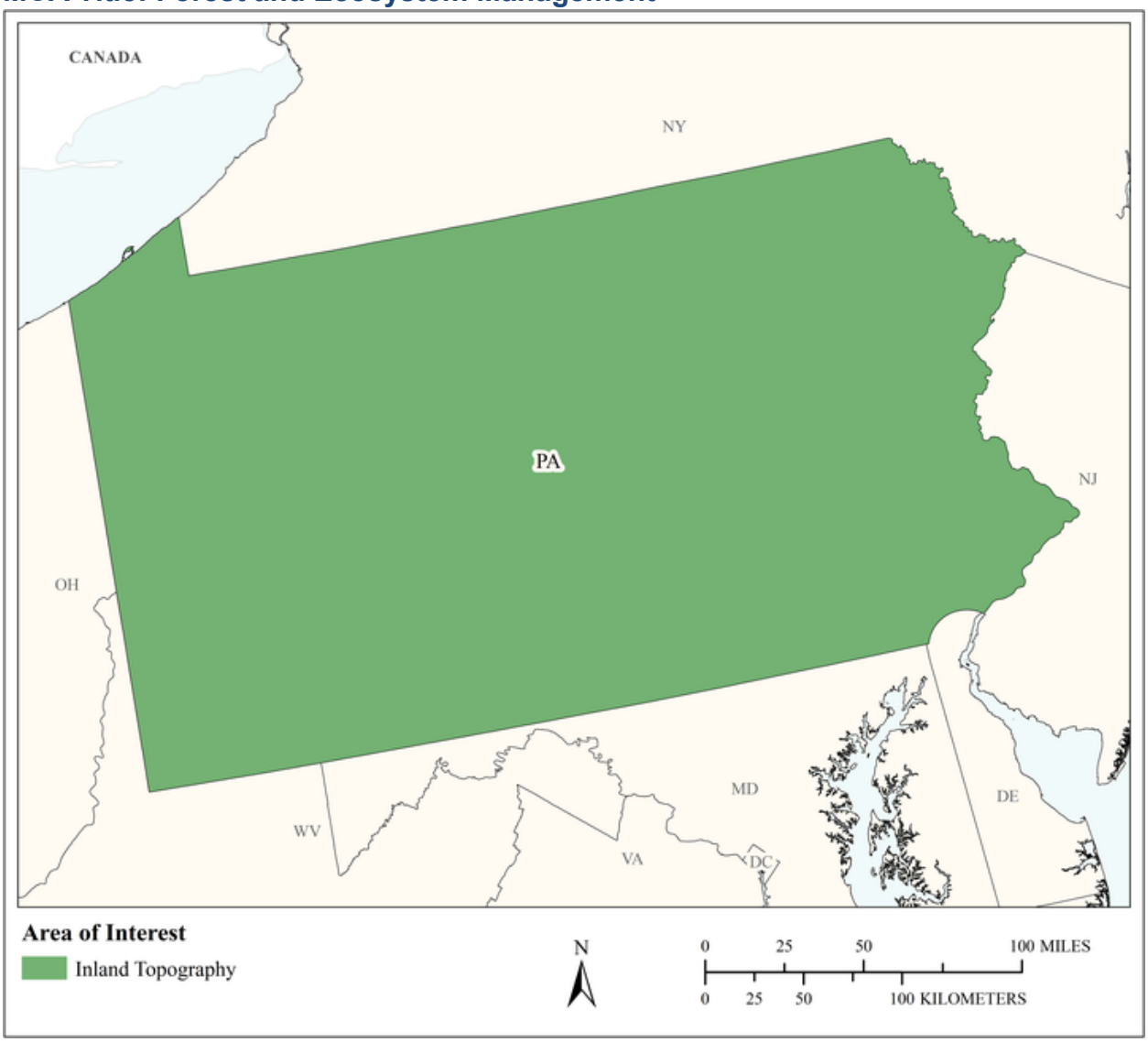
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Mission-driven performance improvements	Major	I don't know	I don't know	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	I don't know	I don't know	
Improved response or timeliness	Major	I don't know	I don't know	
Improved customer experience	Major	I don't know	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	I don't know	I don't know	
Environmental	Major	I don't know	I don't know	
Public safety, including life and property	Major	I don't know	I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost savings/cost reduction	None			Moderate	Unable to provide		I don't know	Unable to provide				
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			I don't know					
Environmental	Moderate			Moderate			I don't know					
Public safety, including life and property	Moderate			Minor			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Forest and Ecosystem Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Sustainable Forest Resource Management / Ecosystem Management
MCA Title	Forest and Ecosystem Management
MCA ID	22182
Organization Type	State or U.S. Territorial government
Organization Name	PA Department of Conservation and Natural Resources (DCNR) - Bureau of Forestry
Sub-Agency or Division	
Organization Mission	The DCNR Bureau of Forestry's mission is to ensure the long-term health, viability, and productivity of the commonwealth's forests and to conserve native wild plants. The bureau will accomplish this mission by: •Managing state forests under sound ecosystem management, to retain their wild character and maintain biological diversity while providing pure water, opportunities for low-density recreation, habitats for forest plants and animals, sustained yields of quality timber, and environmentally sound utilization of mineral resources. •Protecting forestlands, public and private, from damage and/or destruction by fires, insects, diseases, and other agents. •Promoting forestry and the knowledge of forestry by advising and assisting other government agencies, communities, landowners, forest industry, and the general public in the wise stewardship and utilization of forest resources. •Protecting and managing native wild flora resources by determining status, classifying, and conserving native wild plants.
Program Name	Ecosystem Management
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	BU 27 - Recreation
Tertiary Business Use	BU 13 - Oil and Gas Resources

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Rocks, cultural feature remnants, abandoned wells, individual trees, road drainage, riparian forest buffers, streams with a bed and bank

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm			
Acceptable Vertical Error	Up to 50 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Nice to have			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Required			
Wetlands	Required			
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	2006-2008 QL2 LIDAR from PAMAP program, with derivatives (2-foot contours, DEM, hillshade, slope, aspect, breaklines)			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	Agency internal enterprise system			

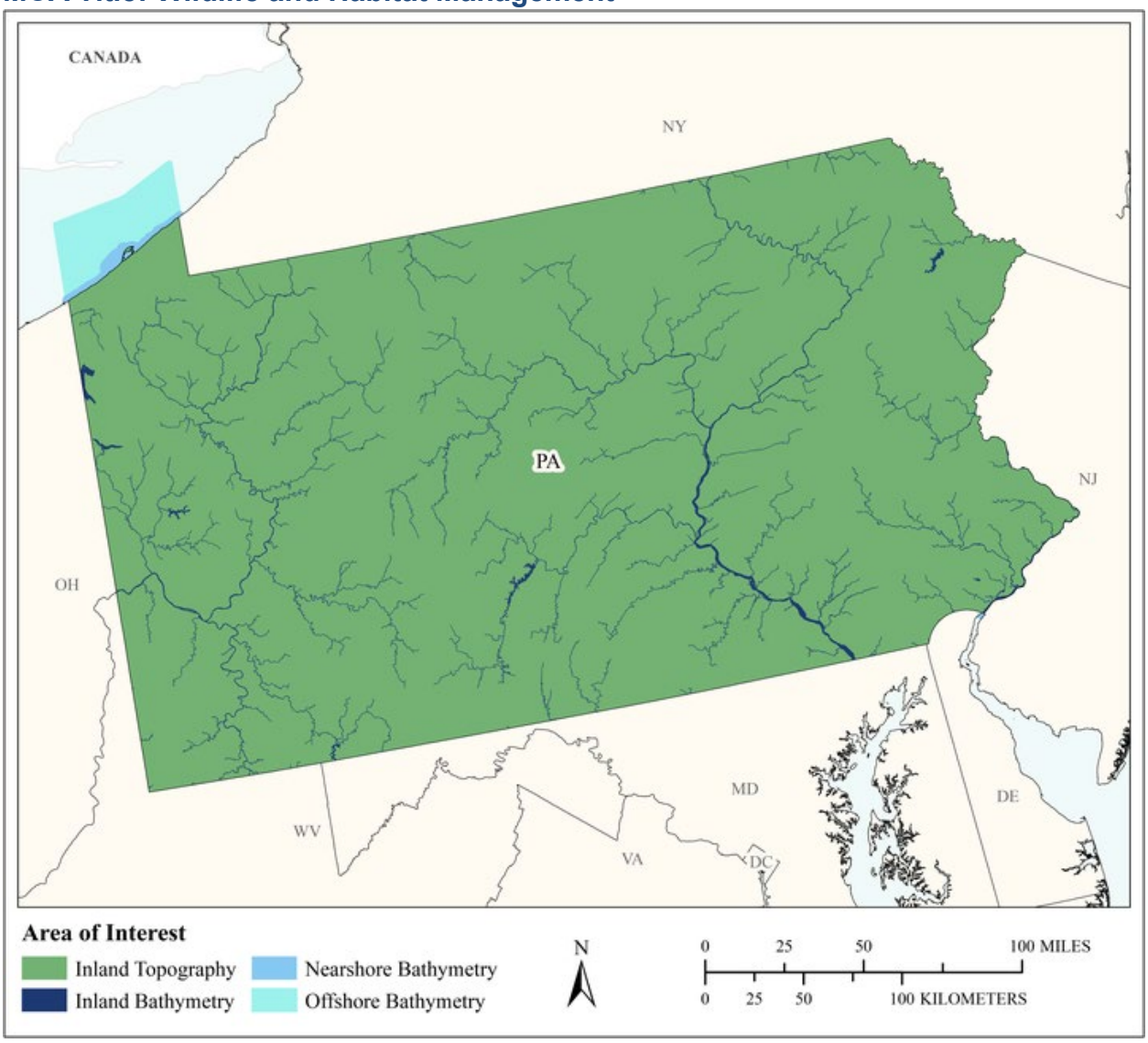
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	Moderate			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	I don't know	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	Minor											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Wildlife and Habitat Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation planning for wildlife refuges and marine sanctuaries. Conservation of critical habitats. Management of diverse migratory bird habitats, coral reef and coral communities, marine mammals, protected fish species, and trust resources.
MCA Title	Wildlife and Habitat Management
MCA ID	60360
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Pennsylvania
Sub-Agency or Division	Pennsylvania Department of Conservation and Natural Resources
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B	QL0B	Special Order
Update Frequency	4-5 years	4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 2 meters	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DTM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Nice to have	Nice to have	Highly desirable
Classified point cloud	Highly desirable	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Highly desirable
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Highly desirable	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Not required	Nice to have
Lease areas			Not required	Nice to have
Fixed obstructions			Nice to have	Highly desirable
Floating observation/navigation systems			Nice to have	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Nice to have
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Highly desirable	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Nice to have	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Minor	Moderate
Cost savings/cost reduction	Major	Minor	Minor	Minor
Cost avoidance	Major	Minor	Moderate	Major
Increased revenues	None	Minor	None	None
Mission-driven performance improvements	Moderate	Moderate	Moderate	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate	Minor	Minor

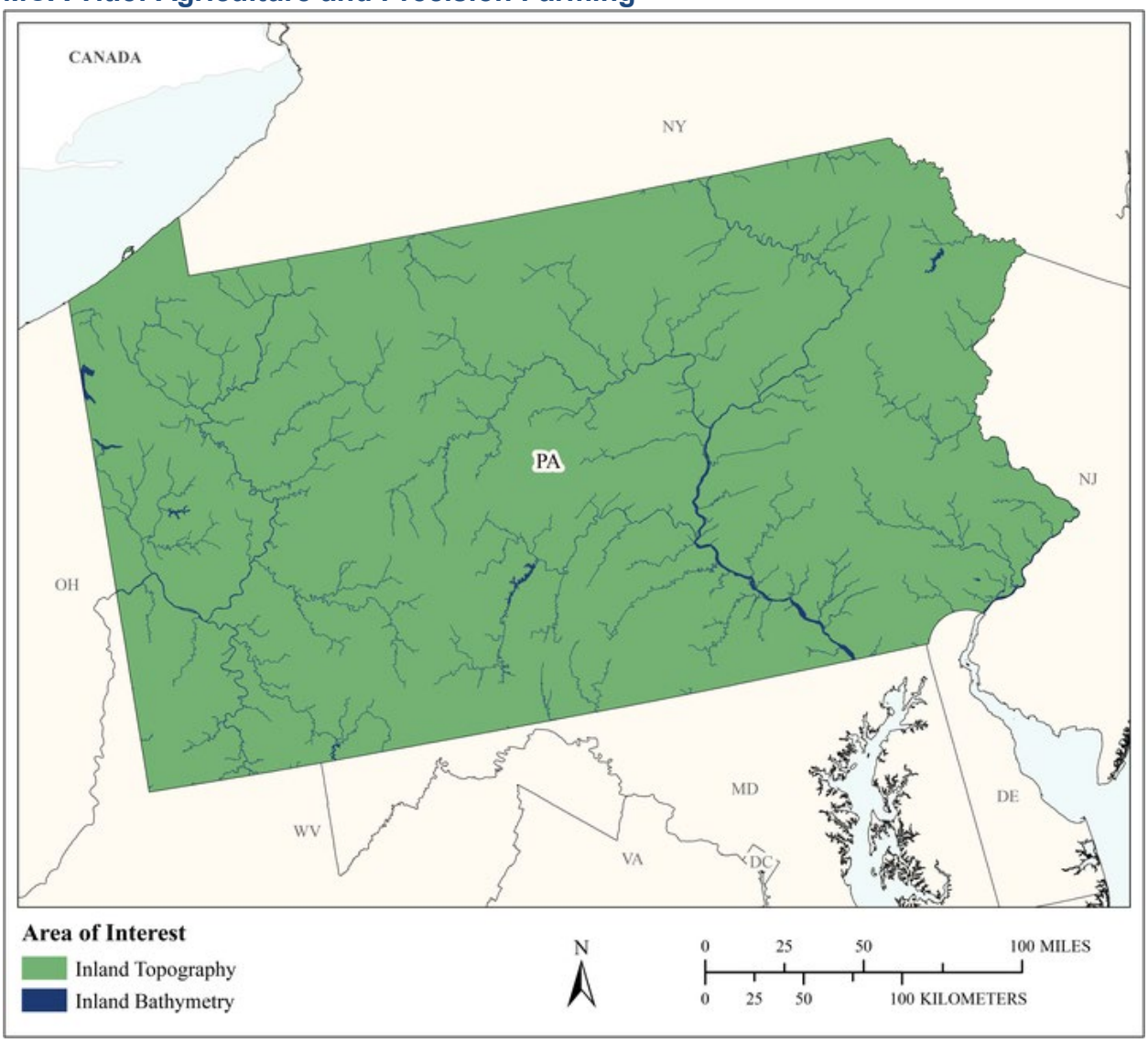
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Minor	Minor	Minor	Minor
Improved customer experience	Minor	Moderate	Minor	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Moderate	Minor	Minor
Environmental	Moderate	Moderate	Moderate	Major
Public safety, including life and property	Minor	Minor	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$10,790		Annual dollars saved/ realized	$86,479		Annual dollars saved/ realized	$72		Annual dollars saved/ realized	$639
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$31,166		Annual dollars saved/ realized	$52,271		Annual dollars saved/ realized	$4		Annual dollars saved/ realized	$44
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate			Moderate		
Environmental	Major			Moderate			Major			Major		
Public safety, including life and property	Moderate			Moderate			Moderate			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes			Yes
Curvature maps				
Cross sections	Yes			Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Agriculture and Precision Farming



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Farm pond design. Irrigation system design. Detailed site analysis to support precision farming. Analysis of farm sedimentation and runoff. Calibration of fertilizer application, fertilizer management, and irrigation planning. Optimized terraforming.
MCA Title	Agriculture and Precision Farming
MCA ID	60361
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Pennsylvania
Sub-Agency or Division	Department of Agriculture
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 08 - Agriculture and Precision Farming
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Nice to have
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL4B		
Update Frequency	2-3 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 10 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 50 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required			Not required	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Not required	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Not required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level			Up to double the required TVU at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Nice to have	Nice to have		
Edited/cube XYZ		Highly desirable		
Full waveform	Nice to have	Highly desirable		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Required	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Highly desirable		
Land use/land cover	Highly desirable	Required		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Nice to have	Required		
Cultural resources	Nice to have	Highly desirable		
Coastal and riverine structures	Highly desirable	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	None		
Cost savings/cost reduction	Major	I don't know		
Cost avoidance	Major	Moderate		
Increased revenues	None	I don't know		
Mission-driven performance improvements	Moderate	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None		

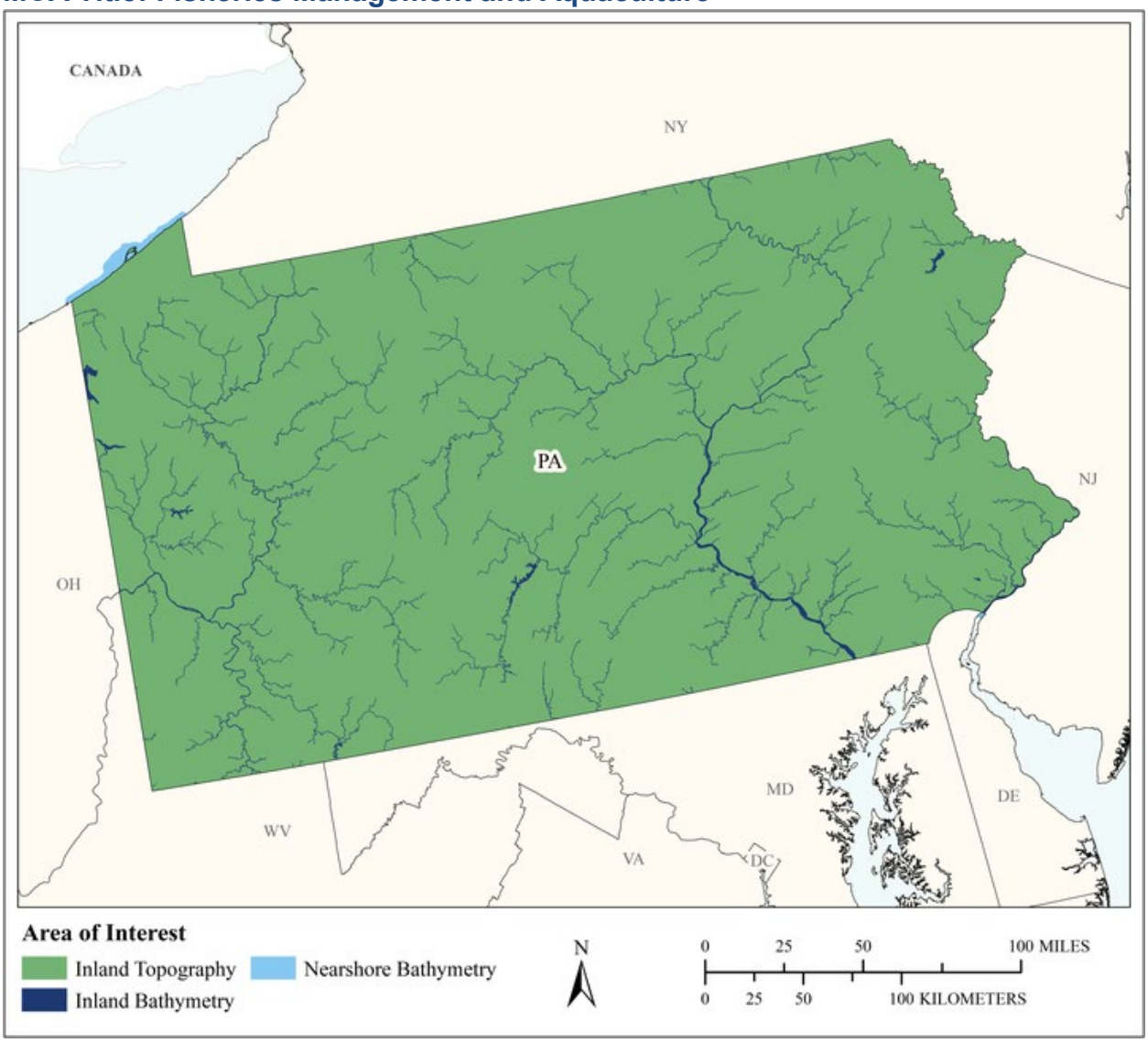
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	None		
Improved customer experience	Moderate	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	None		
Environmental	Major	I don't know		
Public safety, including life and property	Moderate	I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$52,448		Annual dollars saved/ realized	$91,889						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$41,578		Annual dollars saved/ realized	$41,578						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate								
Environmental	Major			Major								
Public safety, including life and property	Minor			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps				
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps		Yes		
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Fisheries Management and Aquaculture



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Management of fisheries. Sustainable aquaculture.
MCA Title	Fisheries Management and Aquaculture
MCA ID	60362
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Pennsylvania
Sub-Agency or Division	Pennsylvania Fish and Boat Commission
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B	QL0B	
Update Frequency	2-3 years	6-10 years	6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Nice to have		Required	Nice to have
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Required	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	
DTM	Required	Highly desirable	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Nice to have	Highly desirable	
Classified point cloud	Highly desirable	Nice to have	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Highly desirable	
Ground control/ground truthing	Required	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Highly desirable	Nice to have	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Required	Highly desirable	Highly desirable	
Land use/land cover	Required	Highly desirable	Nice to have	
Wetlands	Required	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Nice to have	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Not required	
Coastal and riverine structures	Required	Highly desirable	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	
Cost savings/cost reduction	Major	Moderate	Major	
Cost avoidance	Moderate	Moderate	Minor	
Increased revenues	Moderate	Moderate	Minor	
Mission-driven performance improvements	Major	Major	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Minor	

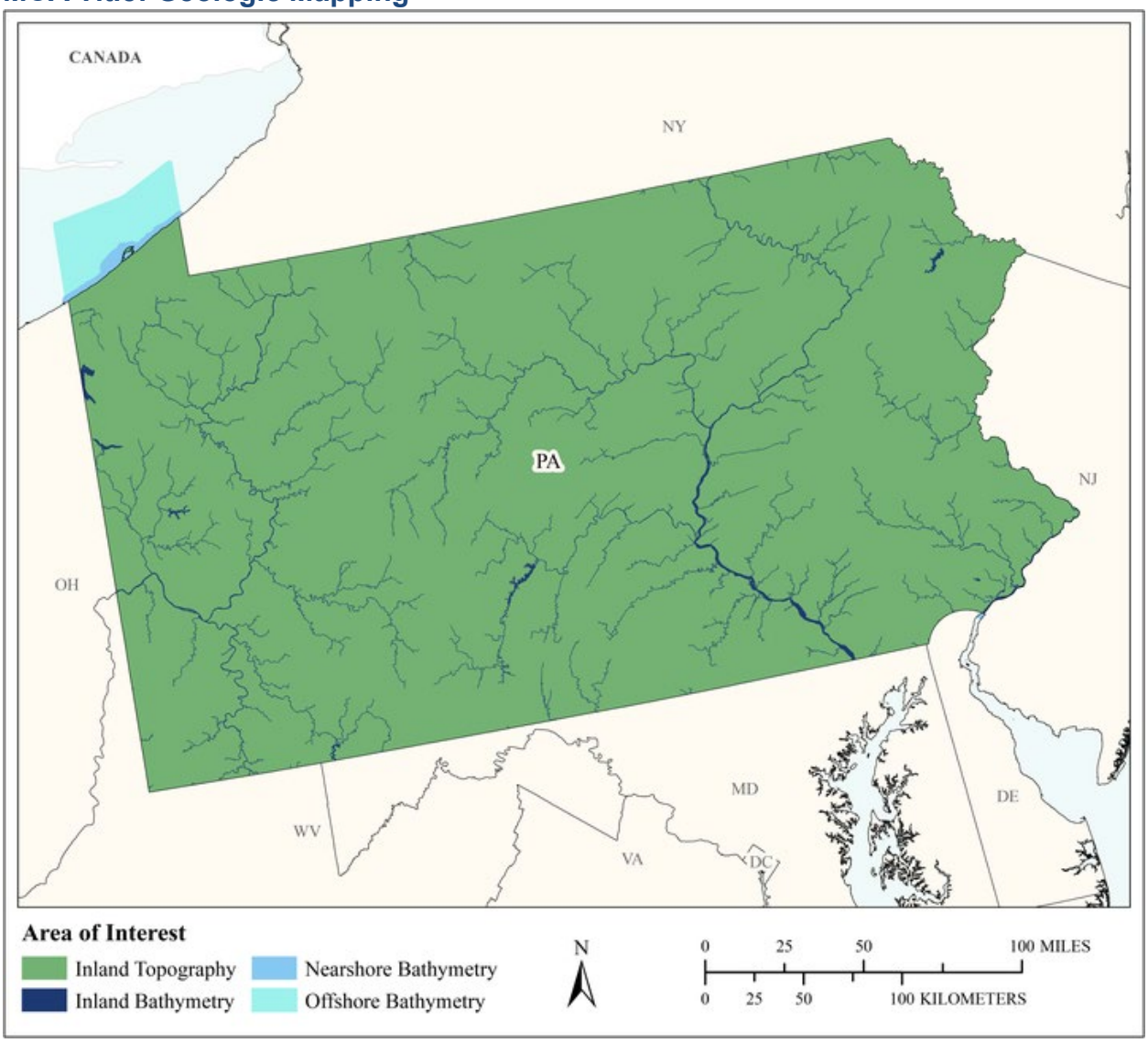
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major	Moderate	
Improved customer experience	Moderate	Major	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Moderate	
Environmental	Major	Moderate	Moderate	
Public safety, including life and property	Moderate	Minor	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Increased revenues	Minor	Unable to provide		None			Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$46,306		Annual dollars saved/ realized	$90,641		Annual dollars saved/ realized	$11,540			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$100,580		Annual dollars saved/ realized	$41,254		Annual dollars saved/ realized	$847			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Moderate					
Environmental	Moderate			Major			Major					
Public safety, including life and property	Moderate			Moderate			Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic Mapping



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Fulfill our legislatively assigned mission of topographic mapping for Pennsylvania
MCA Title	Geologic Mapping
MCA ID	1447
Organization Type	State or U.S. Territorial government
Organization Name	PA Geological Survey
Sub-Agency or Division	
Organization Mission	Collect, preserve, and disseminate impartial information regarding Pennsylvania's geology, geologic resources, and topography.
Program Name	Geologic Mapping
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 11 - Geologic Resource Mining and Extraction
Tertiary Business Use	BU 13 - Oil and Gas Resources

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Rock blocks on slopes and in various rock cities.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Nice to have
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL0B	Special Order
Update Frequency	6-10 years	Event driven only – Data need to coincide with a specific event.	4-5 years	6-10 years
Event type(s)		Event driven only		
Quality Level and/or update frequency variability across AOI				Parameters define area of Presque Isle, Presque Isle Bay and minor selected reaches of the Lake Erie shoreline
Acceptable Horizontal Error	Up to 1 meter	The best horizontal accuracy achievable for the vertical accuracy I need	Less than 50 cm	Up to 1 meter
Acceptable Vertical Error	Up to 20 cm	Less than 10 cm	Up to 20 cm	Less than 1 meter
How far onshore needed			500 meters inland	
How far down the beach profile needed	Below MLLW		To 10 meter depth	
Tide correction requirement			No requirement for tide correction	No requirement for tide correction
Cross sections and/or transects meet needs			Partial	
Cross section/transect requirement			Portions of Erie shoreline other than Presque Isle and Presque Isle Bay. A .5 meter longitudinal sampling interval along the transects should be adequate. Vertical accuracy of	

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Not required	Required	Highly desirable	Not required	Required
Entire AOI under same environmental conditions	Highly desirable	Not required	Highly desirable	Highly desirable	Not required	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Required	Highly desirable	Required	Required
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Up to double the required TVU at the 95% confidence level	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Nice to have
DTM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Nice to have	Nice to have	Nice to have	Nice to have
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Nice to have	Highly desirable	Required
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Highly desirable	Required	Required

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Required	Required	Highly desirable	Not required
Ground control/ground truthing	Required	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Not required	Not required
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required	Required	Highly desirable	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Highly desirable	Nice to have
Submerged features			Nice to have	Highly desirable
Subbottom characteristics			Highly desirable	Nice to have
Geologic and seismic data	Highly desirable	Highly desirable	Highly desirable	Nice to have
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Not required	Nice to have
Tide/wave heights			Not required	
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Not required	
Boundaries			Not required	Not required
Routes			Highly desirable	Nice to have
Offshore cadastral			Not required	Not required
Lease areas			Not required	Not required
Fixed obstructions			Highly desirable	Required
Floating observation/navigation systems			Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Nice to have	Required	
Land use/land cover	Highly desirable	Not required	Nice to have	Highly desirable
Wetlands	Highly desirable	Not required	Highly desirable	Highly desirable
Estuaries			Not required	Not required
Inland surface water features	Required	Highly desirable	Required	
Bridges/culverts	Required	Highly desirable		
Landmark features	Required		Highly desirable	
Cultural resources	Required	Highly desirable	Required	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL 3 data that was gathered in the mid aughts, ending in 2008	Data collected at state park lakes via watercraft-borne sonar. Data is normalized against curve created from manual measurements. Data is used to create recreational water-depth maps for Pennsylvania State Parks.	We currently do not have bathymetric data for the Lake Erie near-shore areas, including Presque Isle Bay	We currently do not have and do not offer bathymetry data for the Lake Erie shoreline.
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State repositories used	Our department, DCNR, has an internal repository. We also utilize the repository at Pennsylvania's Spatial Data Access (PASDA), the publically accessible repository operated by Penn State University under contract with the Commonwealth of PA.			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	None	None	None
Cost savings/cost reduction	Major	None	None	None
Cost avoidance	Major	None	None	None
Increased revenues	Minor	None	None	None
Mission-driven performance improvements	Major	None	Moderate	None
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Moderate	None
Improved response or timeliness	Moderate	I don't know	Minor	None
Improved customer experience	Major	I don't know	Moderate	None
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Major	Moderate	None
Environmental	Major	Major	Moderate	None
Public safety, including life and property	Major	Major	Major	None

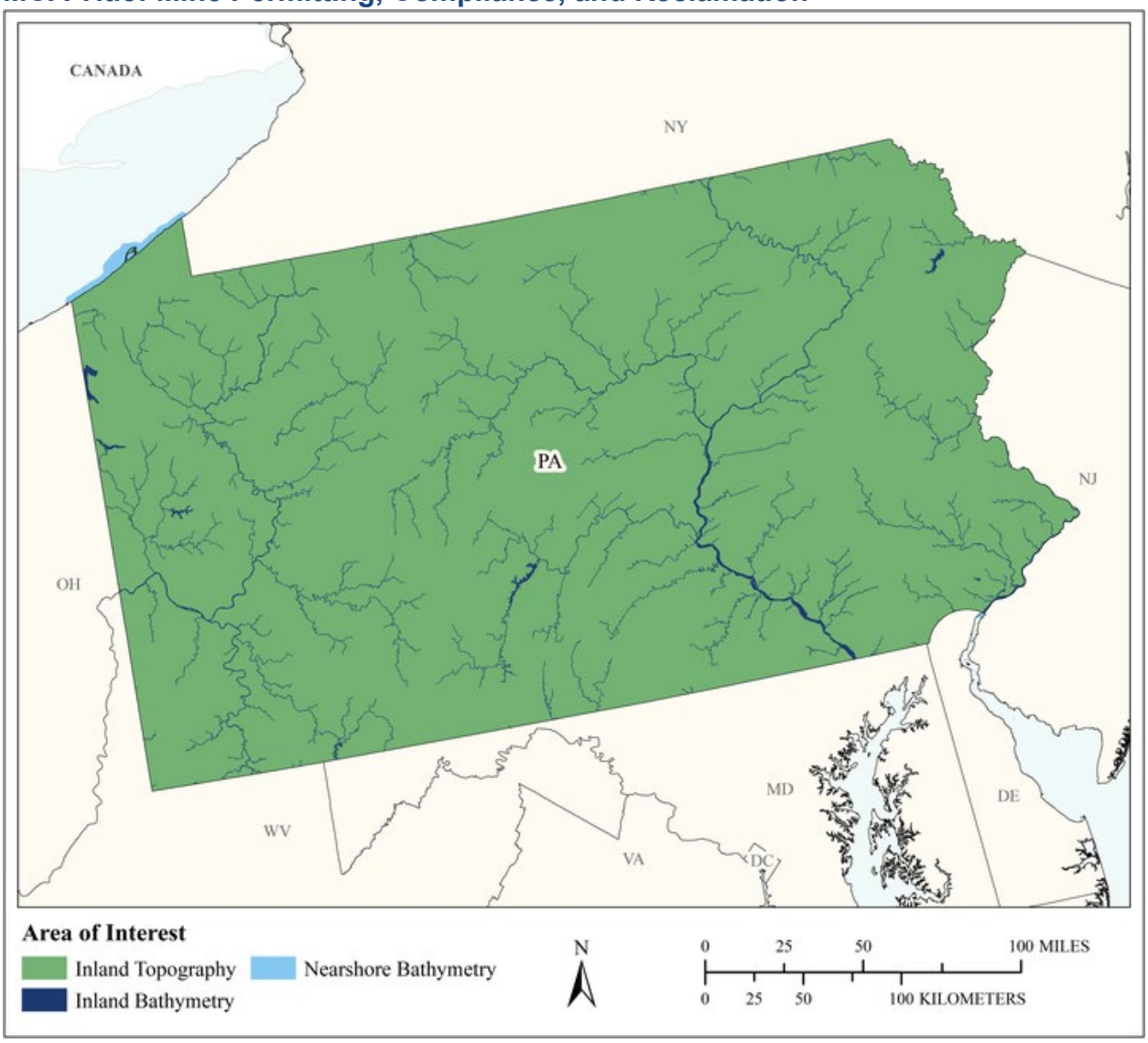
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$19,296	Major	Annual dollars saved/realized	$6,030	I don't know	Unable to provide		None		
Time savings description	The accurate and standardized data source minimizes errors allowing staff to accomplish much more on their own thereby allowing GIS resources to focus on more serious /real problems. Combined hours for all staff. Savings from ability to minimize field visits and surveying time when compiling geologic maps. Time spent redirecting staff to the correct resources for their purpose. Fulfilling our legislated duty to provide topographic mapping for the state. These hours reflect savings garnered from minimizing the help we provide to the public. These savings are realized as the public learns to access a stable source/location for their data. Estimate of hours saved using statewide DEM as basis for modeling of geologic units. Accurate and consistent analysis can be done in support of projects. Everyone working from the same accurate dataset minimizes the need for handholding and correction of staff who use incorrect data in their analysis.			Comparting/evaluating the lidar-derived data against our own sonar based datasets will take some time. If the data proves adequate for our purposes, our agency will save annually, a dozen or so person days of data collection and analysis. Bathymetric data collection would be terminated, at least initially. Unsure until we are convinced the lidar-derived data is superior to our own sonar -derived.			The agency is the source of topographic mapping/products.			There is no current data-collection program so there are no affiliated savings due to improvements in data or data collection methods.		
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Annual dollars saved/realized	$200	None			None		
Cost savings/cost reduction description	PA has had QL 3 level data for 10 years so, our level of effort would not decrease all that much with higher-density, more accurate data. I do not have adequate information to estimate savings from DCNR's forest pest management and other programs.			Initial purpose of bathymetric program was engineering and operation related... water volumes, sediment calculations, etc. The recreational value was recognized only after the initial work was welcomed by the public. Annual average expended on bathymetric data collection.						Again, there is no current data collection program and no bathymetric products or data available for the Lake Erie shoreline.		
Cost avoidance	I don't know	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide		None		
Cost avoidance description				We would avoid the data processing time for the 3 or 4 lakes we survey per year, perhaps several person weeks.			Our agency does not directly suffer property loss due to natural disasters.					
Increased revenues	Moderate	Unable to provide		None			None			None		
Increased revenues description	Related to the above item, being able to accurately design infrastructure speeds up the permitting, and construction and gets is in operation sooner. As always, time is money. Accurate and current elevation data are critical to managing forest resources. Natural gas royalties and timber harvests from state forests generate tens of millions of dollars annually so the more efficiently we can manage their exploitation (such as transportation and pipeline infrastructure), the more money we save.											
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide		None			Major	Unable to provide	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Mission-driven performance improvements description	Accurate elevation models impact all of the department's natural resource management efforts. That was a major reason PA has had QL1 level data for 10 years.			Again we would eliminate a commitment of several person weeks for the data collection and processing. Our mission is the preparation of topographic data for the state so obviously the bathymetric data would be invaluable in carrying out our mission. Here the value derives from the assumption that the lidar-based data will be at least equivalent to our manually collected sonar data.						Although significant, bathymetric data for the Erie shoreline would be a minor part of our overall topographic mapping program. 3D Nation would be our first offering of this data so it would be a significant new product/service for users.		
Other operational benefits				Moderate	Annual dollars saved/realized	$6,030						
Other operational benefits description				Eliminates our annual data collection and analysis program.								
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide	
Value added to products or services description	We provide the elevation information, the user reaps the benefits.						Again, the higher accuracy more detailed data would incrementally improve most of our geologic mapping products and related resource estimates. Agency would create some type of recreational bathymetric product for Presque Isle Bay and near-shore Presque Isle.			The agency would gain some appreciation and notoriety for releasing these new bathymetric products or applications. As above, no prior product to compare to.		
Improved response or timeliness	Moderate	Annual dollars saved/realized	$2,261	Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness description	Accurate elevation data improves our estimation of geological resources and helps forestry and parks improve management of natural resources. An accurate elevation model allows our staff to provide quicker and more reliable responses to user inquiries. Unrelated to our mission. Once again our mission is to provide the data on which these projections are based.			Private companies use our data to create data products for their fish finders and GPS enabled equipment. Providing this data is a minor expense for our organization. We typically do not publically release our bathymetric data. Regardless of the data/model source, we would still invest the same resources in preparing our cartographic products. Irrelevant to our program.			For the first time our agency would have the near-shore bathymetry necessary to create recreational maps and products for the park's visitors.			We will be able to direct inquiries to the data as well as our as yet undefined derivative products. No existing products therefore the mere creation of the product makes it "more up to date".		
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved customer experience description	The more detailed and accurate our elevation model, the more our customers (the public) benefit.			Eventually we will integrate the bathymetric data into our own web-mailing applications. That will done regardless of the data source. Public acknowledgement of our products is typically the best we can achieve. Again, we may save the time we currently dedicate to packaging data to answer inquiries from 3rd party vendors.			Visitors to Presque Isle State Park and vicinity would have new recreational bathymetric.			Undoubtedly we will create mapping applications that allow users to interact with the data in real time. Creating and making the data available makes it "better" than the complete lack of data. We will gain recognition for providing a product that fills a void.		
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Minor			Moderate			Moderate		
Education or outreach description				We occasionally have the opportunity to describe our bathymetric program to other agencies and the public.			Bathymetric data would open new opportunities for outreach programming at Presque Isle State Park			Data will greatly enhance our educational and outreach efforts		
Environmental	Major			None			Moderate			None		
Environmental description				We recognize no particular environmental benefits but the Bureau of State Parks definitely does. One of the primary uses for our early bathymetry was to calculate water volumes to be used in calculating pesticide dosages.			The value of the first seamless elevation model of Presque Isle and Vicinity would be an invaluable asset for the myriad of environmental studies at the park.			Although the data will be unimaginably helpful to environmental assessments and such., other than data provider, or agency plays no role in such assessments		
Public safety, including life and property	Major			Minor			Minor			None		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps				
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Mine Permitting, Compliance, and Reclamation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Geospatial technologies including elevation data are used to support DEP's mine permitting and compliance operations (active mining regulation) as well as abandoned mine lands reclamation, mine safety, and other programs such as Mine Subsidence Insurance. Topographic mapping of abandoned mine areas.
MCA Title	Mine Permitting, Compliance, and Reclamation
MCA ID	22432
Organization Type	State or U.S. Territorial government
Organization Name	PA DEP Bureau of Abandoned Mine Reclamation & Bureau of Mining Programs
Sub-Agency or Division	
Organization Mission	The Bureau of Abandoned Mine Reclamation administers and oversees the Abandoned Mine Reclamation Program in Pennsylvania. The bureau is responsible for resolving problems such as mine fires, mine subsidence, dangerous highwalls, open shafts and portals, mining-impacted water supplies and other hazards which have resulted from past coal mining (pre-1977) practices in accordance with requirements established by the federal Office of Surface Mining under authority of the Surface Mining Control and Reclamation Act. While our primary focus is on abandoned coal mine problems we also deal with abandoned non-coal problems as well.
Program Name	Investigation, Planning/Development, Design and Construction Sections & Office of Active and Abandoned Mining Operations (AAMO)
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 11 - Geologic Resource Mining and Extraction
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Boreholes, drainage structures, property boundary monuments, mine shaft openings, small structures

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required

Inland Bathy Feature Size Requirements	Response
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	I don't know	
Update Frequency	4-5 years and certain events.	Event driven only – Data need to coincide with a specific event.	Event driven only – Data need to coincide with a specific event.	
Event type(s)	Line and Event driven	Event driven only	Data is only needed if there is the presence of an abandoned mine	
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Less than 50 cm	Up to 1 meter	
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm	Up to 1 meter	
How far onshore needed			Data would only be needed if abandoned mines exit within a particular area	
How far down the beach profile needed	Below MLLW		Depends upon existence of any abandoned mine	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Required	Not required		Required	Highly desirable
Entire AOI under same environmental conditions	Required	Required	Not required		Required	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Highly desirable		Required	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable		Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	
DTM	Required	Required	Highly desirable	
DEM	Required	Required	Highly desirable	
Raw point cloud data	Required	Highly desirable	Highly desirable	
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Not required	Not required	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Not required	Not required	
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Nice to have	
Ground control/ground truthing	Highly desirable	Highly desirable	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Required	Highly desirable	Highly desirable	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Required	Highly desirable	Nice to have	
Land use/land cover	Highly desirable	Not required	Nice to have	
Wetlands	Required	Highly desirable	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Nice to have	
Inland surface water features	Required	Highly desirable	Nice to have	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Not required	Nice to have	
Cultural resources	Highly desirable	Not required	Nice to have	
Coastal and riverine structures	Required	Highly desirable	Nice to have	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Photogrammetric mapping from aerial photography, lidar, ground and hydrographic surveys, underground mine mapping. PAMAP Program - 3.2 ft Digital Elevation Model 2006 - 2008	Hydrographic surveys performed by staff	Currently not using any bathymetric data. This information would only be needed if it was determined that there was an abandoned mine in the area.	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			

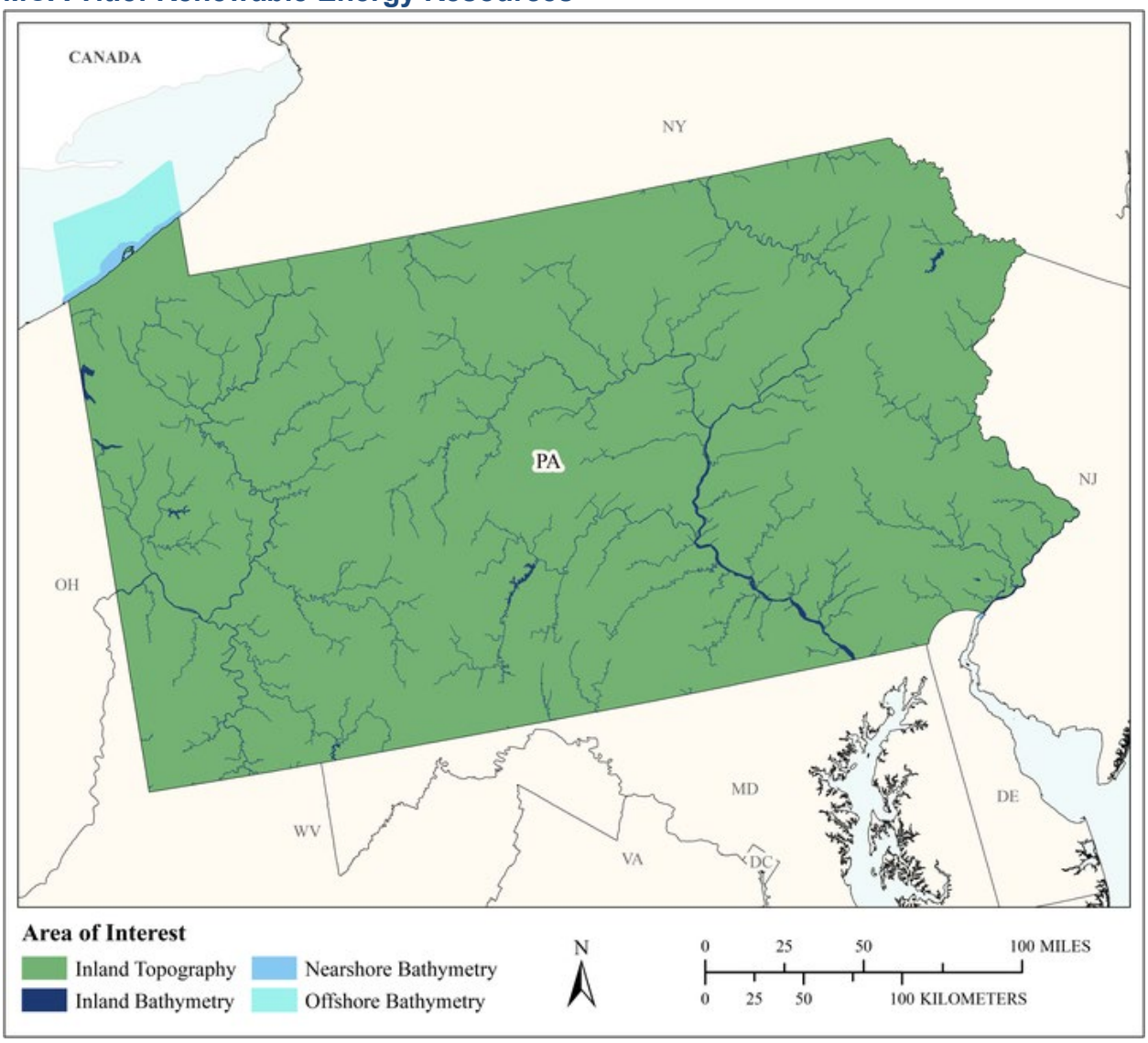
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State repositories used	Pennsylvania Spatial Data Access (http://www.pasda.psu.edu/) Pennsylvania Mine Map Atlas (http://www.minemaps.psu.edu/)			
Other	Yes	Yes	Yes	
Other description	Mapping contracts and surveys performed by staff	In-house surveys	Currently not used	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available	None	
Cost savings/cost reduction	Major	Inland bathy data not available	None	
Cost avoidance	Major	Inland bathy data not available	None	
Increased revenues	None	Inland bathy data not available	None	
Mission-driven performance improvements	Major	Inland bathy data not available	None	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available	None	
Improved response or timeliness	Major	Inland bathy data not available	None	
Improved customer experience	Major	Inland bathy data not available	None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Inland bathy data not available	None	
Environmental	Major	Inland bathy data not available	None	
Public safety, including life and property	Major	Inland bathy data not available	None	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Time savings description	Updated topographic elevation data would most likely improve the efficiency of GIS applications in DEP's mining bureaus in various ways.											
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Cost avoidance description	Updated topographic elevation data could benefit PA's Mine Subsidence Insurance program. Updated topographic elevation data could greatly benefit PA's efforts toward reclaiming hazardous abandoned mine features and possibly mine safety programs as well.											
Increased revenues	None			I don't know	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements description	Updated topographic elevation data would most likely improve the effectiveness of GIS applications in DEP's mining bureaus in various ways.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know			I don't know					
Environmental	Major			Major			I don't know					
Public safety, including life and property	I don't know			Major			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes	Yes	Yes	
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Renewable Energy Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Alternate energy development – solar, tidal, wind, wave, and ocean current. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Low head power potential for hydropower.
MCA Title	Renewable Energy Resources
MCA ID	60363
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Pennsylvania
Sub-Agency or Division	Pennsylvania Department of Environmental Protection
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	I don't know
Rivers and Streams	
Less than 10 ft	I don't know
10 - 50 ft	I don't know
51 - 100 ft	I don't know
101 - 500 ft	I don't know
501 - 2,500 ft	I don't know
Greater than 2,500 ft	I don't know
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	I don't know
½ - 1 acre	I don't know
1.1 – 2 acres	I don't know
2.1 – 5 acres	I don't know

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	I don't know
Greater than 10 acres	I don't know

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	I don't know	I don't know	I don't know
Update Frequency	6-10 years	I don't know	I don't know	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	I don't know	I don't know	I don't know
Acceptable Vertical Error	Up to 20 cm	I don't know	I don't know	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					I don't know	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	I don't know	I don't know	I don't know	I don't know	I don't know
Entire AOI under same environmental conditions	Highly desirable	I don't know	I don't know	I don't know	I don't know	I don't know
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	I don't know	I don't know	I don't know	I don't know	I don't know
DEM for entire AOI needs to be seamless	Highly desirable	I don't know	I don't know	I don't know	I don't know	I don't know
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	I don't know	I don't know	I don't know
DTM	Required	I don't know	I don't know	I don't know
DEM	Required	I don't know	I don't know	I don't know
Raw point cloud data	Highly desirable	I don't know	I don't know	I don't know
Classified point cloud	Highly desirable	I don't know	I don't know	
Edited/cube XYZ		I don't know	I don't know	I don't know
Full waveform	Nice to have	I don't know	I don't know	I don't know
Bathymetric Attributed Grid (BAG)		I don't know	I don't know	I don't know
Breaklines required for standard hydro-flattening	Nice to have	I don't know		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			I don't know	I don't know
Tide Predictions			I don't know	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			I don't know	I don't know
Intensity imagery/sidescan imagery	Not required	I don't know	I don't know	I don't know
Ground control/ground truthing	Highly desirable	I don't know	I don't know	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			I don't know	I don't know
Nautical and/or navigation charts			I don't know	I don't know
Acoustic imagery of the seafloor			I don't know	I don't know
Aerial and/or satellite imagery	Highly desirable	I don't know	I don't know	I don't know
Underwater videography			I don't know	I don't know
Bottom texture			I don't know	I don't know
Bottom type			I don't know	I don't know
Submerged features			I don't know	I don't know
Subbottom characteristics			I don't know	I don't know
Geologic and seismic data	Not required	I don't know	I don't know	I don't know
Water column properties - Physical			I don't know	I don't know
Water column properties - Chemical			I don't know	I don't know
Water column properties - Biological			I don't know	I don't know
Currents			I don't know	I don't know
Tide/wave heights			I don't know	I don't know
Sea ice conditions			I don't know	I don't know
Habitat distribution and classification			I don't know	I don't know
Boundaries			I don't know	I don't know
Routes			I don't know	I don't know
Offshore cadastral			I don't know	I don't know
Lease areas			I don't know	I don't know
Fixed obstructions			I don't know	I don't know
Floating observation/navigation systems			I don't know	I don't know
Shorelines – current, historic, change rates	Nice to have	I don't know	I don't know	
Land use/land cover	Highly desirable	I don't know	I don't know	I don't know
Wetlands	Nice to have	I don't know	I don't know	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			I don't know	I don't know
Inland surface water features	Nice to have	I don't know	I don't know	
Bridges/culverts	Nice to have	I don't know		
Landmark features	Nice to have	I don't know	I don't know	
Cultural resources	Not required	I don't know	I don't know	
Coastal and riverine structures	Nice to have	I don't know	I don't know	
Overhead structures			I don't know	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	I don't know	I don't know	I don't know
Cost savings/cost reduction	Moderate	I don't know	I don't know	I don't know
Cost avoidance	Moderate	I don't know	I don't know	I don't know
Increased revenues	None	I don't know	I don't know	I don't know
Mission-driven performance improvements	Minor	I don't know	I don't know	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	I don't know	I don't know	I don't know

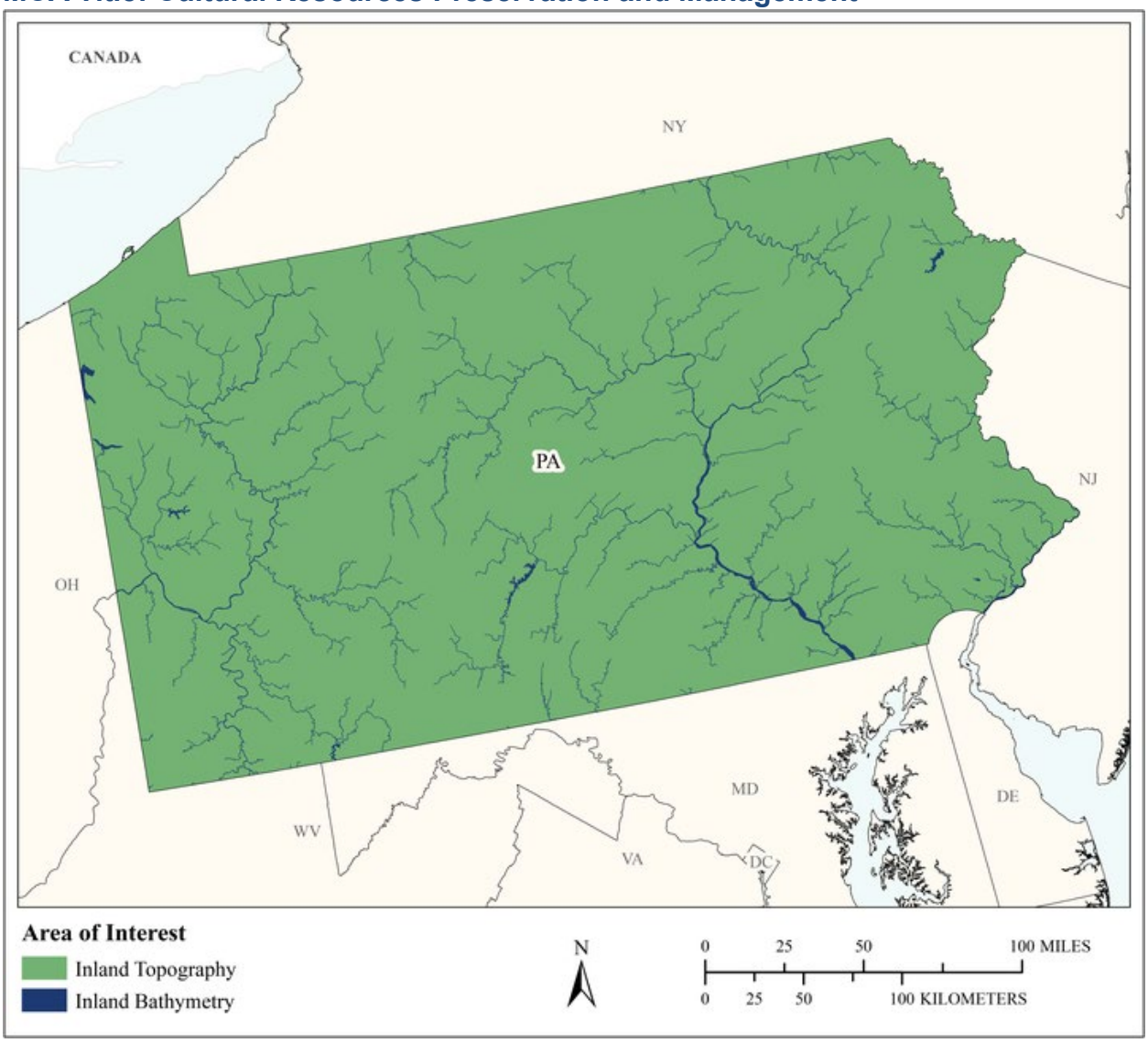
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Minor	I don't know	I don't know	I don't know
Improved customer experience	Minor	I don't know	I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	I don't know	I don't know	I don't know
Environmental	Minor	I don't know	I don't know	I don't know
Public safety, including life and property	Minor	I don't know	I don't know	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Minor	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			I don't know			I don't know			I don't know		
Environmental	Minor			I don't know			I don't know			I don't know		
Public safety, including life and property	None			I don't know			I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Cultural Resources Preservation and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Discovery and analysis of underwater archaeological and historical cultural sites. Site protection and preservation planning. Discovery and analysis of Native American and other historical cultural sites and subsistence activities.
MCA Title	Cultural Resources Preservation and Management
MCA ID	60364
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Pennsylvania
Sub-Agency or Division	Pennsylvania Historic and Museum Commission
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B		
Update Frequency	4-5 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Nice to have	Nice to have			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Not required			Nice to have	
DEM for entire AOI needs to be seamless	Nice to have	Nice to have			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level			Up to double the required TVU at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Not required	Not required		
Classified point cloud	Nice to have	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Nice to have	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Highly desirable		
Ground control/ground truthing	Nice to have	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Highly desirable		
Land use/land cover	Nice to have	Highly desirable		
Wetlands	Nice to have	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have	Highly desirable		
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Nice to have	Highly desirable		
Cultural resources	Required	Highly desirable		
Coastal and riverine structures	Nice to have	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Moderate	Minor		
Cost avoidance	Minor	Minor		
Increased revenues	None	Minor		
Mission-driven performance improvements	Moderate	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor		

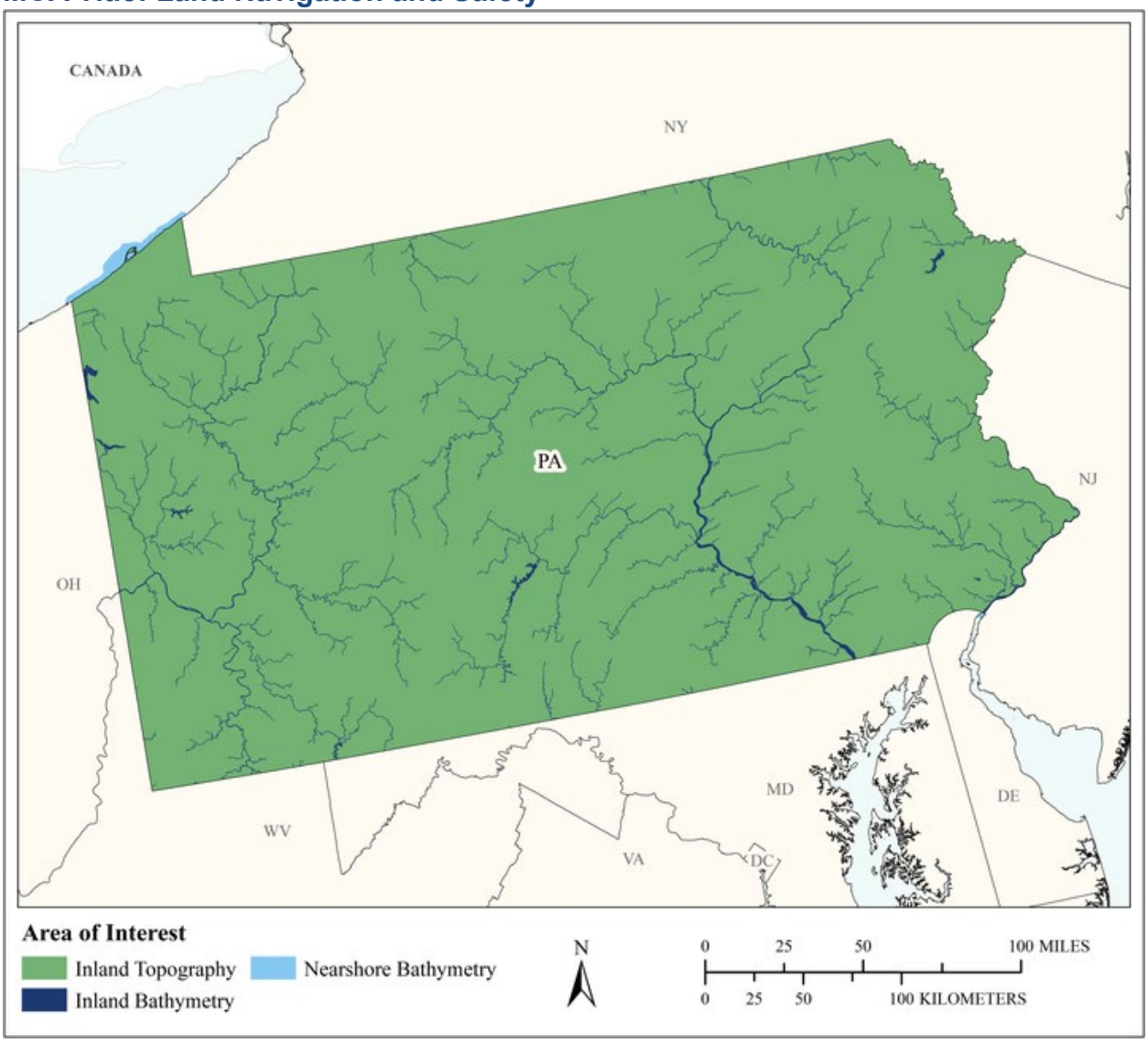
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major		
Improved customer experience	Moderate	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor		
Environmental	Minor	Moderate		
Public safety, including life and property	Minor	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Minor	Unable to provide							
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide							
Increased revenues	None			None								
Mission-driven performance improvements	Moderate	Unable to provide		Minor	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$8,303		Annual dollars saved/ realized	$19,911						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Moderate	Unable to provide		Minor	Unable to provide							
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$7,259									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Moderate								
Environmental	Minor			Minor								
Public safety, including life and property	Minor			Minor								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Land Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Road and railroad route selection and maintenance. Slope analysis for autonomous cars. GPS navigation visualization.
MCA Title	Land Navigation and Safety
MCA ID	60365
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Pennsylvania
Sub-Agency or Division	Pennsylvania Department of Transportation
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 19 - Land Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL0B	QL0B	
Update Frequency	2-3 years	2-3 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable		Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Highly desirable	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	
Classified point cloud	Highly desirable	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Highly desirable	
Full waveform	Nice to have	Nice to have	Highly desirable	
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	
Ground control/ground truthing	Required	Required	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Highly desirable	Highly desirable	Highly desirable	
Water column properties - Physical			Highly desirable	
Water column properties - Chemical			Highly desirable	
Water column properties - Biological			Highly desirable	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Highly desirable	
Boundaries			Highly desirable	
Routes			Highly desirable	
Offshore cadastral			Highly desirable	
Lease areas			Highly desirable	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Nice to have	Required	Highly desirable	
Land use/land cover	Highly desirable	Required	Highly desirable	
Wetlands	Required	Required	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Highly desirable	Highly desirable	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Minor	
Cost savings/cost reduction	Major	Minor	Minor	
Cost avoidance	Moderate	Minor	Minor	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	None	

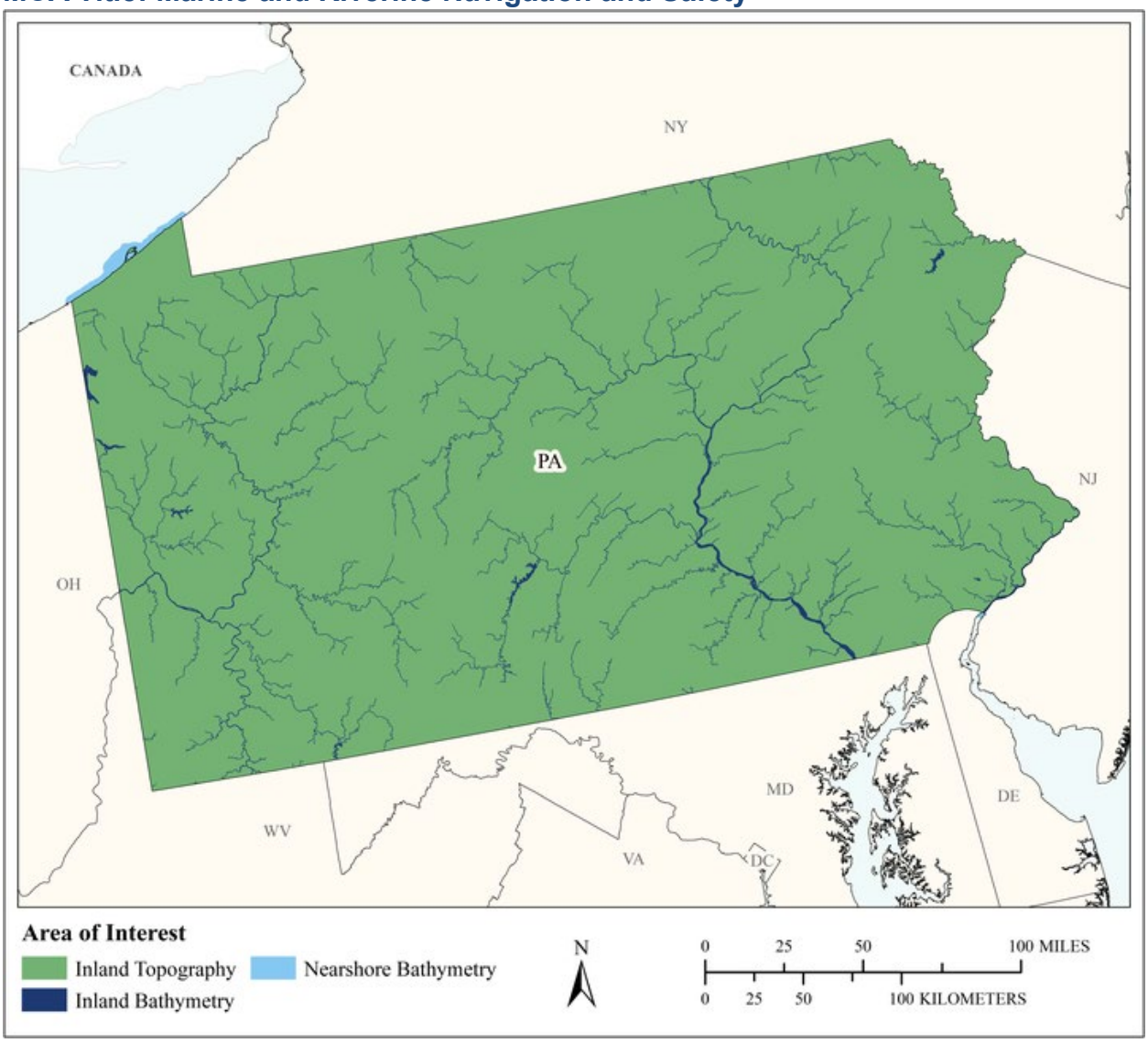
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	None	
Improved customer experience	Major	Minor	None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	None	
Environmental	Moderate	Moderate	Moderate	
Public safety, including life and property	Major	Minor	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		None					
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$586,837		Annual dollars saved/ realized	$25,031						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$47,390		Annual dollars saved/ realized	$258						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			None					
Environmental	Major			Moderate			Moderate					
Public safety, including life and property	Major			Moderate			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps	Yes		Yes	
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes		Yes	
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Marine and Riverine Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Nautical charting. Bathymetric measurements of nearshore submerged coastal topography. Identification of hazards to navigation. Sediment management at coastal navigation projects. Precision marine navigation. Movement of goods and fishing vessels.
MCA Title	Marine and Riverine Navigation and Safety
MCA ID	60366
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Pennsylvania
Sub-Agency or Division	Delaware and Susquehanna River Basin Commissions
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Nice to have
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B	QL0B	
Update Frequency	2-3 years	2-3 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Nice to have	Nice to have		Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required		Required	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Required	
DTM	Required	Highly desirable	Required	
DEM	Required	Required	Required	
Raw point cloud data	Required	Nice to have	Required	
Classified point cloud	Required	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Highly desirable	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	
Breaklines required for standard hydro-flattening	Highly desirable	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Highly desirable	
Ground control/ground truthing	Required	Nice to have	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Required	Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Not required	Not required	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Highly desirable	
Boundaries			Nice to have	
Routes			Required	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Required	
Floating observation/navigation systems			Required	
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Nice to have	Nice to have	Nice to have	
Wetlands	Highly desirable	Required	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Highly desirable	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Required	Nice to have	Nice to have	
Cultural resources	Highly desirable	Highly desirable	Nice to have	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts		Yes	Yes	
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	
Cost savings/cost reduction	Major	I don't know	Minor	
Cost avoidance	Moderate	Major	Minor	
Increased revenues	Moderate	None	Minor	
Mission-driven performance improvements	Moderate	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	None	Minor	

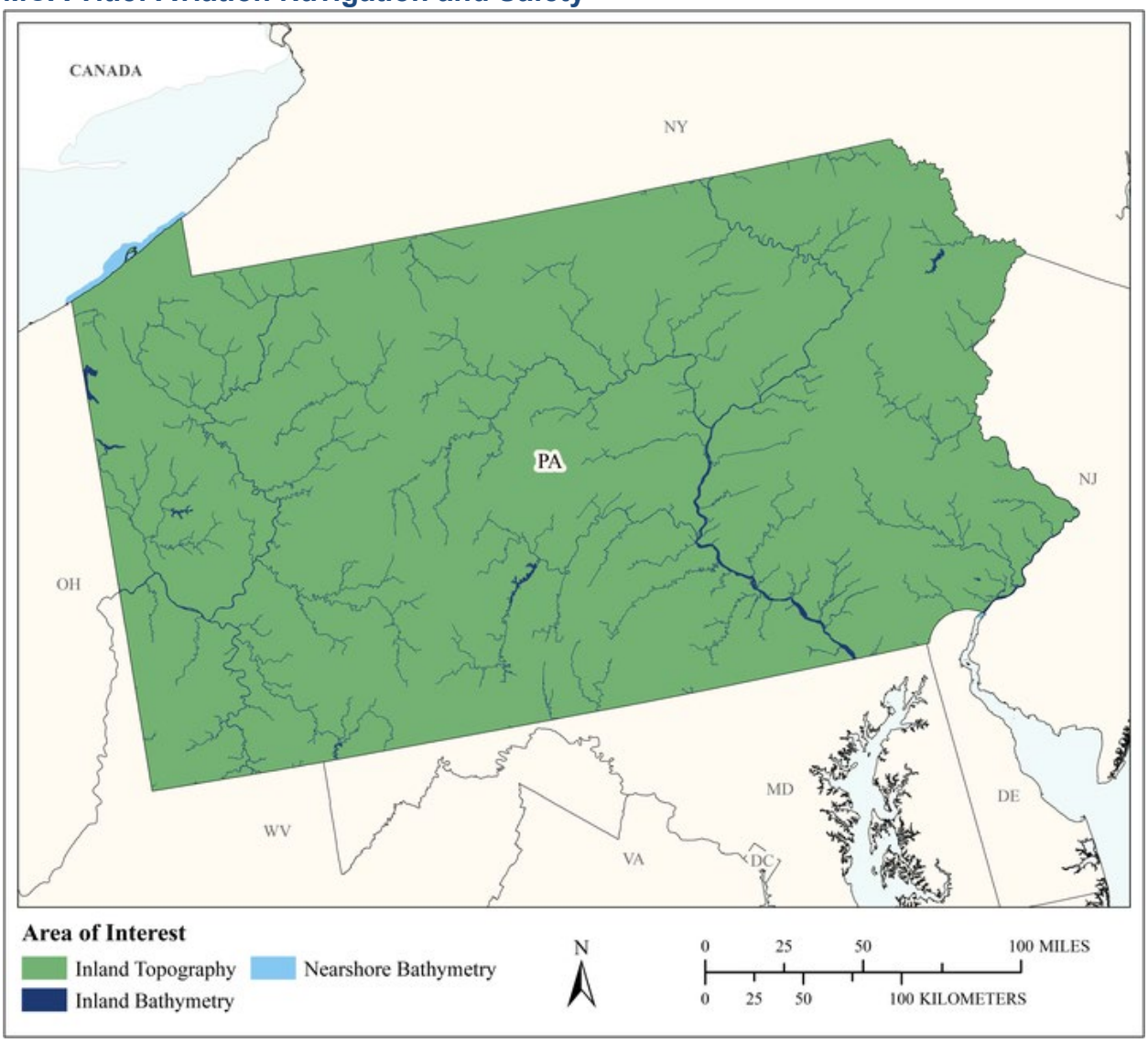
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Minor	None	Minor	
Improved customer experience	Moderate	None	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	None	Minor	
Environmental	Moderate	None	Minor	
Public safety, including life and property	Major	None	Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Increased revenues	None			Moderate	Unable to provide		Major	Unable to provide				
Mission-driven performance improvements	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,735,377		Annual dollars saved/ realized	$826,315		Annual dollars saved/ realized	$56,313			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Future annual customer service benefits added during validation					Annual dollars saved/ realized	$108,752		Annual dollars saved/ realized	$1,906			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			Moderate			Minor					
Environmental	None			Moderate			Major					
Public safety, including life and property	Minor			Moderate			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps				
Aspect maps				
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Aviation Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of in-flight hazards and path obstructions. Aeronautical charting. Runway construction and repair.
MCA Title	Aviation Navigation and Safety
MCA ID	60367
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Pennsylvania
Sub-Agency or Division	Pennsylvania Department of Transportation
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 21 - Aviation Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Nice to have
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B	I don't know	
Update Frequency	Annually	Annually	Annually	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	I don't know	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	I don't know	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Nice to have		Highly desirable	Nice to have
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Highly desirable	
DTM	Required	Required	Highly desirable	
DEM	Required	Required	Highly desirable	
Raw point cloud data	Highly desirable	Highly desirable	Nice to have	
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Nice to have	
Full waveform	Highly desirable	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Nice to have	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Nice to have	
Submerged features			Not required	
Subbottom characteristics			Not required	
Geologic and seismic data	Nice to have	Nice to have	Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Highly desirable	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Not required	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Required	Required	Required	
Wetlands	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Required	Highly desirable	Not required	
Cultural resources	Required	Highly desirable	Nice to have	
Coastal and riverine structures	Highly desirable	Nice to have	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	
Cost savings/cost reduction	Major	Major	Moderate	
Cost avoidance	Major	Major	Moderate	
Increased revenues	Major	None	None	
Mission-driven performance improvements	Major	Major	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Moderate	

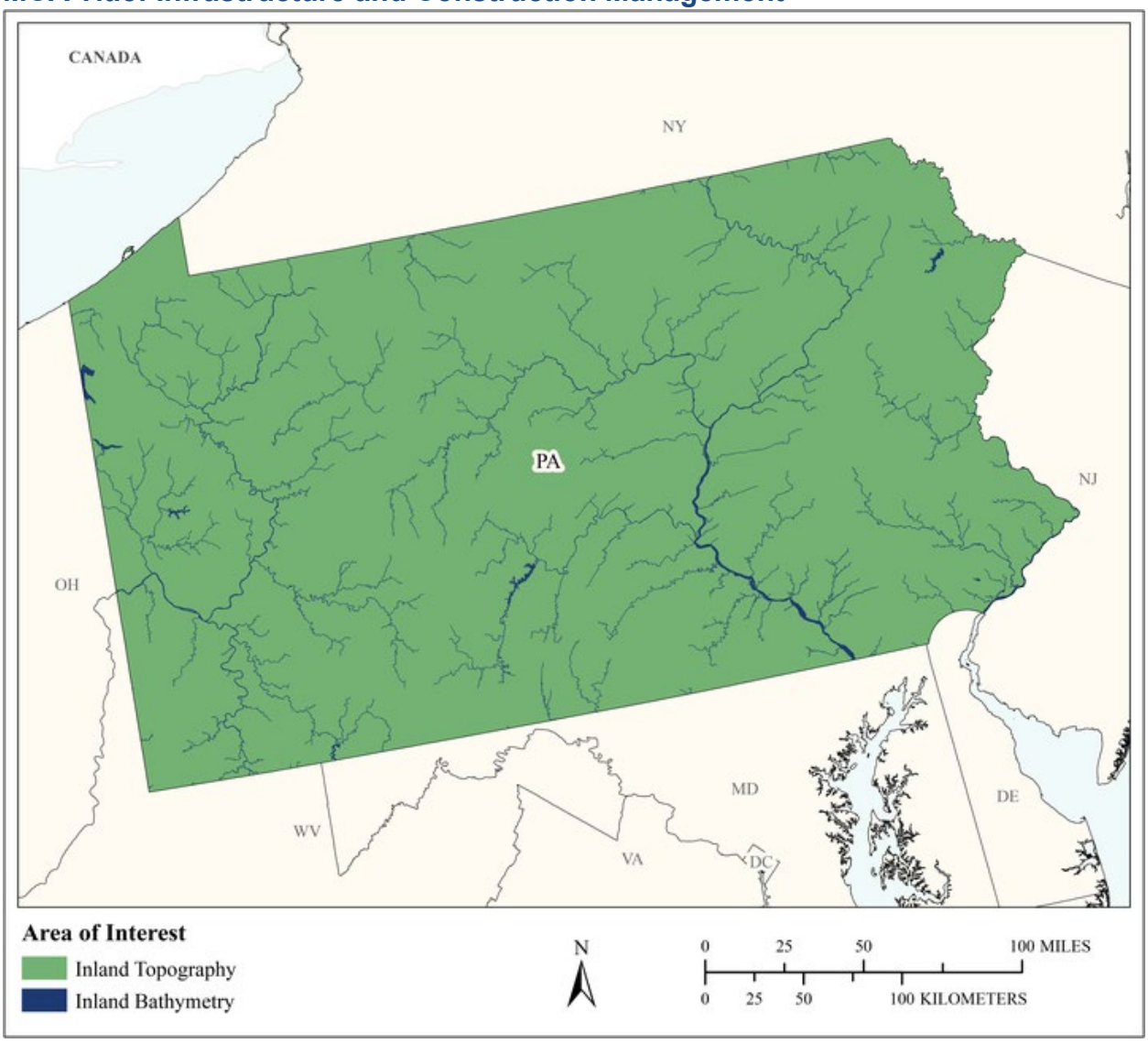
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major	Minor	
Improved customer experience	Major	Major	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	Minor	None	
Environmental	Major	Moderate	None	
Public safety, including life and property	Major	Moderate	None	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Increased revenues	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$153,139		Annual dollars saved/ realized	$30,494						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$190,730									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Moderate			I don't know					
Environmental	Moderate			Major			I don't know					
Public safety, including life and property	Moderate			Major			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes	Yes	Yes	
Curvature maps	Yes			
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Infrastructure and Construction Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Marine construction. Bridge design and construction. Engineering and construction of dams, levees, dikes, reservoirs, and coastal structures. Shipyard and port construction. Water, sewer, or power line planning and vegetation analysis. Pump, drain, and well placement. Stormwater modeling. Cut and fill analysis for earth-moving. Building site analysis. Road infrastructure. Infrastructure hardening or mitigation for climate change effects, e.g. sea level change.
MCA Title	Infrastructure and Construction Management
MCA ID	60368
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Pennsylvania
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	Up to 2 meters		
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Nice to have		
Classified point cloud	Required	Highly desirable		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Nice to have		
Coastal and riverine structures	Highly desirable	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Moderate		
Increased revenues	Minor	None		
Mission-driven performance improvements	Moderate	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate		

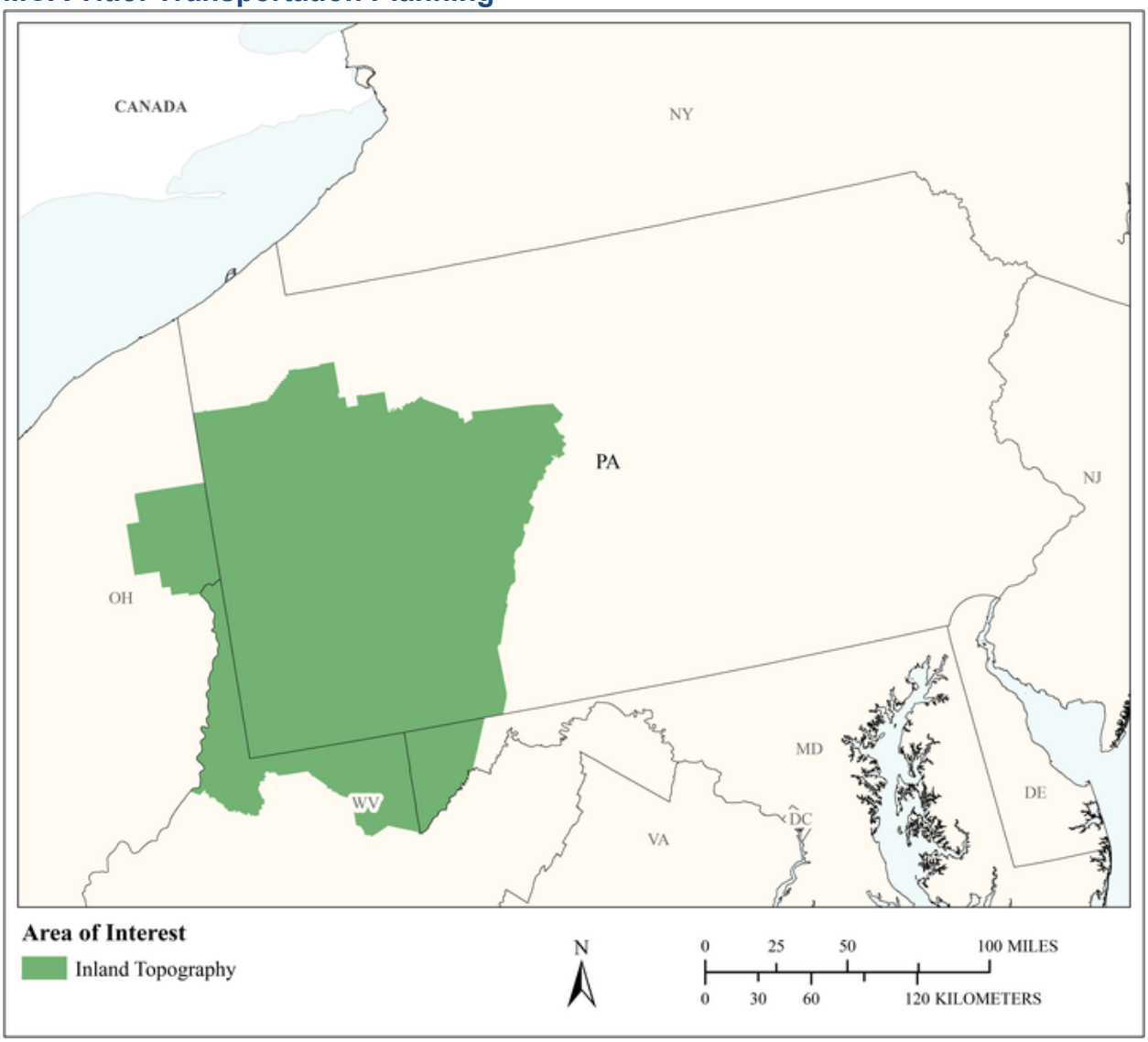
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major		
Improved customer experience	Moderate	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor		
Environmental	Moderate	Minor		
Public safety, including life and property	Moderate	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide							
Increased revenues	None			None								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,035,783		Annual dollars saved/ realized	$685,888						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Minor	Unable to provide							
Improved customer experience	Major	Unable to provide		Minor	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$5,990,900		Annual dollars saved/ realized	$71,221						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor								
Environmental	Moderate			Moderate								
Public safety, including life and property	Major			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Transportation Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements	Allegheny, Armstrong, Beaver, Butler, Fayette, Greene, Indiana, Lawrence, Washington, and Westmoreland counties, PA as well as surrounding counties			

MCA Description	Response
Mission Critical Activity	Transportation planning
MCA Title	Transportation Planning
MCA ID	21586
Organization Type	Metropolitan Planning Organization
Organization Name	Southwestern PA Commission
Sub-Agency or Division	
Organization Mission	The Southwestern Pennsylvania Commission, or SPC, is the regional planning agency serving the Pittsburgh 10-county area and providing essential services to the region. The official Metropolitan Planning Organization (MPO), SPC directs the use of all state and federal transportation and economic development funds allocated to the region---approximately $33 billion through 2030. For example, SPC helps counties, cities, municipalities, and townships use federal transportation funds in a timely way. SPC is also the region's designated Local Development District and Economic Development District by the US Appalachian Regional Commission and the US Department of Commerce. In this role, SPC establishes regional economic development priorities and provides a wide range of services to the region.
Program Name	Unified Planning and Work Program
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	While a building / house / road is required, it would be nice to identify smaller items and minor changes in elevation for storm water planning

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	4-5 years			
Event type(s)				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 30 cm			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	2006 DEM from PA Dept of Conservation and Natural Resources' 2006 PAMAP Program, consists of a raster digital elevation model with a horizontal ground resolution of 3.2 feet. The model was constructed from PAMAP LiDAR (Light Detection and Ranging) elevation points. PAMAP data are organized into blocks, which do not have gaps or overlaps that represent 10,000 feet by 10,000 feet on the ground.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				

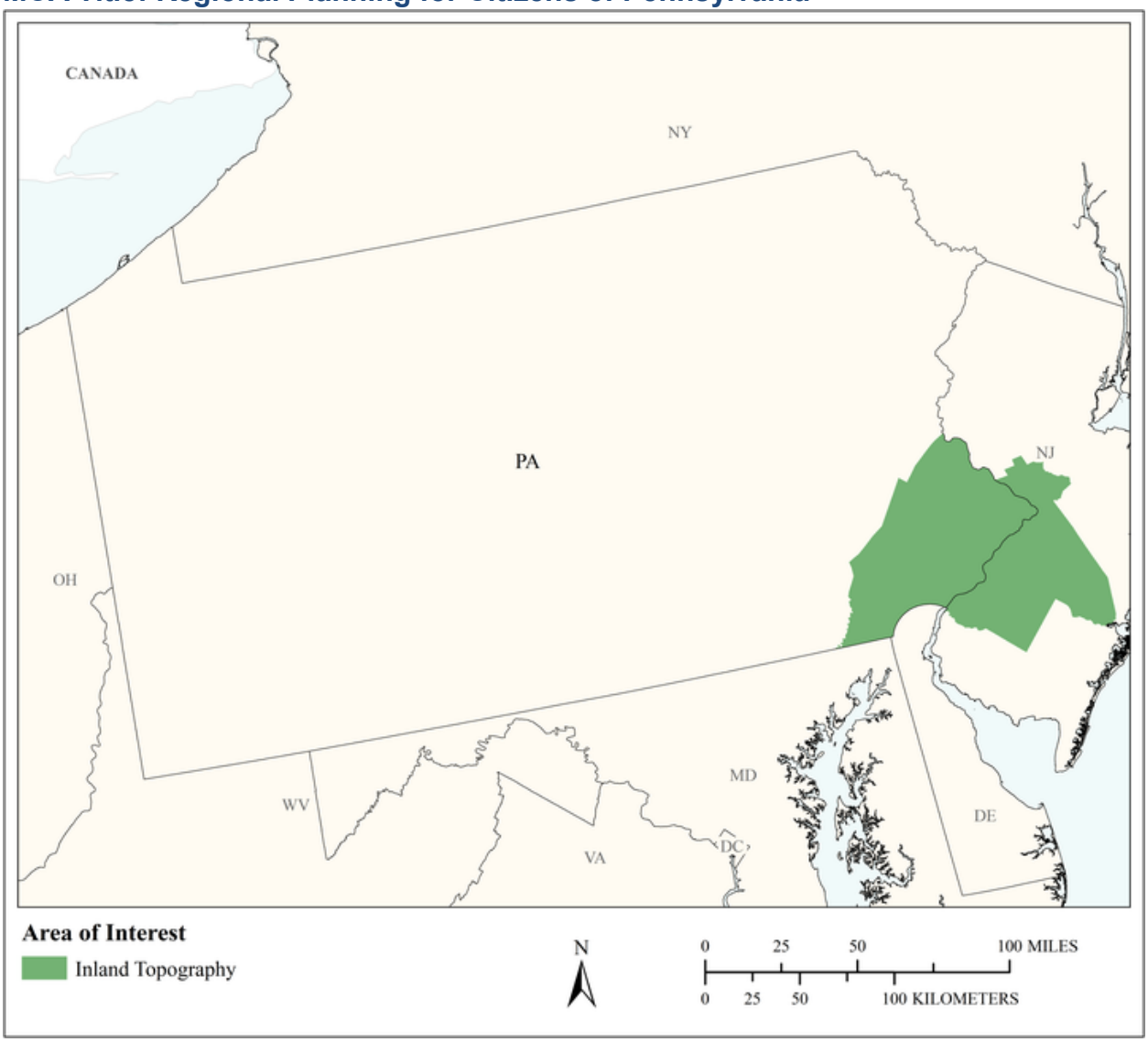
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Pennsylvania Spatial Data Access (PASDA) is Pennsylvania's official public access geospatial information clearinghouse. PASDA was developed in 1996 by the Pennsylvania State University and has served as the clearinghouse for Pennsylvania for over twenty years. http://www.pasda.psu.edu/			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Minor			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			
Improved response or timeliness	Moderate			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	Moderate			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Time savings description	We use whatever sources are available. For a 7,000 sq mi jurisdiction, field inspection is not feasible.											
Cost savings/cost reduction	Major	Unable to provide										
Cost savings/cost reduction description	Not in budget to pay for quality elevation data over a large jurisdiction.											
Cost avoidance	Major	Unable to provide										
Cost avoidance description	Use elevation data to identify areas that could be affected by flooding.											
Increased revenues	Minor	Unable to provide										
Increased revenues description	Would take advantage of apps using the data.											
Mission-driven performance improvements	Major	Unable to provide										
Mission-driven performance improvements description	Good data would lead to better planning.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved response or timeliness description	Good data could lead to increased resiliency of infrastructure.											
Improved customer experience	Moderate	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades				
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Regional Planning for Citizens of Pennsylvania



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements	Bucks, Chester, Delaware, Montgomery, and Philadelphia counties, PA; Burlington, Camden, Gloucester, and Mercer counties, NJ			

MCA Description	Response
Mission Critical Activity	Land development and zoning. Municipal mapping of building footprints and elevations. Port resilience planning. Parks and transportation planning. Virtual city creation. Urban ecology planning.
MCA Title	Regional Planning for Citizens of Pennsylvania
MCA ID	21719
Organization Type	Regional, County, City, or other local government
Organization Name	Delaware Valley Regional Planning Commission
Sub-Agency or Division	
Organization Mission	The Delaware Valley Regional Planning Commission (DVRPC) convenes the widest array of partners across a nine-county, two state region to increase mobility choices, protect and preserve natural resources, and create healthy communities that foster greater opportunities for all. City, county and state representatives work together to address key issues, including transportation, land use, environmental protection, economic development, and equity. DVRPC provides services to member governments and others through planning analysis, data collection, and mapping services. Aerial photographs, maps and a variety of publications are available to the public and private sector.
Program Name	DVRPC's Planning Work Program
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 16 - Sea Level Rise and Subsidence
Tertiary Business Use	BU 03 - Coastal Zone Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Buildings, roads.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Update Frequency	Unlike our aerial imagery, we have no set update cycle for LiDAR-derived data			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required			
DTM	Not required			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Nice to have			
Wetlands	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Not required			
Bridges/culverts	Not required			
Landmark features	Not required			
Cultural resources	Not required			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	USGS 2015 Delaware Valley High Density QL2 Lidar 2015 Sandy Supplemental MD/PA QL2 Lidar (for Chester County, PA)			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other	Yes			
Other description	We have all of the data from the 2015 USGS/DVRPC project as well as the 2015 Sandy Supplemental for Chester County, PA stored in house.			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	I don't know			
Cost avoidance	I don't know			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Moderate			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	I don't know			
Public safety, including life and property	I don't know			
Other Current Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other	Major			
Other description	Allows planning staff to visualize the topographic aspects of an area much more accurately than in the past			

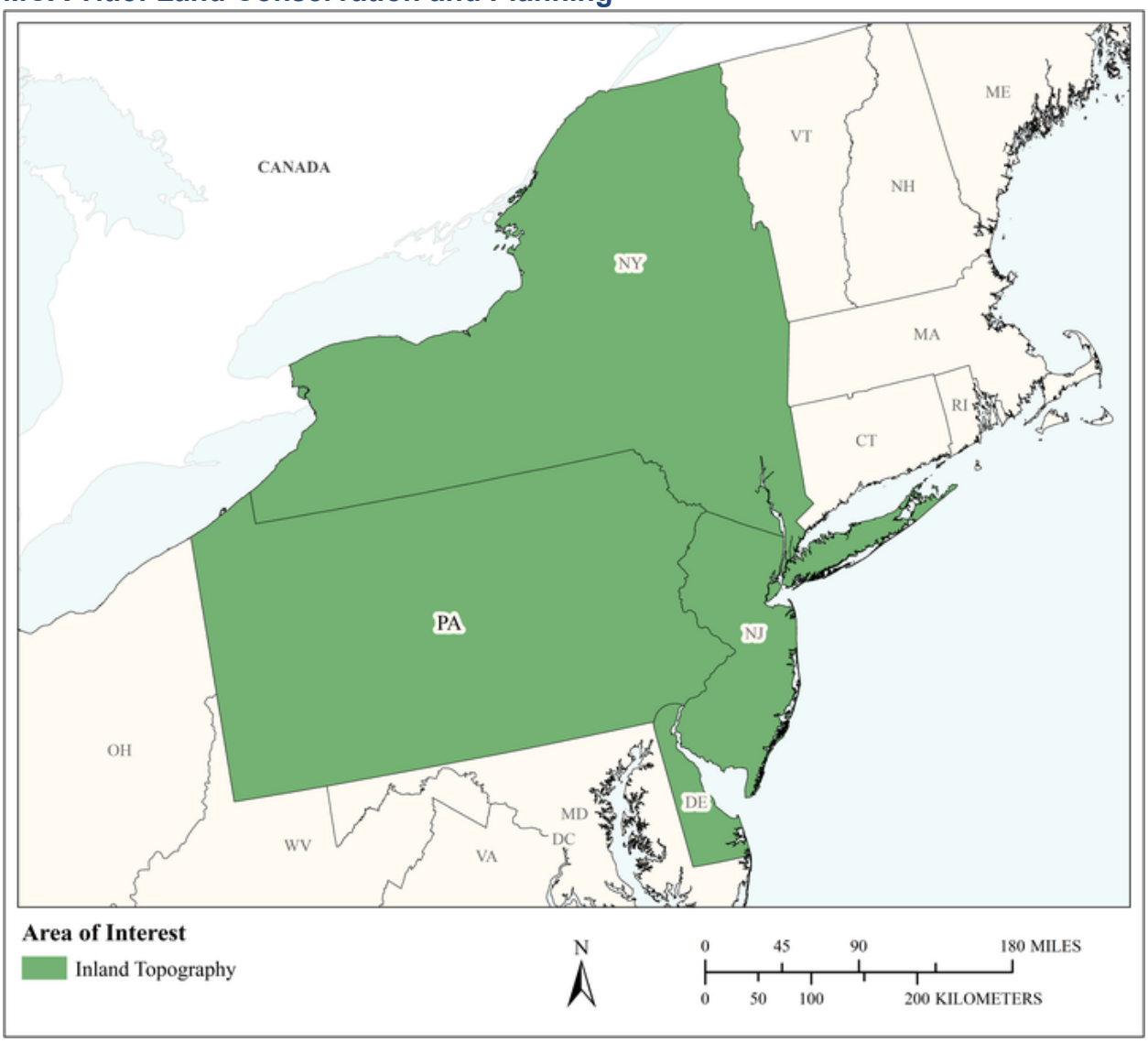
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$1,206									
Time savings description	Having a contiguous elevation dataset would save many hours of searching for, combining and processing datasets from multiple sources (some of which would likely not be of the same specification).											
Cost savings/cost reduction	Major	Annual dollars saved/realized	$500,000									
Cost savings/cost reduction description	In 2015, we utilized a public/private partnership via the USGS 3DEP BAA to acquire QL-2 LiDAR for an eight-county area. Without the 3DEP BAA process, DVRPC would not have been able to acquire this data on our own.											
Cost avoidance	I don't know	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Mission-driven performance improvements description	Not sure how to quantify a "Percent Improvement", however having this data certainly improved the performance of the programs for which it was used.											
Other operational benefits	Major	Unable to provide										
Other operational benefits description	Not sure how to quantify, however having this data certainly is beneficial to the programs for which it is used.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Value added to products or services description	The LiDAR data we acquired via the 3DEP BAA was distributed to FEMA for their use. The LiDAR data we acquired via the 3DEP BAA is in the public domain and, therefore, is likely being used by others in various ways.											
Improved response or timeliness	Major	Unable to provide										
Improved response or timeliness description	The LiDAR data we acquired via the 3DEP BAA was distributed to FEMA for their use. The LiDAR data we acquired via the 3DEP BAA is in the public domain and, therefore, is likely being used by others in various ways.											
Improved customer experience	Major	Unable to provide										
Improved customer experience description	The LiDAR data we acquired via the 3DEP BAA is available via the National Map, as well as the Pennsylvania Spatial Data Access (PASDA) website. The LiDAR data we acquired via the 3DEP BAA is in the public domain and, therefore, is likely being used by others in various ways.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Education or outreach description	This type of data certainly has the potential to benefit society, however I cannot estimate to what extent.			
Environmental	I don't know			
Environmental description	This type of data certainly has the potential to benefit society, however I cannot estimate to what extent.			
Public safety, including life and property	I don't know			
Public safety, including life and property description	This type of data certainly has the potential to benefit society, however I cannot estimate to what extent.			
Other	Increased accuracy of elevation data for planning and mapping purposes			
Other benefits	Major			
Other description	The data has already proven valuable for various planning and mapping projects here at DVRPC.			

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Land Conservation and Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Land conservation (easements and fee simple purchases), municipal/regional planning.
MCA Title	Land Conservation and Planning
MCA ID	22066
Organization Type	Academic or Not-for-Profit
Organization Name	Natural Lands Trust
Sub-Agency or Division	
Organization Mission	Land for life. Preserving and nurturing nature's wonders. Nature for all. Creating opportunities for joy and discovery in nature for everyone in our region.
Program Name	Natural Lands Trust
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Small features

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 80 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Not required					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required			
DTM	Nice to have			
DEM	Highly desirable			
Raw point cloud data	Not required			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data				
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Required			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	PASDA lidar data			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	PASDA (PA)			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	None			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None			

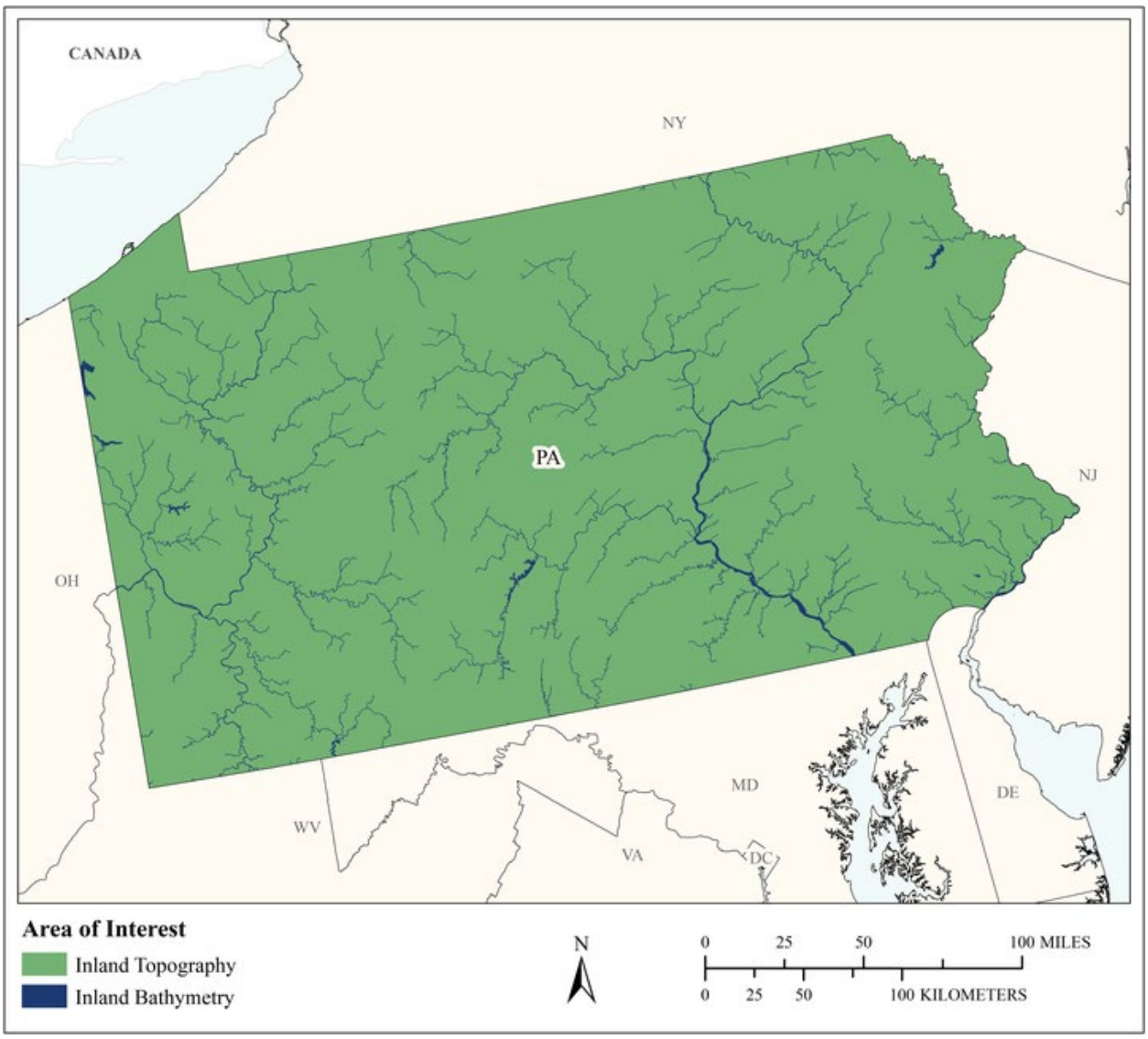
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	None			
Improved customer experience	None			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	None			
Public safety, including life and property	None			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide										
Cost savings/cost reduction	I don't know	Unable to provide										
Cost avoidance	I don't know	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	I don't know	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide										
Improved response or timeliness	I don't know	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Telecommunications



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Telecommunication tower site selection. Design of radio and radar systems. Interference analysis. Path profiles. Undersea telecommunication route selection and deployment.
MCA Title	Telecommunications
MCA ID	60369
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Pennsylvania
Sub-Agency or Division	Pennsylvania Utilities Commission
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 28 - Telecommunications
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Not required			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Nice to have	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have		
DTM	Highly desirable	Nice to have		
DEM	Highly desirable	Nice to have		
Raw point cloud data	Highly desirable	Nice to have		
Classified point cloud	Required	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Highly desirable	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Not required		
Ground control/ground truthing	Highly desirable	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Highly desirable		
Bridges/culverts	Required	Highly desirable		
Landmark features	Required	Highly desirable		
Cultural resources	Required	Highly desirable		
Coastal and riverine structures	Required	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI		Yes		
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Major		
Increased revenues	None	None		
Mission-driven performance improvements	Major	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major	Major		
Improved customer experience	Major	Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor		
Environmental	Minor	Minor		
Public safety, including life and property	Major	Major		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know								
Environmental	I don't know			I don't know								
Public safety, including life and property	I don't know			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

Puerto Rico

Current status of elevation data for Puerto Rico

Approximately 3,500 square miles of Quality Level 2 (QL2) lidar survey and mapping data were collected over Puerto Rico in 2016 and 2017 in support of the 3D Elevation Program (3DEP) and serve as a pre-Hurricane Maria snapshot of the island's elevation before the hurricane made landfall in 2017. Data are served through the USGS National Map portal.

Figure 1. Puerto Rico 2017 Topography and Bathymetry

In response to Hurricane Maria, additional island-wide lidar were collected in 2018-2019 as the result of disaster supplemental funding provided by Congress. This data collection effort has resulted in high-resolution digital elevation models to update and inform landslide, flooding, and storm surge analysis. Additionally, many bathymetric datasets are available for the environs of Puerto Rico and those are publicly available through NOAA's Digital Coast.

Importance of elevation data to Puerto Rico

High-resolution elevation data supports the production of a complete and accurate 3D map of the entire commonwealth for use in emergency management, storm surge modeling, wave runup potential and energy modeling, flood inundation, hazard mitigation, infrastructure planning, agriculture, forestry, and geologic mapping, among other purposes, and the 3D map must meet the requirements of all state agencies. High-resolution elevation data will be used both by emergency response agencies that offer support to Puerto Rico, as well as the local agencies that are responding to hazards, such as Hurricane Maria and recent earthquakes, from a regional level. The island still has not recovered from the devastation caused by Hurricane Maria. The dynamic nature of the island causes continuous changes, even at the land-water interface. This creates challenges to maintaining infrastructure that is critical to provide public safety and support the state and national economies. Landslides caused by the rains of Hurricane Maria have caused infrastructure and agricultural damage and many structures are still without permanent roofs. Better terrestrial elevation data would contribute to improved infrastructure management, among other applications, whereas better bathymetry would contribute greatly to improved

navigation, understanding of fisheries habitat, aquaculture support, and flood modeling. Additionally, the January 2020 earthquakes caused more structural damage and geomorphic response, so having high-resolution elevation data is imperative.

High-level summary of elevation data requirements

To map Puerto Rico most effectively in any multi-year cycle, the following elevation data principles apply:

- Large, seamless, temporally consistent;
- Consistent with existing aerial photography flight schedule;
- Systematic collection;
- Prioritize existing data gaps (due to land change, heavy vegetation, etc.); and
- Prioritize major business uses (recovery of infrastructure, critical housing needs, etc.).

Planning, acquisition, processing and derivative products of QL1 and QL2 elevation data require aggregate nominal pulse densities between 2-8 points per square meter with ideal collection conditions of minimal water levels and leaf decline with tidal considerations within one mile of the coastal boundary for streams, rivers, and inlets for terrestrial data.

Heavy vegetation and variable terrain create survey challenges in Puerto Rico. Rapid and very thick growth of vegetation along with active landslides may drive more frequent update collection.

Bathymetric elevation requirements are not fully defined, and additional outreach and understanding are needed to determine the nearshore and offshore requirements of port and coastline managers to address many economic considerations: coastal infrastructure, navigation, recreation, and reef health.

High-level summary of benefits that would come from higher resolution elevation data

In addition to the uses in emergency management, infrastructure planning, agriculture, and forestry, higher-resolution elevation data will also support the coastal zone. When collected at higher densities, bathymetric elevation data are capable of aiding with the management of estuarine and marine sanctuaries as small details related to the submerged topography can be extracted from the data. This includes areas where motorized watercraft cause damage to the subaquatic vegetation. Additionally, the coastal area could be quickly collected using a topographic lidar sensor while the water elevations are near mean lower low tide to measure the elevations and width of beaches. When collected over multiple temporal periods, this would allow the commonwealth to manage beach erosion and identify deterioration of jetty, groin, and breakwater structures to aid in determining where beaches and support structures may need to be extended or repaired to help mitigate storm surge related flooding.

Additional comments

As mentioned above, further information is needed to determine detailed requirements going forward. Puerto Rico has no lead agency to coordinate lidar acquisition, and there is minimal coordination for training and resources to support the widespread use of lidar data. Federal agencies that provide assistance to Puerto Rico will be well served from frequent and high-quality topographic and bathymetric elevation data.

As Puerto Rico moves forward with more elevation planning and expanded use, the commonwealth expects that more requirements will be noted in the following areas:

- Natural Resource Management;
- Wildlife and Habitat Management;

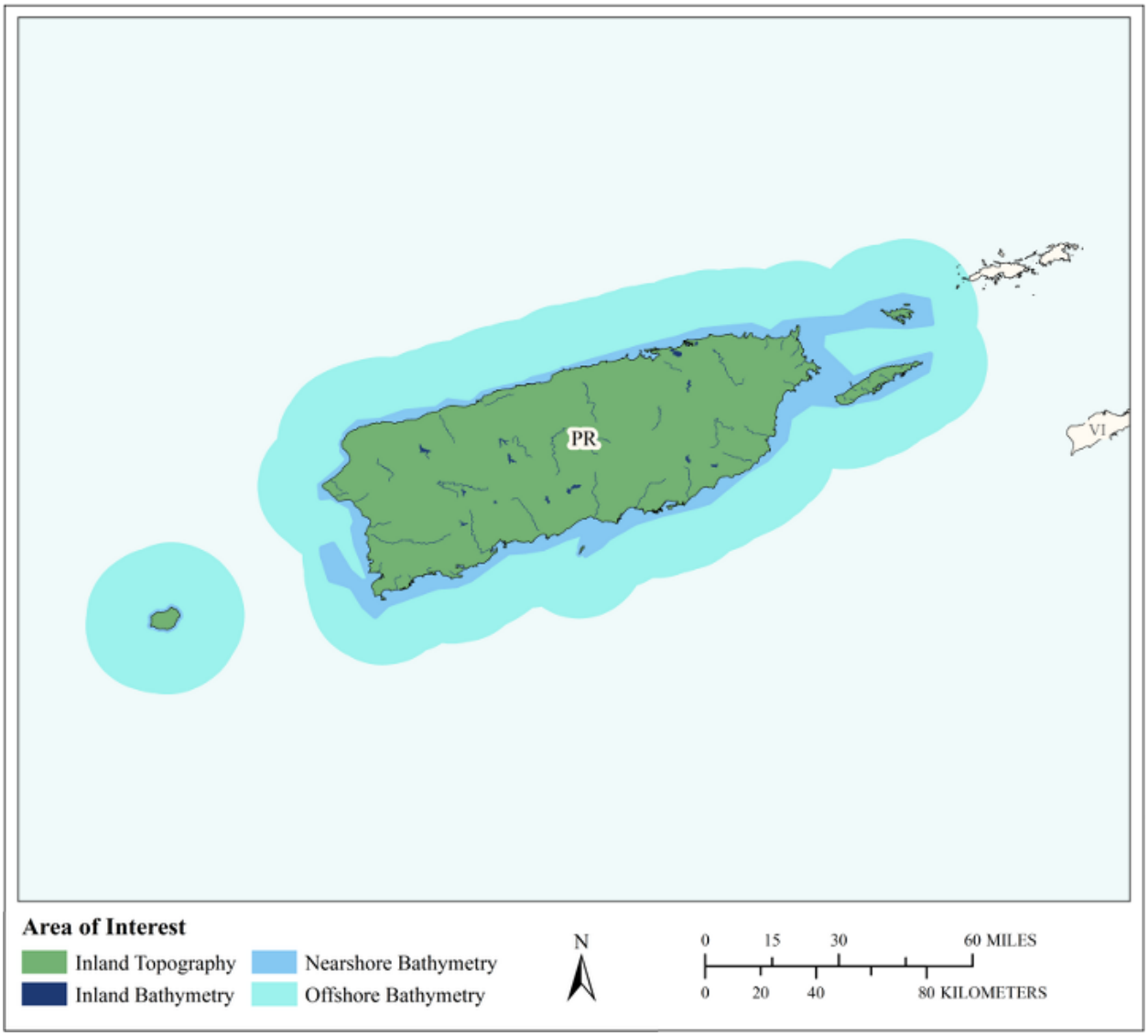
- Fisheries Management and Aquaculture;
- Renewable Energy Resources;
- Cultural Resource Management;
- Marine and Riverine Navigation;
- Urban and Regional Planning; and
- Maritime and Land Boundary Management.

The Commonwealth of Puerto Rico has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 03 – Coastal Zone Management	University of PR Rio Piedras Campus	22550	Coastal Research and Planning	Inland Topo	QL0 HD	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Inland Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Offshore Bathy	Order 1	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

MCA Title: Coastal Research and Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Custom description	Custom description
Sub Area Requirements			Puerto Rico	Puerto Rico water out to 12 nm

MCA Description	Response
Mission Critical Activity	Coastal Research and Planning (shoreline changes, coastal erosion, recommendation in coastal zoning). Coastal Zone Management. Flood Risk Management. Sea Level Rise and Subsidence.
MCA Title	Coastal Research and Planning
MCA ID	22550
Organization Type	Academic or Not-for-Profit
Organization Name	University of PR Rio Piedras Campus
Sub-Agency or Division	
Organization Mission	Academic and Research To conduct academic, research and outreach activities Graduate School of Planning (Coastal planning and management)
Program Name	Institute of Coastal Research and Planning University of PR
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 16 - Sea Level Rise and Subsidence

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Narrow beaches (2 meters)

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL1B	QL1B	Order 1
Update Frequency	4-5 years	2-3 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed			1 kilometer inland	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MHW	MHW
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DTM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Nice to have	Nice to have	Nice to have	Nice to have
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Not required	Not required	Not required
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Nice to have
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	Nice to have
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Not required	Not required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Nice to have	Nice to have
Routes			Not required	Not required
Offshore cadastral			Nice to have	Nice to have
Lease areas			Not required	Not required
Fixed obstructions			Not required	Not required
Floating observation/navigation systems			Not required	Not required
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Required	Required	Required	Required
Wetlands	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Required	Required	Required	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Best available	Best available	Best available	Best available
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	Yes
NCEI	Yes	Yes	Yes	Yes
Open Topography				
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts				
USGS Inland Waters server		Yes		
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available	Major	Major
Cost savings/cost reduction	Major	Inland bathy data not available	Major	Major
Cost avoidance	Major	Inland bathy data not available	Major	Major
Increased revenues	Major	Inland bathy data not available	Major	Major

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Mission-driven performance improvements	Major	Inland bathy data not available	Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available	Major	Major
Improved response or timeliness	Major	Inland bathy data not available	Major	Major
Improved customer experience	Major	Inland bathy data not available	Major	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Inland bathy data not available	Major	Major
Environmental	Major	Inland bathy data not available	Major	Major
Public safety, including life and property	Major	Inland bathy data not available	Major	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know			I don't know			I don't know		
Environmental	I don't know			I don't know			I don't know			I don't know		
Public safety, including life and property	I don't know			I don't know			I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

Rhode Island

Introduction to Rhode Island's Landscape

The State of Rhode Island, nicknamed "The Ocean State," is 37 miles in length east to west and 48 miles north to south encompassing 1,045 square miles of land area, 360 miles of coastline, and is highlighted by a number of islands and peninsulas in Narragansett Bay to the east and coastal ponds and barrier beaches along the southern boundary of the state. Approximately 55% of Rhode Island is forested.

Current status of elevation data for Rhode Island

As of 2010, approximately 50% of Rhode Island was covered by a patchwork of nine individual, publicly-accessible lidar datasets, of varying and coarse quality levels, acquired under different projects through NOAA, FEMA, NGA, Rhode Island Army National Guard, USACE, and the Providence Water Supply Board. Rhode Island achieved statewide lidar coverage in spring 2011 through the Northeast LiDAR Project (USGS ARRA). For Rhode Island, participation in this project was the most successful regional, Quality Level 2 (QL2) elevation data collection effort to date due to its wide area of acquisition, depth of coordination, and multi-agency cost sharing facilitated by the USGS Geospatial Liaison Network. This dataset continues to be the best available source of consistent and seamless elevation data for Rhode Island. The 2014 USGS Coastal and Marine Geology Program lidar, the 2014 NOAA Post- Hurricane Sandy topobathy lidar, and the 2018 USACE National Coastal Mapping Program topobathy lidar provide the latest elevation data collected, however, these data are limited to coastal areas. In June of 2019 Massachusetts Institute of Technology Lincoln Laboratory (MIT/LL) Humanitarian Assistance and Disaster Relief Systems flew a series of calibration test flights over coastal portions of Rhode Island collecting elevation data using their latest Geiger-mode lidar sensor and provided the LAS files for inclusion in the Rhode Island Geographic Information System (RIGIS). In addition, discussions underway to incorporate a 2018 statewide LiDAR dataset purchased from EagleView into RIGIS for public distribution.

Importance of elevation data to Rhode Island

Elevation data is a critical geospatial thematic element to applications of landscape modeling and planning. 1) Striking a balance between accuracy and cost, coastal zone and emergency managers strive to obtain the best available elevation data to support applications to determine risk, impact, response to climate change-related sea level rise, storm surge, flooding of inland waterways, and wave impacts. It is also used by real estate, banking and insurance companies for modeling tsunami, wildfire and seismic hazards. 2) Environmental managers use elevation data to develop protection measures and strategies for public drinking water supplies and to model and manage threats to water quality from stormwater runoff and oil spills. It is also used in riverine ecosystem management, wildlife habitat characterization and management, shellfish aquaculture, as well as in the management and mapping of forests, parks and recreation areas, soils, wetlands and impervious surfaces. 3) Transportation engineers and managers make use of high-resolution elevation data to support infrastructure design and asset management applications to facilitate land, marine, riverine, and aviation navigation and safety. 4) Academic institutions use high-resolution elevation data to support a variety of educational training, research, and facilities management applications.

High-level summary of elevation data requirements

In the larger forested areas of western Rhode Island, QL1 lidar may maximize ground returns through areas of dense forest canopy. For urban/suburban areas in greater Providence and surrounding Narragansett Bay, QL2 lidar is acceptable for generating bare-earth DEMs. However, due to the small area of Rhode Island, it is desirable to collect data using consistent set of specifications to support

continuity in data products and analyses across the entire state. The dynamic nearshore coastal region will benefit from QL3B topobathy lidar updates and in the offshore areas, IHO Order 2 bathymetry will support general seafloor mapping.

High-level summary of benefits that would come from higher resolution elevation data

QL0HD and QL0 UAV data would be useful in evaluating pre- and post-restoration conditions in thin layer sediment placement salt marsh restoration projects in coastal Rhode Island and for monitoring pre and post impacts to coastal features and structures from storm related events. QL0UAV data using UAV and Mobile Mapping Systems would support detailed transportation planning applications.

Additional comments

Rhode Island has now reached the nine-year mark since its last statewide lidar acquisition at QL2. As was done for the 2011 Northeast LiDAR Project, Rhode Island is interested in partnering with other states to maximize efficiency related to mobilization costs and data processing for an update to statewide lidar-based elevation data.

The State of Rhode Island has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

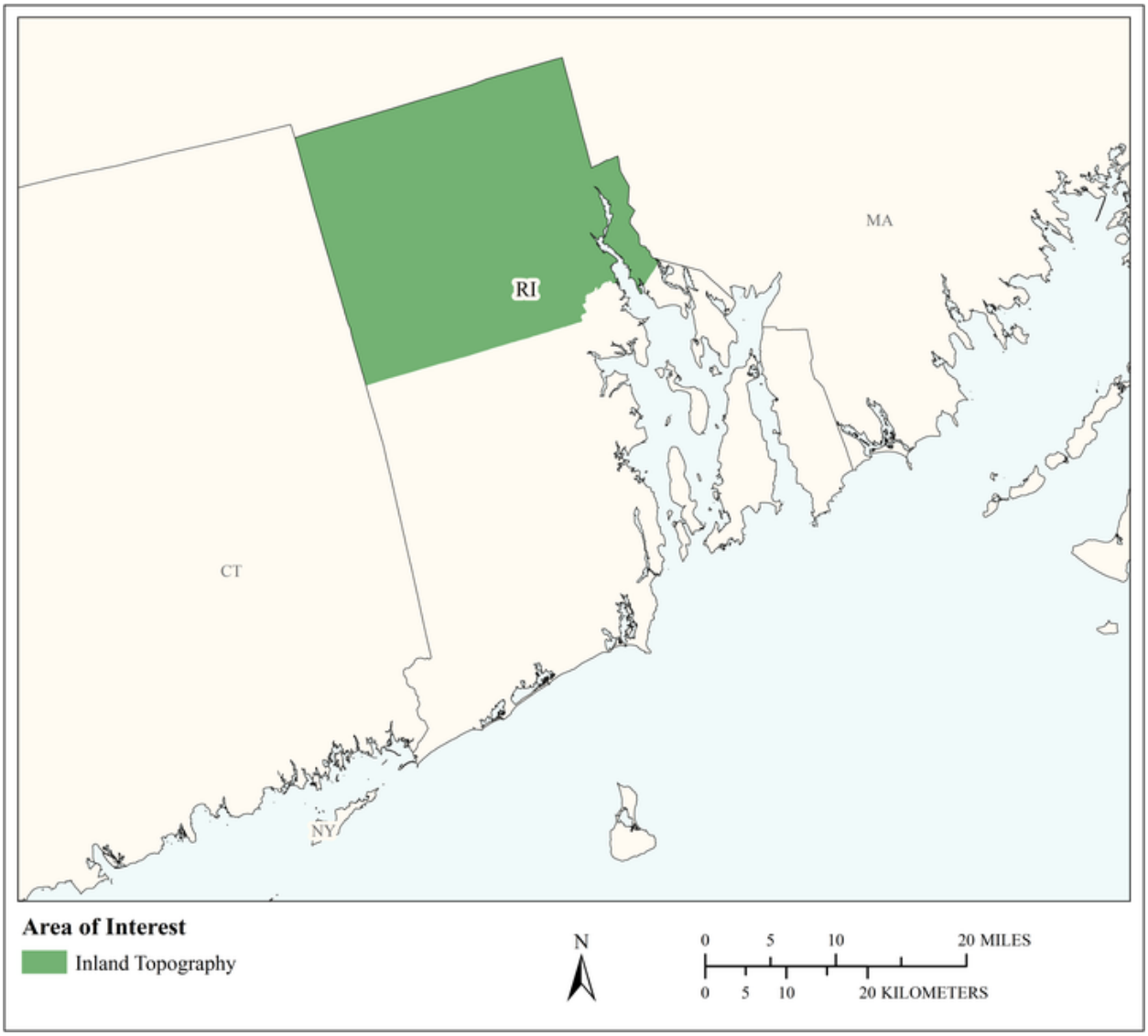
MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	City of Providence, Providence Water	1179	Drinking Water Infrastructure Siting and System Planning	Inland Topo	QL3	4-5 years	$1,712	$458	None	None	Minor
BU 01 – Water Supply and Quality	RI Dept of Environmental Management	1385	Water Quality and Forest Habitat Management and Assessment	Inland Topo	QL2	6-10 years	$4,291	$1,149	I don't know	Moderate	I don't know
				Inland Bathy	QL1B	6-10 years	$25,974	$2,714	Moderate	Major	Moderate
				Nearshore Bathy	QL1B	4-5 years	$5,971	$9,837	Moderate	Moderate	Moderate
BU 02 – Riverine Ecosystem Management	State of Rhode Island	60370	Riverine Ecosystem Management	Inland Topo	QL1 HD	6-10 years	$1,657	$165	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$882	$62	Major	Major	Major
				Nearshore Bathy	QL0B	2-3 years	$18,110	$13,839	Moderate	Moderate	Moderate
BU 03 – Coastal Zone Management	RI Coastal Resources Management Council	1311	Coastal Zone Management	Inland Topo	QL0	2-3 years	$55,830	$9,760	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$23,958	$14,045	Moderate	I don't know	I don't know
				Nearshore Bathy	QL2B	4-5 years	$40,652	$68,600	Major	Moderate	I don't know
				Offshore Bathy	Order 1b	6-10 years	$22,375	$4,467	Major	Moderate	I don't know
BU 04 – Forest Resource Management	State of Rhode Island	60371	Forest Resources Management	Inland Topo	QL1	2-3 years	$4,281	$6,206	Major	Major	Major
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 05 – Rangeland Management	State of Rhode Island	60372	Rangeland Management	Inland Topo	QL2	Annually	Unable to quantify	Unable to quantify	Minor	Major	I don't know
				Inland Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 06 – Natural Resource Management	State of Rhode Island	60373	Natural Resources Conservation	Inland Topo	QL1 HD	4-5 years	$42,474	$155,978	Major	Major	Major
				Inland Bathy	QL0B	6-10 years	$5,756	$259	Major	Major	Major
				Nearshore Bathy	QL1B	6-10 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate
				Offshore Bathy	Cross sections and/or transects meet needs	4-5 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
BU 07 – Wildlife and Habitat Management	State of Rhode Island	60374	Wildlife and Habitat Management	Inland Topo	QL2	4-5 years	$257	$745	Moderate	Major	Moderate
				Inland Bathy	QL2B	4-5 years	$2,067	$1,249	Moderate	Moderate	Moderate
				Nearshore Bathy	QL0B	4-5 years	$179	$10	Moderate	Major	Moderate
				Offshore Bathy	Special Order	4-5 years	$281	$19	Moderate	Major	Major

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 08 – Agriculture	State of Rhode Island	60375	Agriculture and Precision Farming	Inland Topo	QL2	2-3 years	$1,253	$993	Major	Major	Minor
				Inland Bathy	QL4B	4-5 years	$2,196	$993	Moderate	Major	Major
BU 09 – Fisheries Management and Aquaculture	State of Rhode Island	60376	Fisheries Management and Aquaculture	Inland Topo	QL2	2-3 years	$1,106	$2,404	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	6-10 years	$2,166	$986	Major	Major	Moderate
				Nearshore Bathy	QL0B	6-10 years	$28,444	$2,088	Moderate	Major	Minor
				Offshore Bathy	Special Order	6-10 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Minor
BU 10 – Geologic Assessment	State of Rhode Island	60377	Geologic Assessment and Hazard Mitigation	Inland Topo	QL1	4-5 years	$228,588	$4,012	Major	Major	Major
				Inland Bathy	QL1B	6-10 years	$3,025	$3,324	Moderate	Moderate	Major
				Nearshore Bathy	QL1B	4-5 years	$13,964	$22,468	Major	Moderate	Major
				Offshore Bathy	Special Order	4-5 years	$426,879	Unable to quantify	Major	Moderate	Major
BU 11 – Geologic Resource Extraction	State of Rhode Island	60378	Geologic Resource Mining and Extraction	Inland Topo	QL1 HD	2-3 years	$264	$175	Minor	Major	Major
				Inland Bathy	QL0B	4-5 years	Unable to quantify	$18	None	Minor	Minor
				Nearshore Bathy	QL3B	I don't know	Unable to quantify	Unable to quantify	I don't know	Moderate	I don't know
				Offshore Bathy	Order 1b	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 12 – Renewable Energy Resources	State of Rhode Island	60379	Renewable Energy Resources	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	None
				Inland Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Offshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 13 – Oil and Gas Resources	State of Rhode Island	60380	Oil and Gas Resources	Inland Topo	QL1	Annually	$475	Unable to quantify	Minor	Major	Major
				Inland Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	QL2B	2-3 years	$14,690	Unable to quantify	Major	Major	Major
				Offshore Bathy	Order 1a	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 14 – Cultural Resource Management	State of Rhode Island	60381	Cultural Resources Preservation and Management	Inland Topo	QL1	4-5 years	$198	$173	Minor	Minor	Minor
				Inland Bathy	QL0B	6-10 years	$475	Unable to quantify	Moderate	Minor	Minor
				Nearshore Bathy	QL0B	4-5 years	$518	Unable to quantify	Minor	Moderate	Minor
				Offshore Bathy	Order 1a	6-10 years	$693	Unable to quantify	Minor	Moderate	Minor

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 15 – Flood Risk Management	City of East Providence, RI	1251	Coastal and Riverine Flood Inundation Mapping	Inland Topo	QL2	6-10 years	$1,809	Unable to quantify	Moderate	Minor	Moderate
				Nearshore Bathy	I don't know	Event driven	Unable to quantify	Unable to quantify	Minor	I don't know	Minor
BU 15 – Flood Risk Management	State of Rhode Island	60382	Flood Risk Management	Inland Topo	QL2	4-5 years	$152,044	$26,603	Major	Moderate	Major
				Inland Bathy	QL1B	4-5 years	$10,562	$11,858	Moderate	Moderate	Major
				Nearshore Bathy	QL2B	4-5 years	$34,280	$25,406	Major	Moderate	Major
				Offshore Bathy	Special Order	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 16 – Sea Level Rise and Subsidence	State of Rhode Island	60383	Sea Level Rise and Subsidence	Inland Topo	QL1 HD	4-5 years	$57,011	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Minor
BU 17 – Wildfire Management	State of Rhode Island	60384	Wildfire Management, Planning, and Response	Inland Topo	QL1	4-5 years	$5,818	Unable to quantify	Major	Major	Major
BU 18 – Homeland Security	State of Rhode Island	60385	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management	Inland Topo	QL2	4-5 years	$31,945	$564	Major	Moderate	Major
				Inland Bathy	QL0B	4-5 years	$8,996	$574	Major	Moderate	Major
				Nearshore Bathy	QL1B	6-10 years	$1,667	$47	Moderate	Moderate	Major
				Offshore Bathy	Order 2	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 19 – Land Navigation	State of Rhode Island	60386	Land Navigation and Safety	Inland Topo	QL0	2-3 years	$14,028	$1,132	Minor	Major	Major
				Inland Bathy	QL0B	2-3 years	$598	$6	Minor	Moderate	Moderate
				Nearshore Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	None	Moderate	Moderate
BU 20 – Marine and Riverine Navigation	State of Rhode Island	60387	Marine and Riverine Navigation and Safety	Inland Topo	QL0 HD	2-3 years	$41,483	Unable to quantify	None	None	Minor
				Inland Bathy	QL0B	2-3 years	$19,752	$2,599	Moderate	Moderate	Moderate
				Nearshore Bathy	QL0B	2-3 years	$138,793	$4,699	Minor	Major	Major
				Offshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 21 – Aviation Navigation	State of Rhode Island	60388	Aviation Navigation and Safety	Inland Topo	QL1 HD	Annually	$3,660	$4,559	Minor	Moderate	Moderate
BU 22 – Infrastructure Management	Rhode Island Department of Transportation (RIDOT)	21678	Transportation Asset Management	Inland Topo	QL1	4-5 years	$48,665	$143,211	Minor	Major	Moderate
				Inland Bathy	QL0B	4-5 years	$16,396	$1,702	Minor	Moderate	Moderate
				Nearshore Bathy	QL1B	4-5 years	$3,783	$520	Minor	Moderate	Major

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 23 – Urban and Regional Planning	State of Rhode Island	60389	Urban and Regional Planning	Inland Topo	QL1	4-5 years	$291,364	$33,638	Moderate	Major	Major
				Inland Bathy	QL1B	6-10 years	$11,866	$15,012	Moderate	Moderate	Major
				Nearshore Bathy	QL2B	4-5 years	$33,138	$34,959	Moderate	Moderate	Moderate
				Offshore Bathy	Cross sections and/or transects meet needs	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 24 – Health and Human Services	State of Rhode Island	60390	Health and Human Services	Inland Topo	QL1	6-10 years	$386	Unable to quantify	Moderate	Moderate	Major
				Inland Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 25 – Real Estate, Banking, and Insurance	State of Rhode Island	60391	Real Estate, Banking, Mortgage, and Insurance	Inland Topo	QL1 HD	4-5 years	$37,625	Unable to quantify	Minor	Minor	Major
				Inland Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	Major	Moderate	Major
				Offshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 26 – Education and Basic Research	State of Rhode Island	60392	Education K12 and Beyond, Basic Research	Inland Topo	QL1 HD	2-3 years	$5,690	$13,602	Major	Major	Major
				Inland Bathy	QL1B	4-5 years	$1,488	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL2B	4-5 years	$1,187	$46	Major	Major	Minor
				Offshore Bathy	Order 1a	6-10 years	$554	Unable to quantify	Major	Minor	Minor
BU 27 – Recreation	State of Rhode Island	60393	Recreation	Inland Topo	QL1	4-5 years	$248	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	4-5 years	$149	Unable to quantify	Major	Major	Moderate
				Nearshore Bathy	QL0B	4-5 years	$23,432	Unable to quantify	Major	Major	Moderate
BU 28 – Telecom-munications	State of Rhode Island	60394	Telecommunications	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 29 – Military	State of Rhode Island	60395	Military	Inland Topo	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Inland Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 30 – Maritime and Land Boundary Management	State of Rhode Island	60396	Maritime and Land Boundary Management	Inland Topo	QL1	6-10 years	$1,218	$4,671	Moderate	Minor	None
				Inland Bathy	QL2B	6-10 years	$914	Unable to quantify	Major	Major	Moderate
				Nearshore Bathy	QL0B	2-3 years	$41,590	Unable to quantify	Moderate	Major	Moderate
				Offshore Bathy	I don't know	2-3 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate

MCA Title: Drinking Water Infrastructure Siting and System Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements	Providence County, RI			

MCA Description	Response
Mission Critical Activity	Drinking water purification. Drinking water transmission and distribution. Pollution risk mitigation. Management of owned watershed parcels. Elevation data are needed for engineering planning for new infrastructure, to include a new wind farm at Scituate Reservoir, how/where to site new infrastructure, decision making regarding repair vs. installation of new mains, etc. Elevation data are also needed as input for water quality modeling (currently using InfoWater).
MCA Title	Drinking Water Infrastructure Siting and System Planning
MCA ID	1179
Organization Type	Regional, County, City, or other local government
Organization Name	City of Providence, Providence Water
Sub-Agency or Division	
Organization Mission	It is the mission of Providence Water to provide reliable, high-quality, safe, clean drinking water for our customers at a reasonable cost, supported by excellent customer service, within the context of a positive, fair, efficient, effective and healthy workplace environment.
Program Name	Capital Improvement Program (CIP) and Infrastructure Replacement Program (IFR).
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Trees, pump station (100-200 sq ft), valves

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL3			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Horizontal Error	Up to 80 cm			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed	To MHHW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required			
DTM	Nice to have			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Nice to have			
Wetlands	Not required			
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Not required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Currently we are mostly using topo contour lines from RIGIS (QL3 spacing, QL2 vertical accuracy). We have a 10m. DEM downloaded from NOAA for our service area.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI	Yes			
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other	Yes			
Other description	RIGIS			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Minor			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Minor			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor			
Improved response or timeliness	Minor			
Improved customer experience	None			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

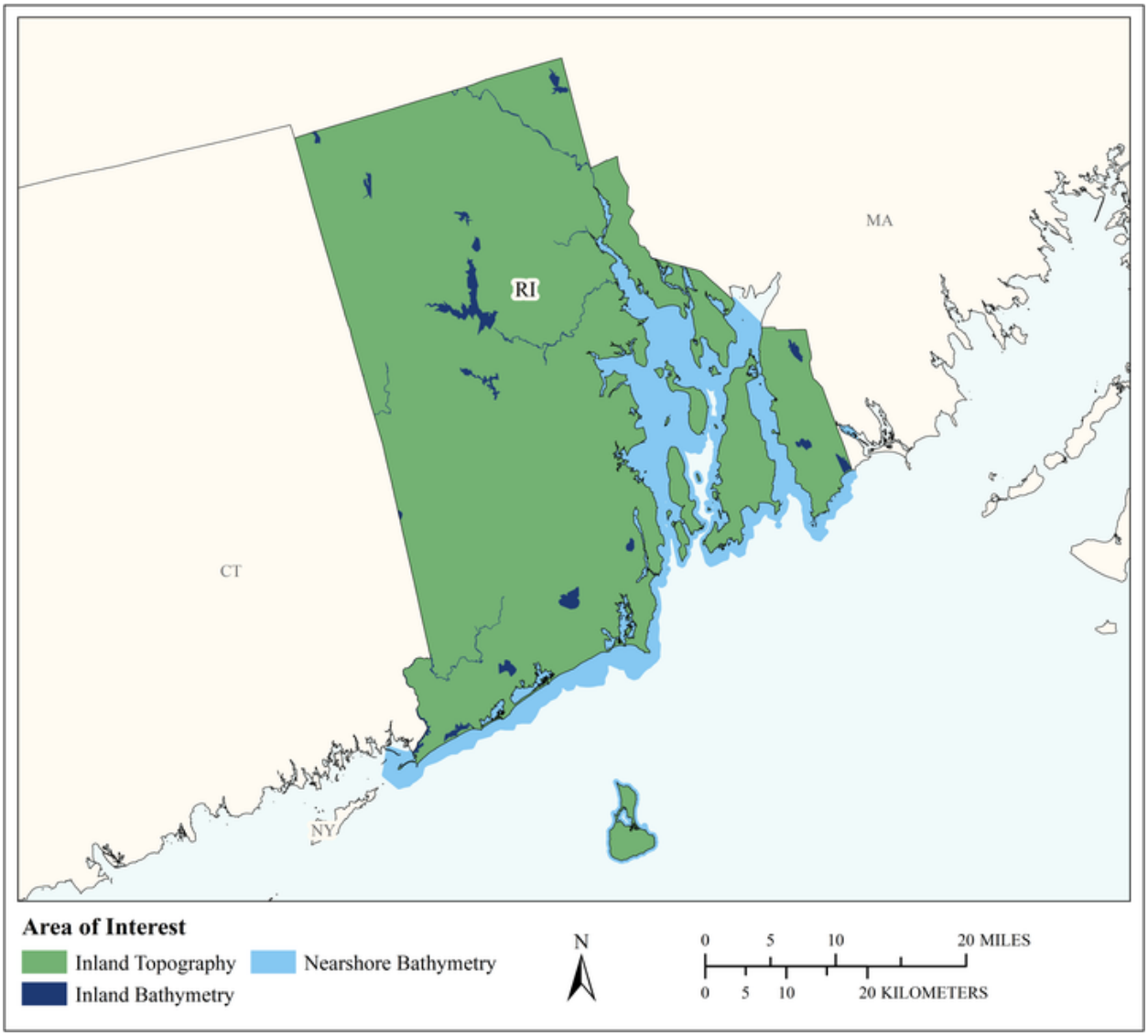
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Minor	Unable to provide										
Time savings description	Without using the newer data, it is difficult to estimate how much time would be saved. Having this data would enable us to do more in house and be more certain of the results of our in-house analyses. Many of our initial decision for how to best alter our system are made from topo maps. Having this data would remove small inefficiencies from our map-making and analysis processes.											
Cost savings/cost reduction	I don't know	Unable to provide										
Cost savings/cost reduction description	We don't currently pay for this data. We could possibly save on construction materials, but since we're not currently using our data for this purpose it is difficult to estimate.											
Cost avoidance	None											
Cost avoidance description	We don't currently quantify the cost for this in dollars but would be more easily quantifiable in time. We already receive pre-processed data.											
Increased revenues	None											
Mission-driven performance improvements	Minor	Unable to provide										
Mission-driven performance improvements description	There would be minor improvements in the ease in which we could make engineering changes to our system. There would be minor improvements in the ease in which we could run our models and the accuracy of the models output.											
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,712									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide										
Value added to products or services description	This data might allow us to provide better service to our customers through the proper calibration of water pressure in different areas.											
Improved response or timeliness	Minor	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Improved customer experience description	Any services and tools that would benefit from this data would be used internally only.											
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$458									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None											
Environmental	None											

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Public safety, including life and property	Minor			
Public safety, including life and property description	Better accuracy of this data might allow us to avoid main breaks and minimize			

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades				
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Water Quality and Forest Habitat Management and Assessment



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	BU 01 Water quality issues related to management of stormwater runoff rely on high quality elevation data for delineation of small catchments draining to individual drainage outfalls. BU 07 Forest habitat management utilizes lidar derived models of canopy and shrub understory height and density.
MCA Title	Water Quality and Forest Habitat Management and Assessment
MCA ID	1385
Organization Type	State or U.S. Territorial government
Organization Name	RI Dept of Environmental Management
Sub-Agency or Division	
Organization Mission	Environmental Protection, Natural Resource Management, Outdoor Recreation
Program Name	Integrated Water Quality Management and Assessment
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 07 - Wildlife and Habitat Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	30 square meter vegetation plots

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL1B	
Update Frequency	6-10 years	6-10 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed	To MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Nice to have		Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Nice to have	
DTM	Required	Highly desirable	Nice to have	
DEM	Highly desirable	Required	Required	
Raw point cloud data	Not required	Nice to have	Nice to have	
Classified point cloud	Required	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Not required	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Not required	Nice to have	Nice to have	
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Highly desirable	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Not required	Nice to have	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Not required	Highly desirable	Highly desirable	
Wetlands	Not required	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Not required	Nice to have	Nice to have	
Cultural resources	Not required	Nice to have	Nice to have	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	2011 USGS Northeast Lidar Project, also considering purchase of 2018 lidar flown by EagleView for National Grid			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Rhode Island Geographic Information System (RIGIS)			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Moderate	Moderate	

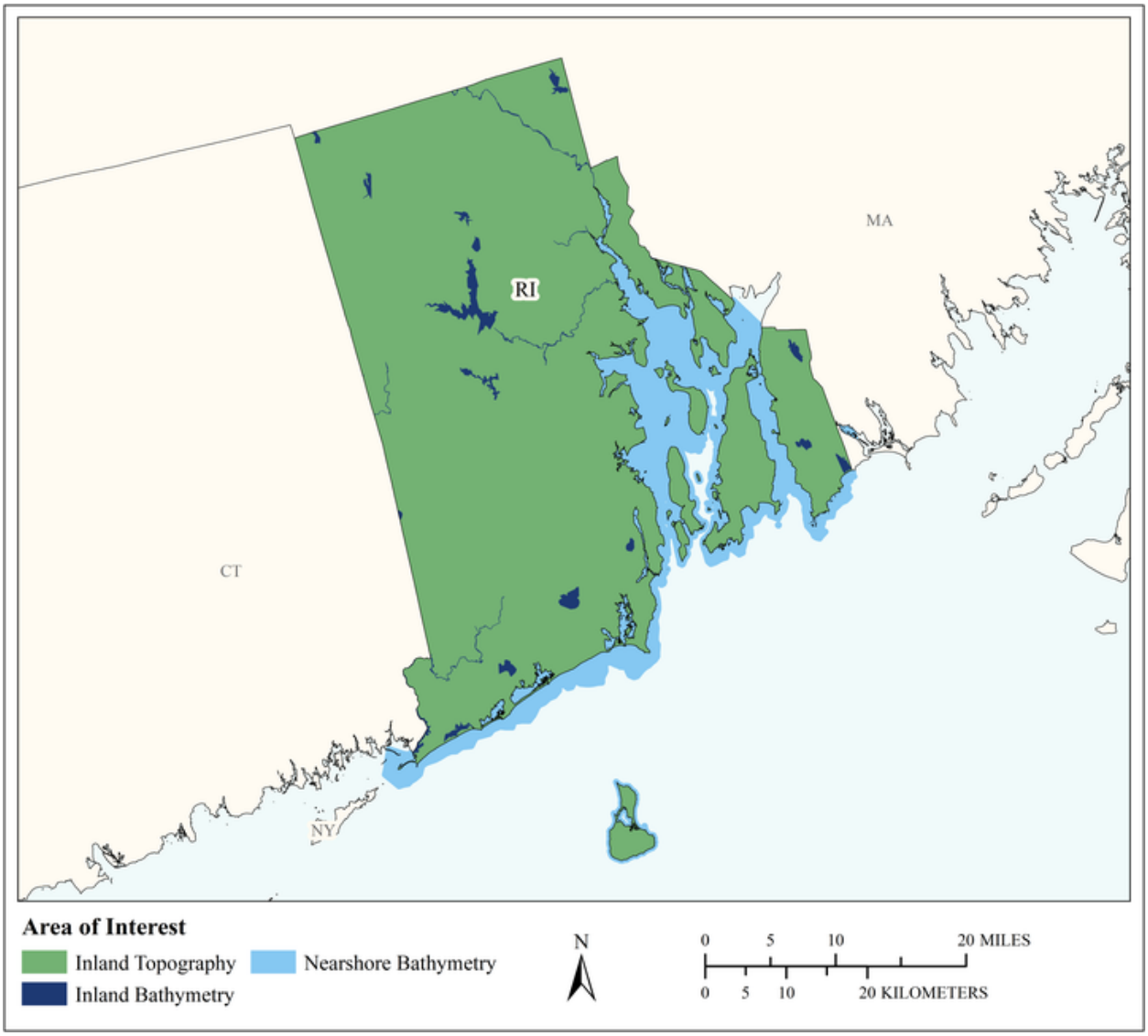
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Cost savings/cost reduction	Moderate	Minor	Moderate	
Cost avoidance	Moderate	Minor	Minor	
Increased revenues	Moderate	None	Minor	
Mission-driven performance improvements	Major	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor	Moderate	
Improved response or timeliness	Moderate	Minor	Moderate	
Improved customer experience	Moderate	Minor	Moderate	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	
Environmental	Major	Moderate	Moderate	
Public safety, including life and property	Major	Minor	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Minor	Unable to provide				
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Increased revenues	I don't know	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$4,291		Annual dollars saved/ realized	$25,974		Annual dollars saved/ realized	$5,971			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,149		Annual dollars saved/ realized	$2,714		Annual dollars saved/ realized	$9,837			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			Moderate			Moderate					
Environmental	Moderate			Major			Moderate					
Environmental description	Reduced water pollution from stormwater runoff											
Public safety, including life and property	I don't know			Moderate			Moderate					
Other												
Other benefits	Major											
Other description	Better management of forest habitat for rare or uncommon species											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes	Yes	
Hydrologic Flow Accumulation Grids		Yes	Yes	
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Riverine Ecosystem Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Stream channel analysis and mapping. Stream bank erosion analysis. Aquatic and terrestrial species habitat management. Environmental management.
MCA Title	Riverine Ecosystem Management
MCA ID	60370
Organization Type	State or U.S. Territorial government
Organization Name	State of Rhode Island
Sub-Agency or Division	Rhode Island Department of Environmental Management
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B	QL0B	
Update Frequency	6-10 years	4-5 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable		Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Required		Highly desirable	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Required	Required		Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	
DTM	Required	Highly desirable	Required	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Nice to have	Nice to have	
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Not required	Nice to have	
Full waveform	Nice to have	Nice to have	Highly desirable	
Bathymetric Attributed Grid (BAG)		Not required	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Nice to have	
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Highly desirable	Required	
Underwater videography			Not required	
Bottom texture			Highly desirable	
Bottom type			Required	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Nice to have	Nice to have	Not required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates	Nice to have	Nice to have	Highly desirable	
Land use/land cover	Highly desirable	Nice to have	Required	
Wetlands	Highly desirable	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have	Not required	
Cultural resources	Nice to have	Nice to have	Not required	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	
Cost savings/cost reduction	Moderate	Minor	Moderate	
Cost avoidance	Moderate	None	None	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	None	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Minor	

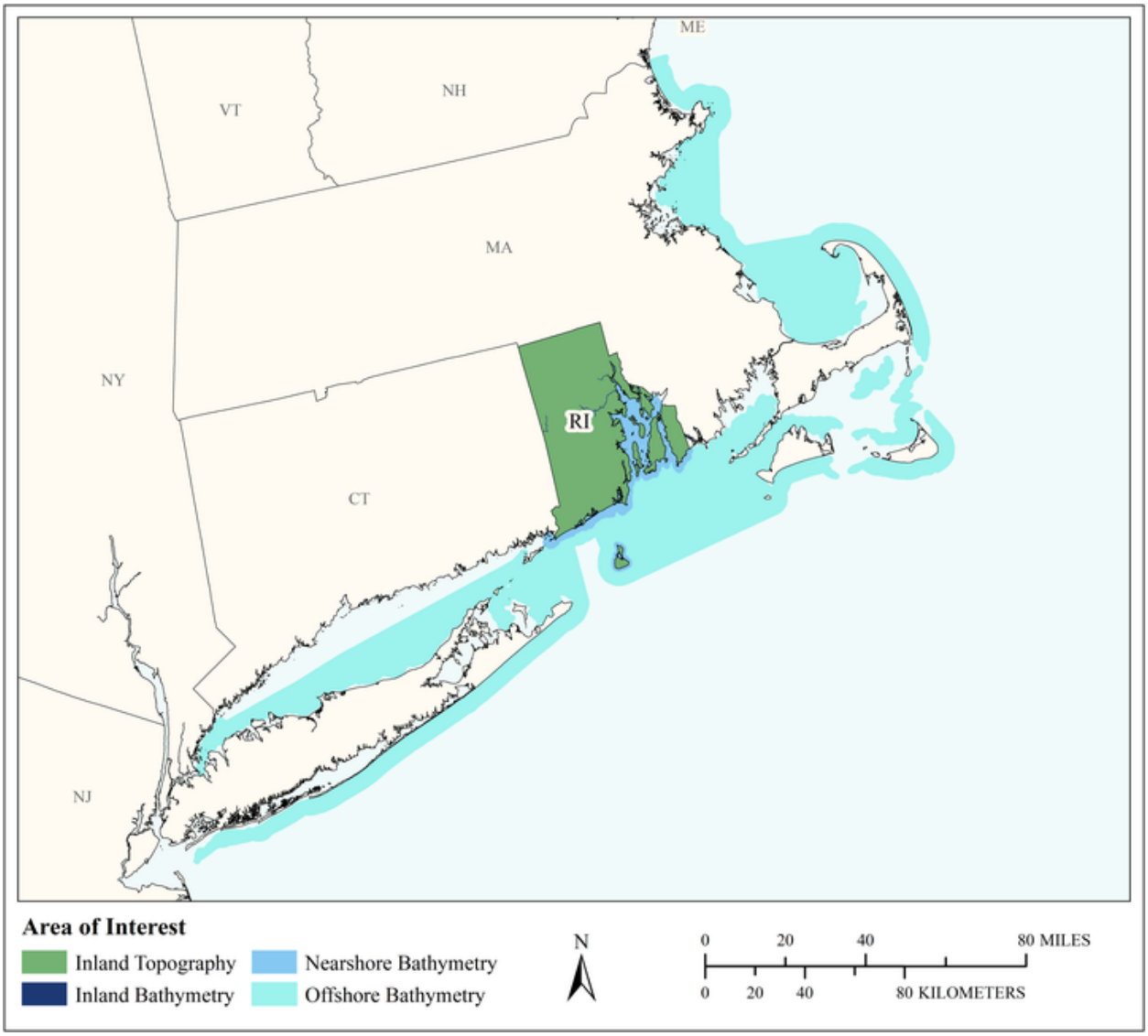
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Moderate	Minor	
Improved customer experience	Major	Minor	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Minor	
Environmental	Major	Major	Moderate	
Public safety, including life and property	Major	Moderate	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,657		Annual dollars saved/ realized	$882		Annual dollars saved/ realized	$18,110			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$165		Annual dollars saved/ realized	$62		Annual dollars saved/ realized	$13,839			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate					
Environmental	Major			Major			Moderate					
Public safety, including life and property	Major			Major			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps			Yes	
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints			Yes	
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Coastal Zone Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Custom description
Sub Area Requirements				Atlantic State waters of Rhode Island, Massachusetts, & New York and the waters between Block Island and Martha's Vineyard

MCA Description	Response
Mission Critical Activity	Coastal hazards mapping including shoreline change; inundation mapping/modeling for both current and future conditions; offshore bathymetric changes; land use changes. Bathymetry is needed for siting wind energy projects, monitoring sand movement in nearshore areas. Elevation data are needed for all Coastal Zone Management Program activities including planning and permitting, modeling and planning for sea level rise, monitoring erosion, and modeling storm surge. RI CRMC works with URI for SLOSH modeling and uses X-Beach for wave modeling. Inland bathymetry is needed for the coastal ponds and lagoons along the shoreline and to evaluate sea level rise impacts to inland flooding.
MCA Title	Coastal Zone Management
MCA ID	1311
Organization Type	State or U.S. Territorial government
Organization Name	RI Coastal Resources Management Council
Sub-Agency or Division	
Organization Mission	Coastal Zone Management to preserve, protect, develop, and where possible, restore the coastal resources of the state for this and succeeding generations through comprehensive and coordinated long-range planning and management designed to produce the maximum benefit for society from such coastal resources. We do permitting for construction within the coastal zone and planning for addressing specific coastal problems such as climate change impacts through Special Area Management Plans.
Program Name	Coastal Resources Management Program, Ocean Special Area Management Plan, Shoreline Change Special Area Management Plan, Salt Ponds Region Special Area Management Plan and Narrow River Special Area Management Plan
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 16 - Sea Level Rise and Subsidence
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Small features – 1 meter or smaller. Also significant changes in elevation or breaks in topography.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL0B	QL2B	Order 1b
Update Frequency	2-3 years and certain events.	4-5 years and certain events.	4-5 years and certain events.	6-10 years
Event type(s)	A significant flood	A significant flood, storm surge	Storm surge	
Quality Level and/or update frequency variability across AOI	Event driven data applied to areas impacted by event		More detail in rapidly changing areas such as tidal inlets and tidal deltas	
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm	Up to 20 cm	I don't know
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed	To MLLW		Below MLLW	
Tide correction requirement			MLLW	No requirement for tide correction
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable	Nice to have	Nice to have	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable	Nice to have	Nice to have	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Highly desirable	Nice to have	Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have	Required	Highly desirable
DTM	Highly desirable	Nice to have	Highly desirable	Highly desirable
DEM	Required	Highly desirable	Required	Highly desirable
Raw point cloud data	Highly desirable	Nice to have	Required	Nice to have
Classified point cloud	Required	Nice to have	Required	
Edited/cube XYZ		Nice to have	Required	Required
Full waveform	Highly desirable	Nice to have	Highly desirable	Highly desirable
Bathymetric Attributed Grid (BAG)		Nice to have	Required	Highly desirable

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Required	Nice to have
Tide Predictions			Required	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Required	Highly desirable
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Required	Required
Ground control/ground truthing	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Required
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Highly desirable
Underwater videography			Highly desirable	Highly desirable
Bottom texture			Highly desirable	Required
Bottom type			Required	Required
Submerged features			Required	Highly desirable
Subbottom characteristics			Required	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Highly desirable	Highly desirable
Water column properties - Physical			Highly desirable	Nice to have
Water column properties - Chemical			Highly desirable	Nice to have
Water column properties - Biological			Highly desirable	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Nice to have	Nice to have
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Highly desirable	Highly desirable
Routes			Highly desirable	Highly desirable
Offshore cadastral			Highly desirable	Highly desirable
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Estuaries			Required	Required
Inland surface water features	Nice to have	Highly desirable	Highly desirable	
Bridges/culverts	Highly desirable	Nice to have		
Landmark features	Nice to have	Nice to have	Highly desirable	
Cultural resources	Highly desirable	Nice to have	Highly desirable	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	2011 USGS ARRA Lidar for the North East - QL3 2014 NOAA NGS Coastal Mapping Program Post Sandy Topobathy LIDAR - QL1	Not sure of data that is currently being used	NOAA hydrographic soundings and multibeam surveys; 2007 2010 USACE coastal bathy lidar; 2014 Post Sandy NOAA topobathy	Program uses bathymetric data but I personally do not.
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes		Yes	Yes
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes	Yes	
State repositories used	RIGIS	RIGIS	RIGIS	
Data that meet my needs are not available				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	I don't know	None	I don't know
Cost savings/cost reduction	I don't know	I don't know	None	I don't know
Cost avoidance	I don't know	None	None	I don't know
Increased revenues	None	Moderate	Moderate	I don't know
Mission-driven performance improvements	Major	I don't know	Major	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate	Major	I don't know
Improved response or timeliness	Minor	I don't know	Major	I don't know
Improved customer experience	Moderate	I don't know	Major	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Major	I don't know
Environmental	Major	Moderate	Major	I don't know
Public safety, including life and property	Major	Moderate	Major	I don't know

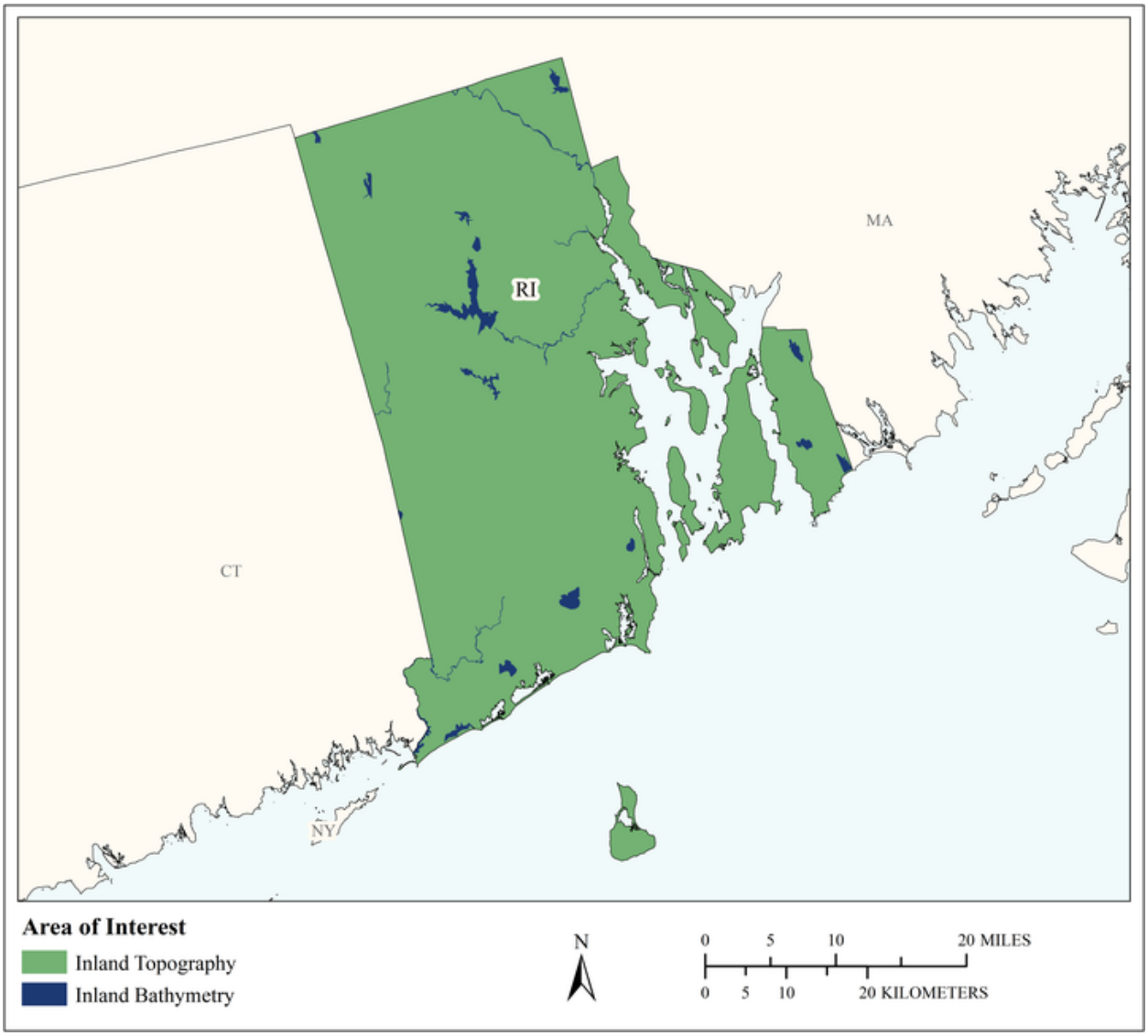
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide		Major	Annual dollars saved/realized	$4,824	Moderate	Unable to provide	
Time savings description	Possibly will be used in conjunction with field visits. Some datum conversion. Will require a risk assessment for future conditions for future coastal zone projects using tools derived from or having incorporated digital elevation products. One data set that was created using the elevation data will be used (STORMTOOLS, SLAMM, etc.). Use as preliminary data to characterize site before collecting onsite data.						Single source of data would save lots of time (one time savings). This may result but unable to quantify.					
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Cost savings/cost reduction description	Possibly used to supplement beach and dune design, could be very valuable after an event that alters the shoreline in order to determine pre-storm conditions. Probably would not be able to collect the data ourselves.											
Cost avoidance	I don't know	Unable to provide		Moderate	Unable to provide		Major	Annual dollars saved/realized	$20,000	Moderate	Unable to provide	
Cost avoidance description							One time savings realized for processing single dataset versus multiple sources. This may result but unable to quantify.					
Increased revenues	None			None			Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues description							Based on future project availability.					
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Other operational benefits				Moderate	Unable to provide							
Other operational benefits description				Better modeling impacts of sea level rise on riverine flooding.								
Future annual operational benefits added during validation		Annual dollars saved/ realized	$55,830		Annual dollars saved/ realized	$23,958		Annual dollars saved/ realized	$15,828		Annual dollars saved/ realized	$22,375
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Value added to products or services description	A good secondary source for shoreline delineation to complement other methods used.						Shoreline delineation - will likely combine with other methods.					
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness description	Use for hazard risk maps but not real time warnings.						Event driven data collection is very useful for post event recovery.					
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience description	Project and funding dependent.											
Other customer service benefits				Moderate	Unable to provide		Moderate	Unable to provide				

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Other customer service benefits description				Better risk maps.			Potential for better regional sediment management.					
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$9,760		Annual dollars saved/ realized	$14,045		Annual dollars saved/ realized	$68,600		Annual dollars saved/ realized	$4,467
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate			Major			Major		
Education or outreach description	Continual improvement of risk assessment tools						Answer based on improvements to existing bathymetric/topographic data products			Answer based on improvements to existing bathymetric/topographic data products		
Environmental	Major			I don't know			Moderate			Moderate		
Environmental description							Answer based on improvements to existing bathymetric/topographic data products			Answer based on improvements to existing bathymetric/topographic data products		
Public safety, including life and property	Major			I don't know			I don't know			I don't know		
Public safety, including life and property description							Likely a benefit but unknown how much			Likely a benefit but unknown how much		
Other				Modeling for inland flooding coupled with sea level rise								
Other benefits				I don't know								
Other description				I am not doing the modeling and have been unable to contact the person who will, so I am not sure what data parameters are needed								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes	Yes	Yes	Yes
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness		Yes	Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Forest Resources Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Forest health assessment. Determination of standing inventory of forest resources. Prescribed burn planning. Analysis of carbon stocks for trade. Harvest systems planning.
MCA Title	Forest Resources Management
MCA ID	60371
Organization Type	State or U.S. Territorial government
Organization Name	State of Rhode Island
Sub-Agency or Division	Rhode Island Department of Environmental Management
Organization Mission	
Program Name	Division of Forest Environment
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B		
Update Frequency	2-3 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Not required		
DTM	Required	Not required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Required	Highly desirable		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Required		
Land use/land cover	Required	Required		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Highly desirable	Required		
Landmark features	Nice to have	Nice to have		
Cultural resources	Highly desirable	Nice to have		
Coastal and riverine structures	Nice to have	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Major		
Increased revenues	Minor	Moderate		
Mission-driven performance improvements	Major	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		

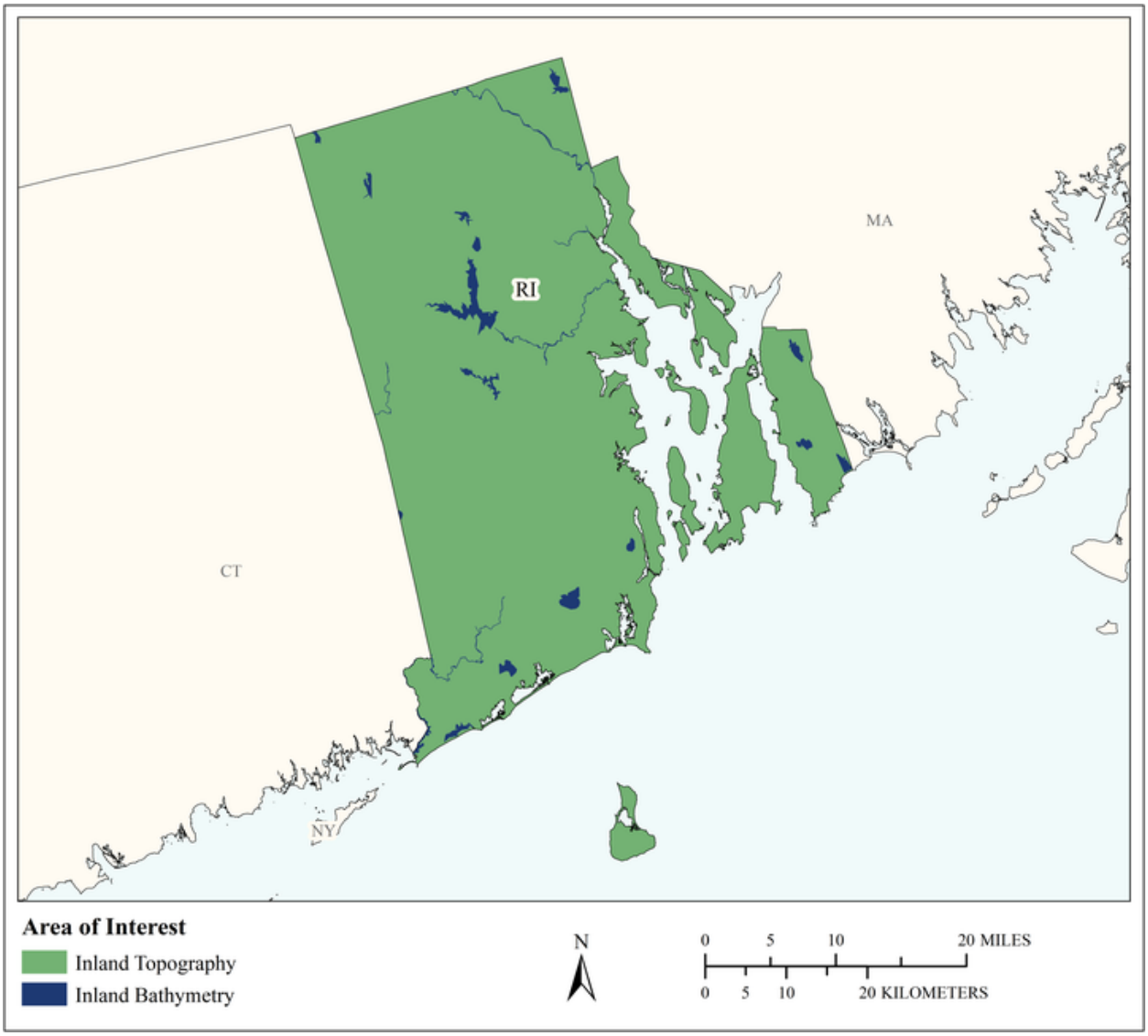
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major		
Improved customer experience	Moderate	Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Major		
Environmental	Major	Major		
Public safety, including life and property	Moderate	Major		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Major	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$4,281									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$6,206									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Major			Major								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes		
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Rangeland Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Assessment of rangeland health. Mapping for soil erosion potential due to grazing.
MCA Title	Rangeland Management
MCA ID	60372
Organization Type	State or U.S. Territorial government
Organization Name	State of Rhode Island
Sub-Agency or Division	Rhode Island Department of Environmental Management
Organization Mission	
Program Name	Agriculture
Total Annual Program Budget	
Primary Business Use	BU 05 - Rangeland Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	I don't know
Rivers and Streams	
Less than 10 ft	I don't know
10 - 50 ft	I don't know
51 - 100 ft	I don't know
101 - 500 ft	I don't know
501 - 2,500 ft	I don't know
Greater than 2,500 ft	I don't know
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	I don't know
½ - 1 acre	I don't know
1.1 – 2 acres	I don't know
2.1 – 5 acres	I don't know
5.1 – 10 acres	I don't know
Greater than 10 acres	I don't know

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	I don't know		
Update Frequency	Annually	I don't know		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	I don't know		
Acceptable Vertical Error	Up to 20 cm	I don't know		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					I don't know	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	I don't know			I don't know	
Entire AOI under same environmental conditions	Required	I don't know			I don't know	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	I don't know			I don't know	
DEM for entire AOI needs to be seamless	Highly desirable	I don't know			I don't know	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	I don't know		
DTM	Highly desirable	I don't know		
DEM	Highly desirable	I don't know		
Raw point cloud data	Nice to have	I don't know		
Classified point cloud	Nice to have	I don't know		
Edited/cube XYZ		I don't know		
Full waveform	Not required	I don't know		
Bathymetric Attributed Grid (BAG)		I don't know		
Breaklines required for standard hydro-flattening	Not required	I don't know		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	I don't know		
Ground control/ground truthing	Required	I don't know		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	I don't know		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	I don't know		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	I don't know		
Land use/land cover	Required	I don't know		
Wetlands	Required	I don't know		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	I don't know		
Bridges/culverts	Not required	I don't know		
Landmark features	Highly desirable	I don't know		
Cultural resources	Highly desirable	I don't know		
Coastal and riverine structures	Not required	I don't know		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None	I don't know		
Cost savings/cost reduction	None	I don't know		
Cost avoidance	None	I don't know		
Increased revenues	None	I don't know		
Mission-driven performance improvements	None	I don't know		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None	I don't know		

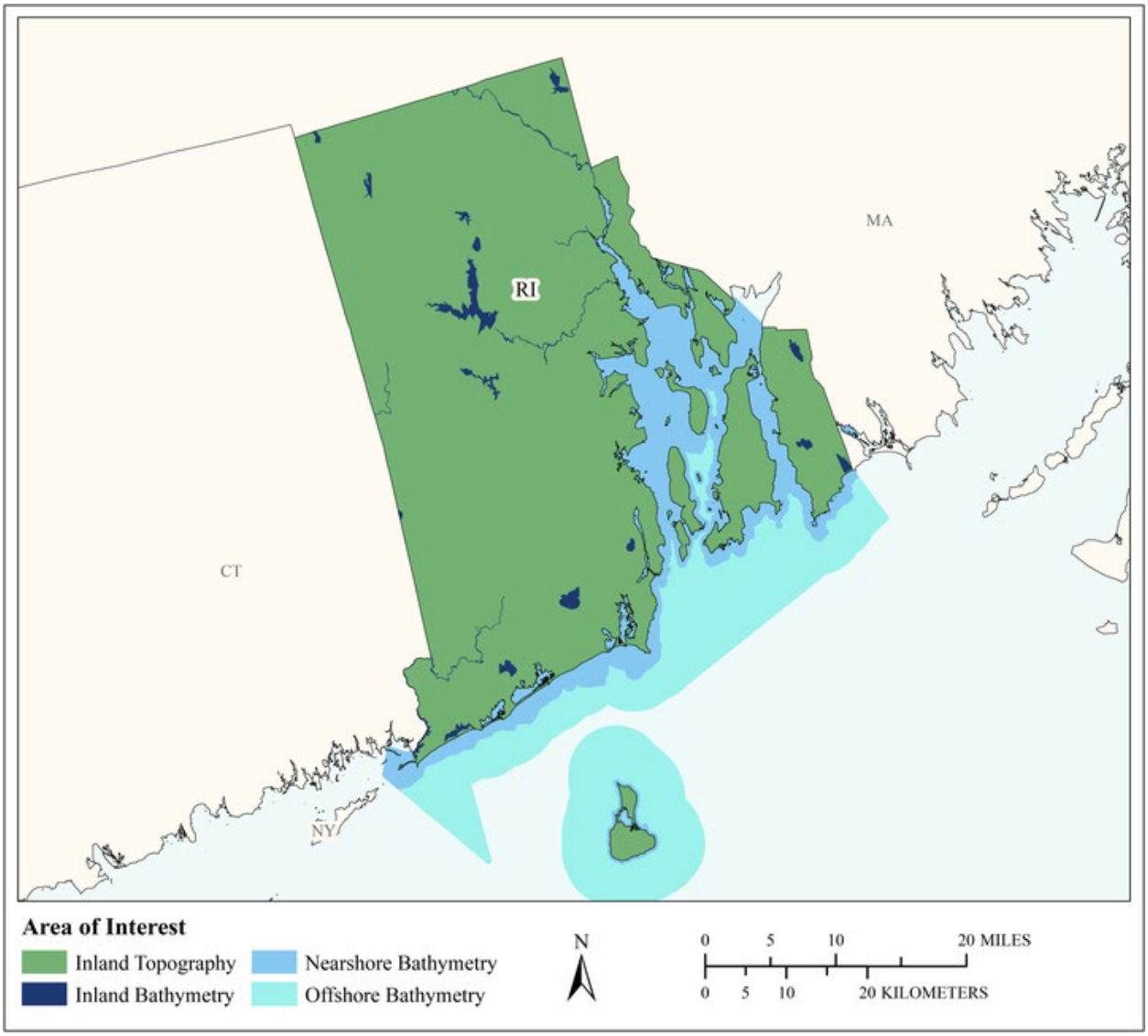
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	None	I don't know		
Improved customer experience	None	I don't know		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	I don't know		
Environmental	None	I don't know		
Public safety, including life and property	None	I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction	None			I don't know	Unable to provide							
Cost avoidance	Minor	Unable to provide		I don't know	Unable to provide							
Increased revenues	Moderate	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	Major	Unable to provide		I don't know	Unable to provide							
Improved customer experience	Minor	Unable to provide		I don't know	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			I don't know								
Environmental	Major			I don't know								
Public safety, including life and property	I don't know			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps	Yes	Yes		
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Natural Resources Conservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation engineering. Soils and wetlands mapping and characterization. Modeling of biological and ecological systems. Erosion control. Rainfall penetration studies, impervious surfaces. Assessment of blue carbon stocks. Rhode Island maps impervious surfaces on an 8-10 year cycle.
MCA Title	Natural Resources Conservation
MCA ID	60373
Organization Type	State or U.S. Territorial government
Organization Name	State of Rhode Island
Sub-Agency or Division	Rhode Island Department of Environmental Management
Organization Mission	
Program Name	Stormwater Management Program
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B	QL1B	Cross sections and/or transects meet needs
Update Frequency	4-5 years	6-10 years	6-10 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				Yes
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Highly desirable	Required	Required	Required	Required
Entire AOI under same environmental conditions	Required	Required	Required	Required	Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Required	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Required	Required	Required	Required
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Highly desirable	Required	Highly desirable
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Nice to have	Highly desirable
Ground control/ground truthing	Required	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Nice to have	Required
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Highly desirable
Underwater videography			Nice to have	Highly desirable
Bottom texture			Nice to have	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Highly desirable	Highly desirable
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Nice to have	Highly desirable
Habitat distribution and classification			Required	Highly desirable
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Highly desirable
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates	Highly desirable	Required	Highly desirable	
Land use/land cover	Required	Required	Highly desirable	Nice to have
Wetlands	Required	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Highly desirable
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Nice to have	Highly desirable	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	Major
Cost savings/cost reduction	Major	Major	Minor	Major
Cost avoidance	Major	Moderate	Minor	I don't know
Increased revenues	Minor	Minor	None	I don't know
Mission-driven performance improvements	Major	Major	Moderate	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Moderate	Major

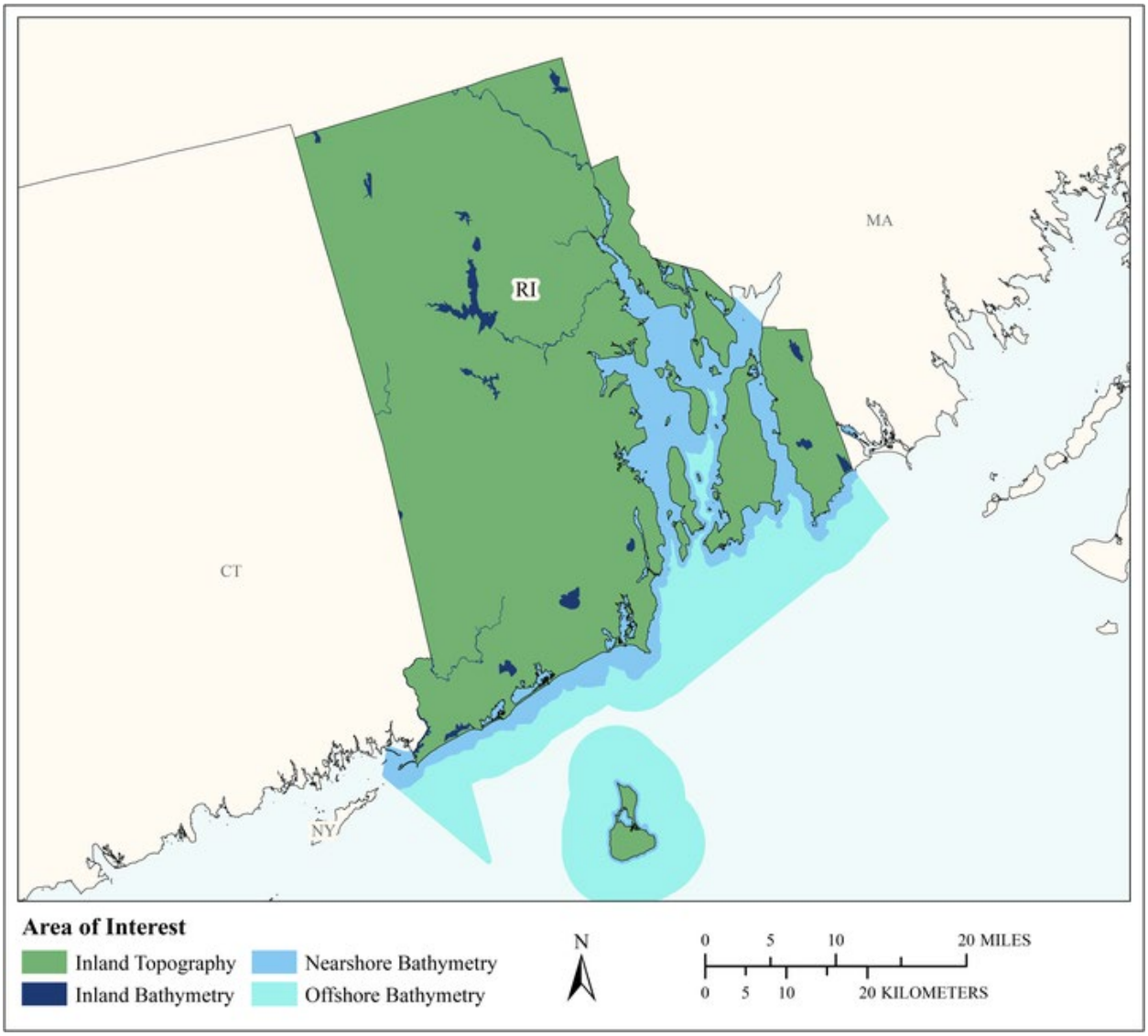
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major	Moderate	Major
Improved customer experience	Major	Moderate	Minor	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Moderate	Major
Environmental	Major	Major	Major	Major
Public safety, including life and property	Major	Moderate	Moderate	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		None			Moderate	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$42,474		Annual dollars saved/ realized	$5,756						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$155,978		Annual dollars saved/ realized	$259						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate			Moderate		
Environmental	Major			Major			Major			Major		
Public safety, including life and property	Major			Major			Moderate			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Wildlife and Habitat Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation planning for wildlife refuges and marine sanctuaries. Conservation of critical habitats. Management of diverse migratory bird habitats, coral reef and coral communities, marine mammals, protected fish species, and trust resources.
MCA Title	Wildlife and Habitat Management
MCA ID	60374
Organization Type	State or U.S. Territorial government
Organization Name	State of Rhode Island
Sub-Agency or Division	Rhode Island Department of Environmental Management
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B	QL0B	Special Order
Update Frequency	4-5 years	4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 2 meters	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DTM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Nice to have	Nice to have	Highly desirable
Classified point cloud	Highly desirable	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Highly desirable
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Highly desirable	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Not required	Nice to have
Lease areas			Not required	Nice to have
Fixed obstructions			Nice to have	Highly desirable
Floating observation/navigation systems			Nice to have	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Nice to have
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Highly desirable	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Nice to have	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Minor	Moderate
Cost savings/cost reduction	Major	Minor	Minor	Minor
Cost avoidance	Major	Minor	Moderate	Major
Increased revenues	None	Minor	None	None
Mission-driven performance improvements	Moderate	Moderate	Moderate	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate	Minor	Minor

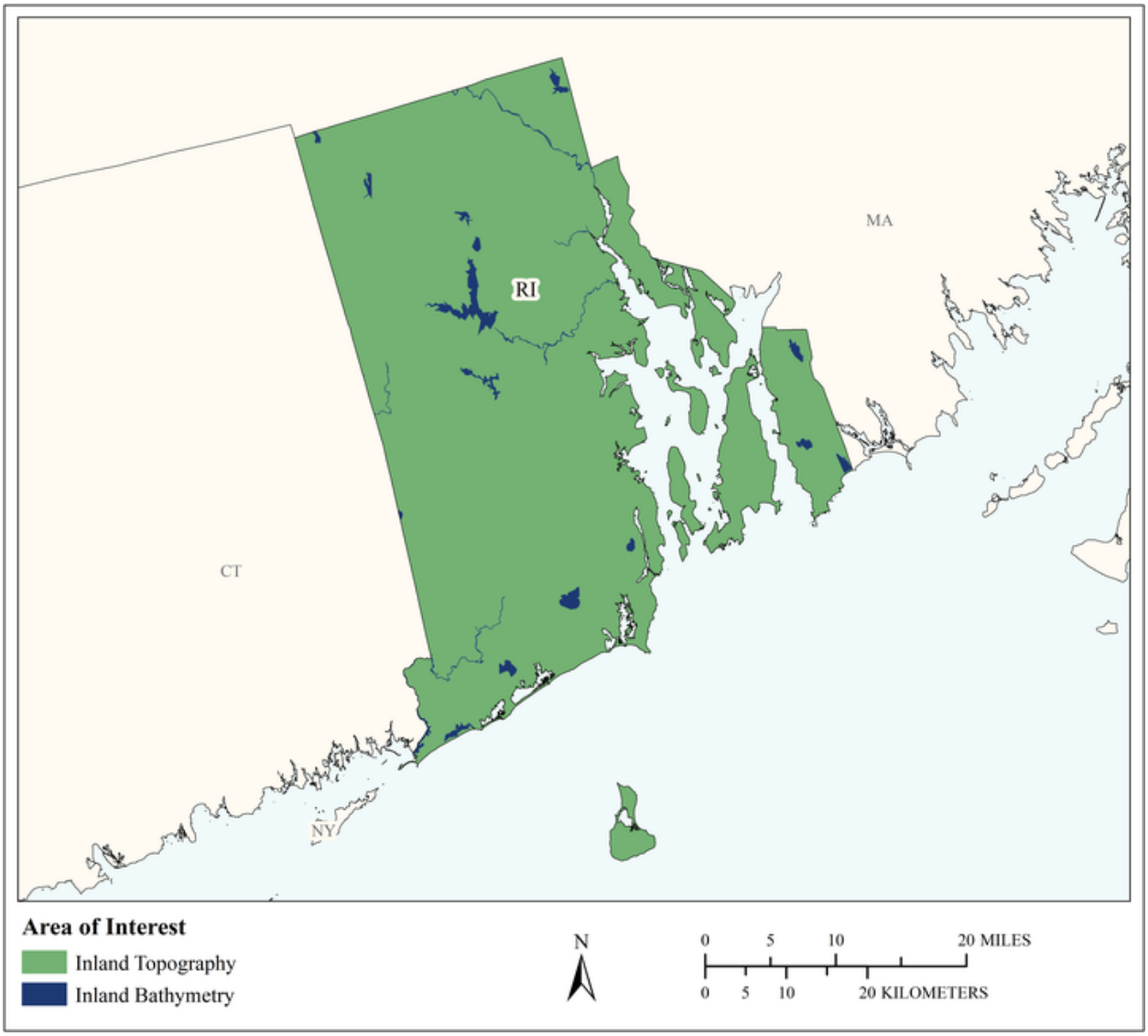
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Minor	Minor	Minor	Minor
Improved customer experience	Minor	Moderate	Minor	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Moderate	Minor	Minor
Environmental	Moderate	Moderate	Moderate	Major
Public safety, including life and property	Minor	Minor	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$257		Annual dollars saved/ realized	$2,067		Annual dollars saved/ realized	$179		Annual dollars saved/ realized	$281
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$745		Annual dollars saved/ realized	$1,249		Annual dollars saved/ realized	$10		Annual dollars saved/ realized	$19
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate			Moderate		
Environmental	Major			Moderate			Major			Major		
Public safety, including life and property	Moderate			Moderate			Moderate			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes			Yes
Curvature maps				
Cross sections	Yes			Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Agriculture and Precision Farming



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Farm pond design. Irrigation system design. Detailed site analysis to support precision farming. Analysis of farm sedimentation and runoff. Calibration of fertilizer application, fertilizer management, and irrigation planning. Optimized terraforming.
MCA Title	Agriculture and Precision Farming
MCA ID	60375
Organization Type	State or U.S. Territorial government
Organization Name	State of Rhode Island
Sub-Agency or Division	Rhode Island Department of Environmental Management
Organization Mission	
Program Name	Agriculture
Total Annual Program Budget	
Primary Business Use	BU 08 - Agriculture and Precision Farming
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Nice to have
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL4B		
Update Frequency	2-3 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 10 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 50 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required			Not required	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Not required	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Not required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level			Up to double the required TVU at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Nice to have	Nice to have		
Edited/cube XYZ		Highly desirable		
Full waveform	Nice to have	Highly desirable		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Required	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Highly desirable		
Land use/land cover	Highly desirable	Required		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Nice to have	Required		
Cultural resources	Nice to have	Highly desirable		
Coastal and riverine structures	Highly desirable	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	None		
Cost savings/cost reduction	Major	I don't know		
Cost avoidance	Major	Moderate		
Increased revenues	None	I don't know		
Mission-driven performance improvements	Moderate	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None		

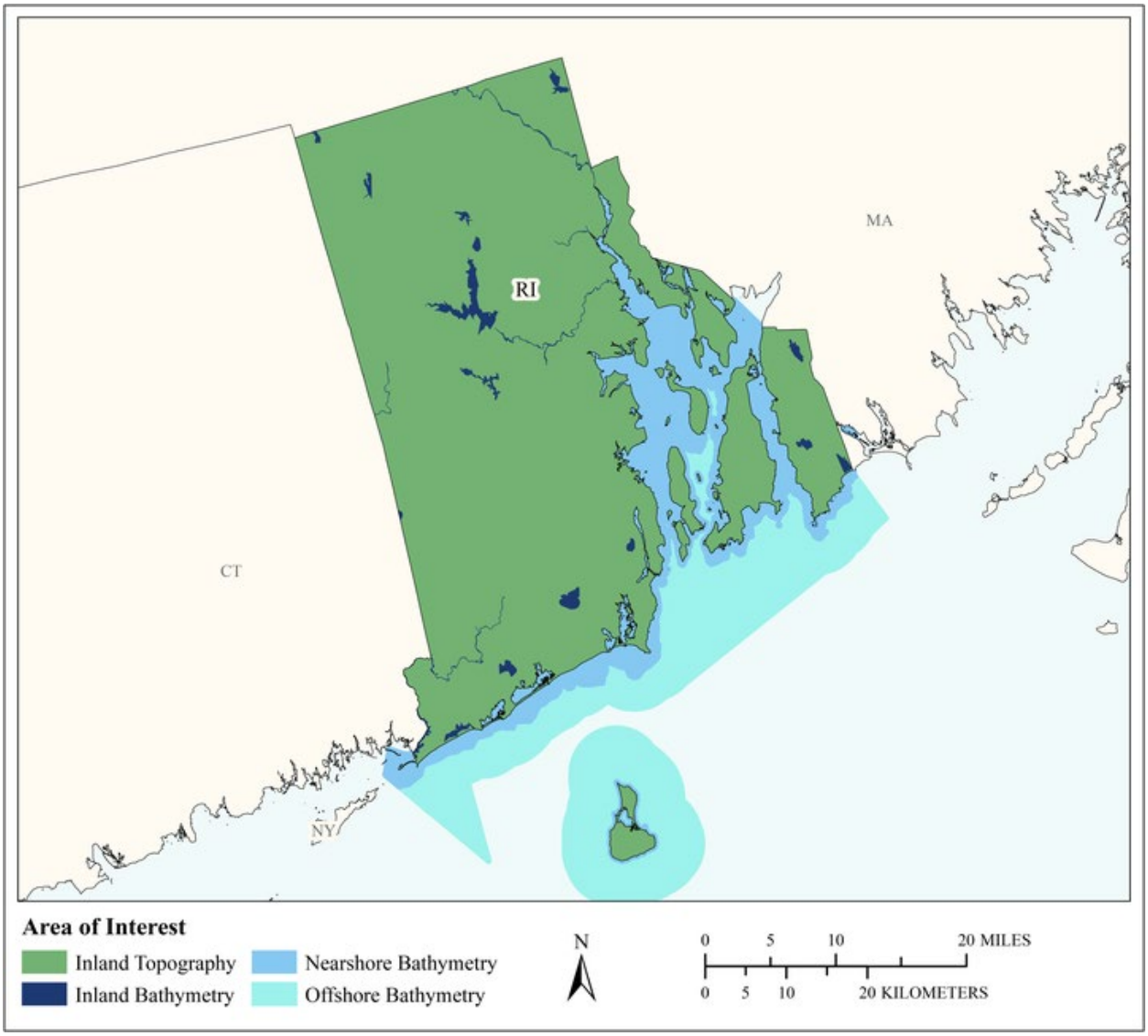
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	None		
Improved customer experience	Moderate	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	None		
Environmental	Major	I don't know		
Public safety, including life and property	Moderate	I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,253		Annual dollars saved/ realized	$2,196						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$993		Annual dollars saved/ realized	$993						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate								
Environmental	Major			Major								
Public safety, including life and property	Minor			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps				
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps		Yes		
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Fisheries Management and Aquaculture



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Management of fisheries. Sustainable aquaculture. Shellfish. Submerged aquatic vegetation mapping.
MCA Title	Fisheries Management and Aquaculture
MCA ID	60376
Organization Type	State or U.S. Territorial government
Organization Name	State of Rhode Island
Sub-Agency or Division	RI Coastal Resources Management Council
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B	QL0B	Special Order
Update Frequency	2-3 years	6-10 years	6-10 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Nice to have	Nice to have	Required	Nice to have
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Required	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Required
DTM	Required	Highly desirable	Highly desirable	Nice to have
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Nice to have	Highly desirable	Nice to have
Classified point cloud	Highly desirable	Nice to have	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Nice to have
Tide Predictions			Not required	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Highly desirable	Required
Ground control/ground truthing	Required	Highly desirable	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Nice to have	Required
Acoustic imagery of the seafloor			Highly desirable	Required
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Required
Underwater videography			Nice to have	Highly desirable
Bottom texture			Nice to have	Required
Bottom type			Highly desirable	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Highly desirable	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Required
Floating observation/navigation systems			Nice to have	Required
Shorelines – current, historic, change rates	Required	Highly desirable	Highly desirable	
Land use/land cover	Required	Highly desirable	Nice to have	Nice to have
Wetlands	Required	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Highly desirable
Inland surface water features	Required	Required	Nice to have	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Not required	
Coastal and riverine structures	Required	Highly desirable	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	Moderate
Cost savings/cost reduction	Major	Moderate	Major	Minor
Cost avoidance	Moderate	Moderate	Minor	Minor
Increased revenues	Moderate	Moderate	Minor	None
Mission-driven performance improvements	Major	Major	Moderate	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Minor	Moderate

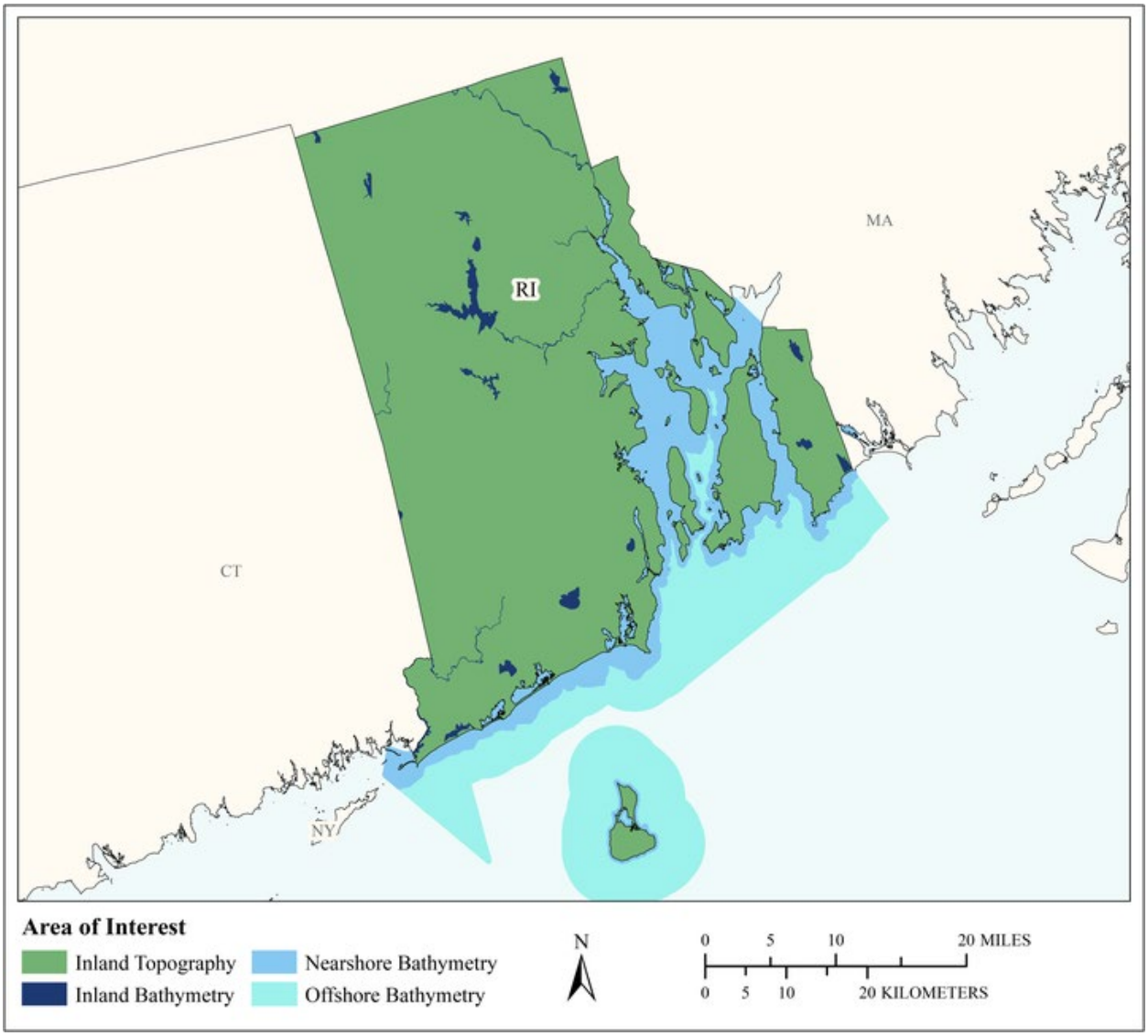
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major	Moderate	Minor
Improved customer experience	Moderate	Major	Minor	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Moderate	Moderate
Environmental	Major	Moderate	Moderate	Minor
Public safety, including life and property	Moderate	Minor	Minor	None

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		None		
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		None		
Increased revenues	Minor	Unable to provide		None			Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,106		Annual dollars saved/ realized	$2,166		Annual dollars saved/ realized	$28,444			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$2,404		Annual dollars saved/ realized	$986		Annual dollars saved/ realized	$2,088			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Moderate			Moderate		
Environmental	Moderate			Major			Major			Moderate		
Public safety, including life and property	Moderate			Moderate			Minor			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes		Yes	Yes
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic Assessment and Hazard Mitigation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Geologic mapping and analysis. Sinkhole and steephead mapping, monitoring, and analysis. Identification of geomorphologic units. Landslide hazard mapping and assessment. Karst mapping, including springs and caves. Aquifer recharge. Rhode Island monitors and analyzes geomorphology along its coastline.
MCA Title	Geologic Assessment and Hazard Mitigation
MCA ID	60377
Organization Type	State or U.S. Territorial government
Organization Name	State of Rhode Island
Sub-Agency or Division	RI Coastal Resources Management Council
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL1B	Special Order
Update Frequency	4-5 years	6-10 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable	Nice to have	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Required	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Required	Highly desirable	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Nice to have	Nice to have	Highly desirable
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Required	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Required	Highly desirable	Required
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Required	Required	Required	Required
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Highly desirable
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Nice to have	Highly desirable
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have	Highly desirable	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Minor	Moderate
Cost savings/cost reduction	Major	Minor	Minor	Minor
Cost avoidance	Major	Minor	Minor	Minor
Increased revenues	None	None	None	None
Mission-driven performance improvements	Major	Minor	Moderate	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Moderate	Major

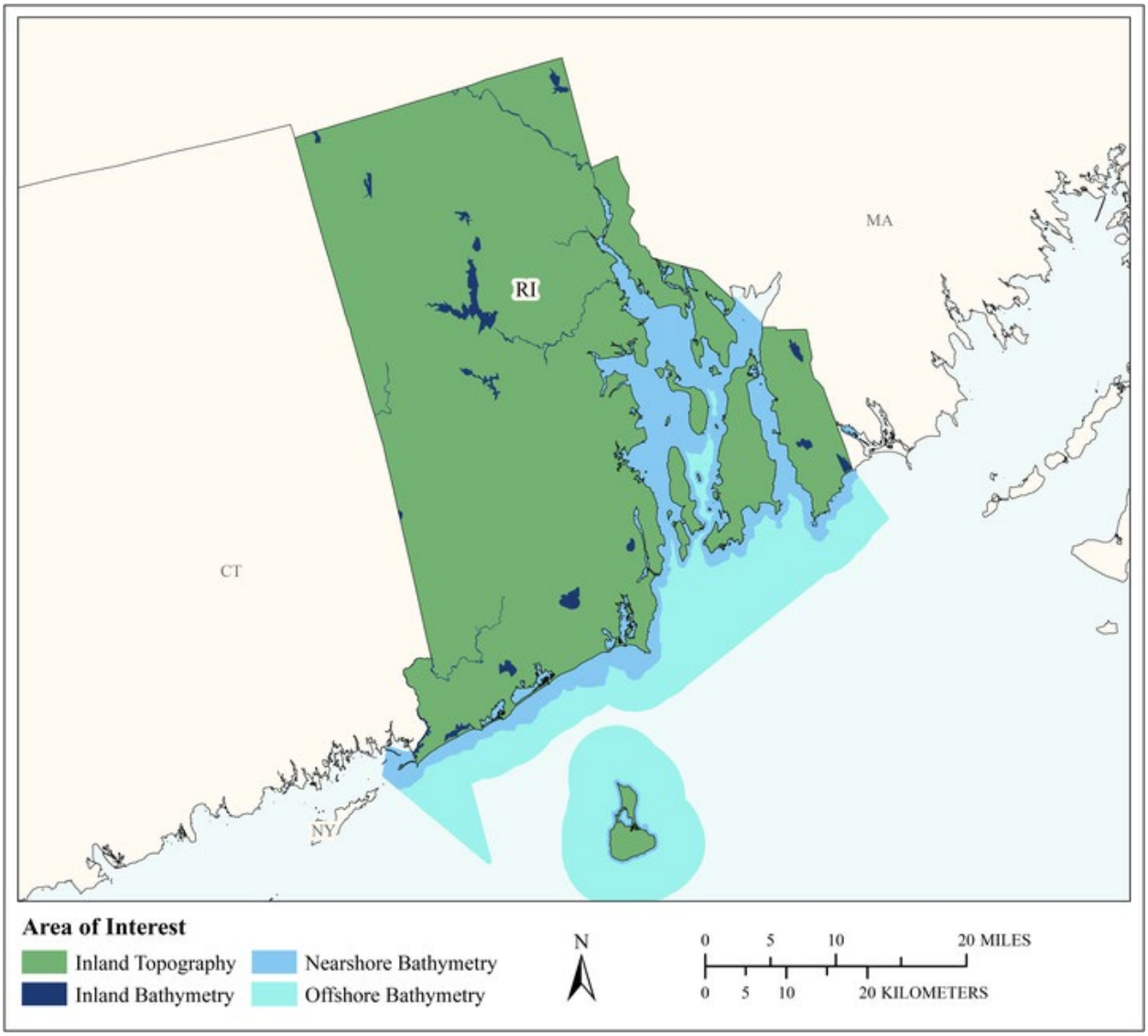
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	Moderate	Moderate
Improved customer experience	Major	Moderate	Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Moderate	Major
Environmental	Major	Moderate	Minor	Moderate
Public safety, including life and property	Major	Major	Major	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Cost avoidance	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		None			None			Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$228,588		Annual dollars saved/ realized	$3,025		Annual dollars saved/ realized	$13,964		Annual dollars saved/ realized	$426,879
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$4,012		Annual dollars saved/ realized	$3,324		Annual dollars saved/ realized	$22,468			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate			Major			Major		
Environmental	Major			Moderate			Moderate			Moderate		
Public safety, including life and property	Major			Major			Major			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic Resource Mining and Extraction



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	The University of Rhode Island maps submerged geologic bottom type using multi-beam instruments. Onshore or offshore mineral extraction. Monitoring sand as a local resource. Seabed resources. Open mine volume computations. Stockpile analysis. Environmental impact assessment and site restoration.
MCA Title	Geologic Resource Mining and Extraction
MCA ID	60378
Organization Type	State or U.S. Territorial government
Organization Name	State of Rhode Island
Sub-Agency or Division	University of Rhode Island
Organization Mission	
Program Name	Graduate School of Oceanography
Total Annual Program Budget	
Primary Business Use	BU 11 - Geologic Resource Mining and Extraction
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B	QL3B	Order 1b
Update Frequency	2-3 years	4-5 years	I don't know	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Nice to have	Nice to have	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Nice to have	Highly desirable	Highly desirable	Nice to have	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Nice to have	Highly desirable	Highly desirable	Nice to have	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Nice to have	Nice to have
DTM	Required	Highly desirable	Nice to have	Nice to have
DEM	Required	Highly desirable	Nice to have	Nice to have
Raw point cloud data	Nice to have	Highly desirable	Highly desirable	Highly desirable
Classified point cloud	Highly desirable	Nice to have	Nice to have	
Edited/cube XYZ		Not required	Not required	Not required
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Nice to have	Nice to have
Ground control/ground truthing	Nice to have	Highly desirable	Nice to have	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Highly desirable	Not required	Not required
Underwater videography			Not required	Not required
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Not required	Not required
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Not required	Not required
Tide/wave heights			Not required	Not required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Not required	Not required
Fixed obstructions			Not required	Not required
Floating observation/navigation systems			Not required	Not required
Shorelines – current, historic, change rates	Not required	Highly desirable	Nice to have	
Land use/land cover	Nice to have	Not required	Nice to have	Nice to have
Wetlands	Nice to have	Highly desirable	Not required	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Nice to have	Nice to have
Inland surface water features	Highly desirable	Nice to have	Nice to have	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Nice to have	Nice to have	Not required	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	I don't know	I don't know
Cost savings/cost reduction	Moderate	Moderate	I don't know	I don't know
Cost avoidance	Moderate	Moderate	I don't know	I don't know
Increased revenues	None	None	I don't know	I don't know
Mission-driven performance improvements	Moderate	Moderate	I don't know	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	None	I don't know	I don't know

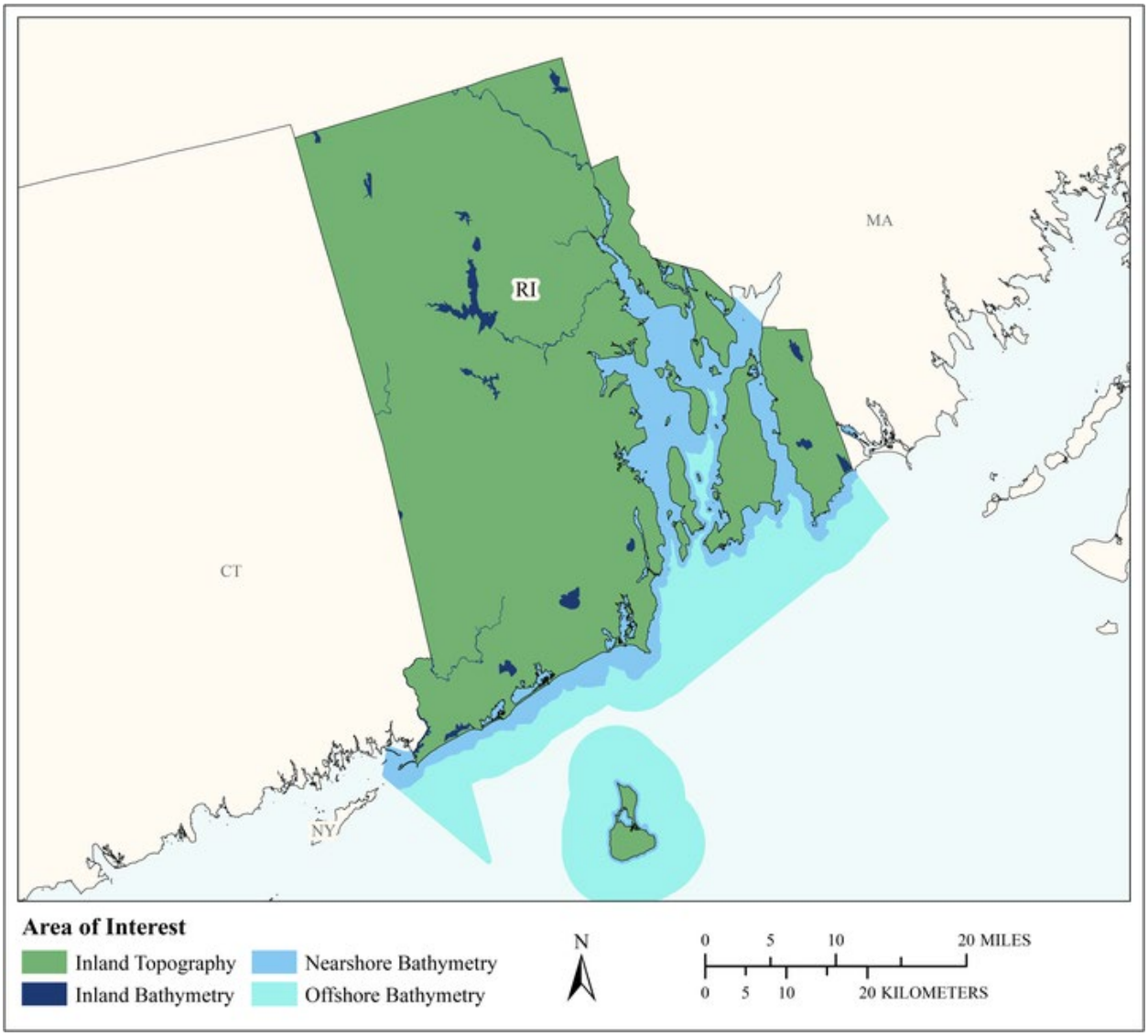
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	None	I don't know	I don't know
Improved customer experience	Moderate	None	I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	None	I don't know	I don't know
Environmental	Major	Minor	I don't know	I don't know
Public safety, including life and property	Moderate	None	I don't know	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Minor	Unable to provide		Minor	Unable to provide		None			I don't know	Unable to provide	
Cost avoidance	Minor	Unable to provide		Moderate	Unable to provide		None			I don't know	Unable to provide	
Increased revenues	None			None			None			I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide		None			I don't know	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$264									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide		None			None			I don't know	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$175		Annual dollars saved/ realized	$18						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			None			I don't know			I don't know		
Environmental	Major			Minor			Moderate			I don't know		
Public safety, including life and property	Major			Minor			I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Renewable Energy Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Alternate energy development – solar, tidal, wind, wave, and ocean current. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Low head power potential for hydropower.
MCA Title	Renewable Energy Resources
MCA ID	60379
Organization Type	State or U.S. Territorial government
Organization Name	State of Rhode Island
Sub-Agency or Division	Rhode Island Office of Energy Resources
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	I don't know
Rivers and Streams	
Less than 10 ft	I don't know
10 - 50 ft	I don't know
51 - 100 ft	I don't know
101 - 500 ft	I don't know
501 - 2,500 ft	I don't know
Greater than 2,500 ft	I don't know
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	I don't know
½ - 1 acre	I don't know
1.1 – 2 acres	I don't know
2.1 – 5 acres	I don't know

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	I don't know
Greater than 10 acres	I don't know

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	I don't know	I don't know	I don't know
Update Frequency	6-10 years	I don't know	I don't know	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	I don't know	I don't know	I don't know
Acceptable Vertical Error	Up to 20 cm	I don't know	I don't know	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					I don't know	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	I don't know	I don't know	I don't know	I don't know	I don't know
Entire AOI under same environmental conditions	Highly desirable	I don't know	I don't know	I don't know	I don't know	I don't know
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	I don't know	I don't know	I don't know	I don't know	I don't know
DEM for entire AOI needs to be seamless	Highly desirable	I don't know	I don't know	I don't know	I don't know	I don't know
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	I don't know	I don't know	I don't know
DTM	Required	I don't know	I don't know	I don't know
DEM	Required	I don't know	I don't know	I don't know
Raw point cloud data	Highly desirable	I don't know	I don't know	I don't know
Classified point cloud	Highly desirable	I don't know	I don't know	
Edited/cube XYZ		I don't know	I don't know	I don't know
Full waveform	Nice to have	I don't know	I don't know	I don't know
Bathymetric Attributed Grid (BAG)		I don't know	I don't know	I don't know
Breaklines required for standard hydro-flattening	Nice to have	I don't know		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			I don't know	I don't know
Tide Predictions			I don't know	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			I don't know	I don't know
Intensity imagery/sidescan imagery	Not required	I don't know	I don't know	I don't know
Ground control/ground truthing	Highly desirable	I don't know	I don't know	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			I don't know	I don't know
Nautical and/or navigation charts			I don't know	I don't know
Acoustic imagery of the seafloor			I don't know	I don't know
Aerial and/or satellite imagery	Highly desirable	I don't know	I don't know	I don't know
Underwater videography			I don't know	I don't know
Bottom texture			I don't know	I don't know
Bottom type			I don't know	I don't know
Submerged features			I don't know	I don't know
Subbottom characteristics			I don't know	I don't know
Geologic and seismic data	Not required	I don't know	I don't know	I don't know
Water column properties - Physical			I don't know	I don't know
Water column properties - Chemical			I don't know	I don't know
Water column properties - Biological			I don't know	I don't know
Currents			I don't know	I don't know
Tide/wave heights			I don't know	I don't know
Sea ice conditions			I don't know	I don't know
Habitat distribution and classification			I don't know	I don't know
Boundaries			I don't know	I don't know
Routes			I don't know	I don't know
Offshore cadastral			I don't know	I don't know
Lease areas			I don't know	I don't know
Fixed obstructions			I don't know	I don't know
Floating observation/navigation systems			I don't know	I don't know
Shorelines – current, historic, change rates	Nice to have	I don't know	I don't know	
Land use/land cover	Highly desirable	I don't know	I don't know	I don't know
Wetlands	Nice to have	I don't know	I don't know	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			I don't know	I don't know
Inland surface water features	Nice to have	I don't know	I don't know	
Bridges/culverts	Nice to have	I don't know		
Landmark features	Nice to have	I don't know	I don't know	
Cultural resources	Not required	I don't know	I don't know	
Coastal and riverine structures	Nice to have	I don't know	I don't know	
Overhead structures			I don't know	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	I don't know	I don't know	I don't know
Cost savings/cost reduction	Moderate	I don't know	I don't know	I don't know
Cost avoidance	Moderate	I don't know	I don't know	I don't know
Increased revenues	None	I don't know	I don't know	I don't know
Mission-driven performance improvements	Minor	I don't know	I don't know	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	I don't know	I don't know	I don't know

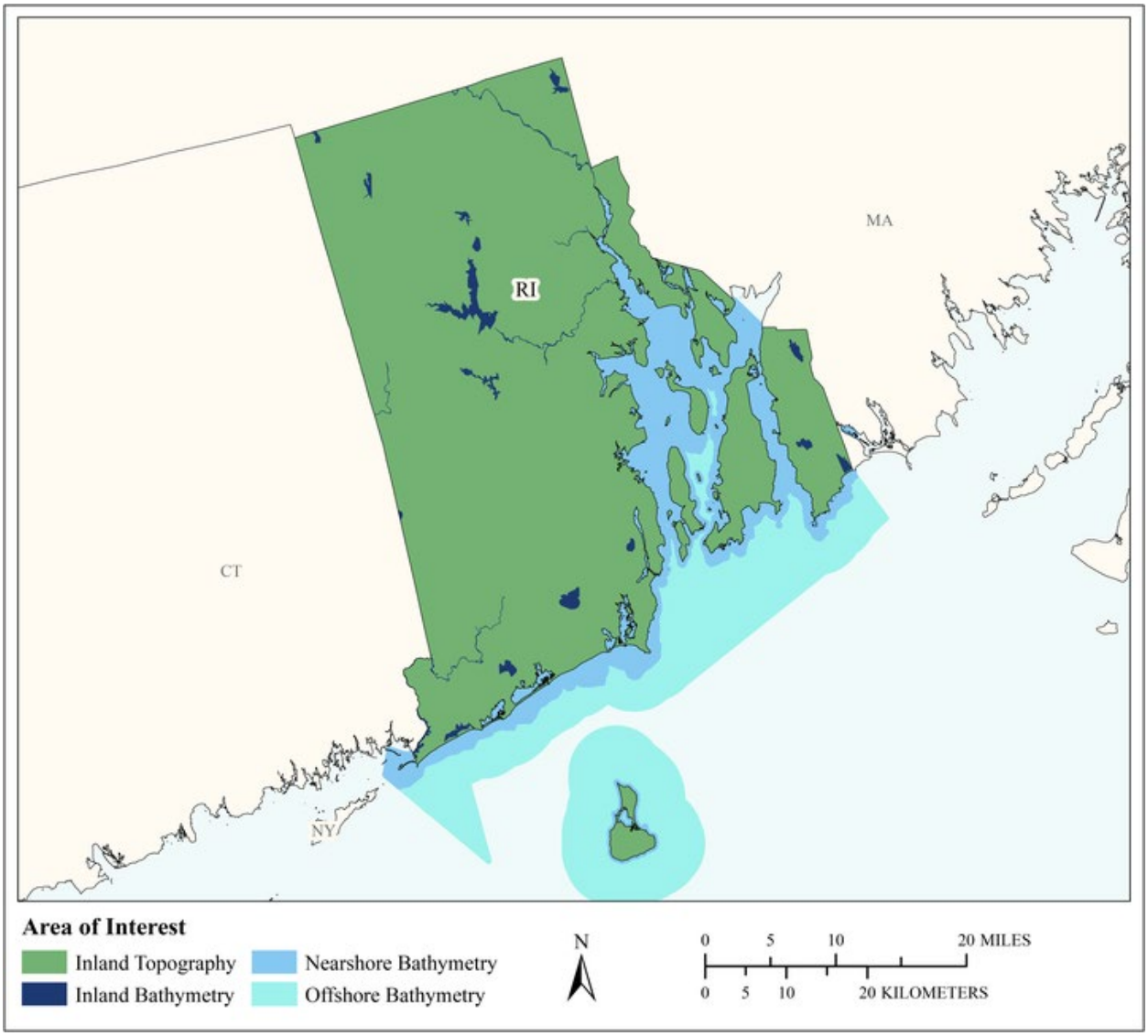
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Minor	I don't know	I don't know	I don't know
Improved customer experience	Minor	I don't know	I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	I don't know	I don't know	I don't know
Environmental	Minor	I don't know	I don't know	I don't know
Public safety, including life and property	Minor	I don't know	I don't know	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Minor	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			I don't know			I don't know			I don't know		
Environmental	Minor			I don't know			I don't know			I don't know		
Public safety, including life and property	None			I don't know			I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Oil and Gas Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Rhode Island has gas pipelines and gas is delivered through its shipping port. The state has performed impact assessments from oil spills. Oil and gas exploration and production. Pipeline and route selection. Facility siting to mitigate geologic hazards. Construction planning. Environmental impact assessment and mitigation. Regulatory compliance.
MCA Title	Oil and Gas Resources
MCA ID	60380
Organization Type	State or U.S. Territorial government
Organization Name	State of Rhode Island
Sub-Agency or Division	Rhode Island Department of Environmental Management
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 13 - Oil and Gas Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Nice to have

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B	QL2B	Order 1a
Update Frequency	Annually	2-3 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 5 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 40 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Required	Required	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Required	Required	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required	Nice to have	Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Required	Required	Required	Nice to have	Highly desirable	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Highly desirable	Required	Highly desirable
DEM	Required	Highly desirable	Required	Highly desirable
Raw point cloud data	Highly desirable	Nice to have	Required	Nice to have
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Not required	Nice to have	Nice to have
Full waveform	Nice to have	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Not required	Not required	Nice to have
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Nice to have
Ground control/ground truthing	Highly desirable	Nice to have	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	Highly desirable
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Underwater videography			Not required	Nice to have
Bottom texture			Nice to have	Nice to have
Bottom type			Nice to have	Nice to have
Submerged features			Required	Highly desirable
Subbottom characteristics			Not required	Nice to have
Geologic and seismic data	Highly desirable	Highly desirable	Nice to have	Highly desirable
Water column properties - Physical			Not required	Nice to have
Water column properties - Chemical			Not required	Nice to have
Water column properties - Biological			Not required	Nice to have
Currents			Not required	Nice to have
Tide/wave heights			Not required	Nice to have
Sea ice conditions			Nice to have	Highly desirable
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Highly desirable	Nice to have
Routes			Highly desirable	Highly desirable
Offshore cadastral			Nice to have	Highly desirable
Lease areas			Nice to have	Highly desirable
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Required	
Land use/land cover	Nice to have	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Highly desirable	Highly desirable	Highly desirable	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Nice to have	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	I don't know	I don't know	I don't know
Cost savings/cost reduction	Minor	I don't know	I don't know	I don't know
Cost avoidance	Minor	I don't know	I don't know	I don't know
Increased revenues	None	I don't know	I don't know	I don't know
Mission-driven performance improvements	Minor	I don't know	I don't know	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	I don't know	I don't know	I don't know

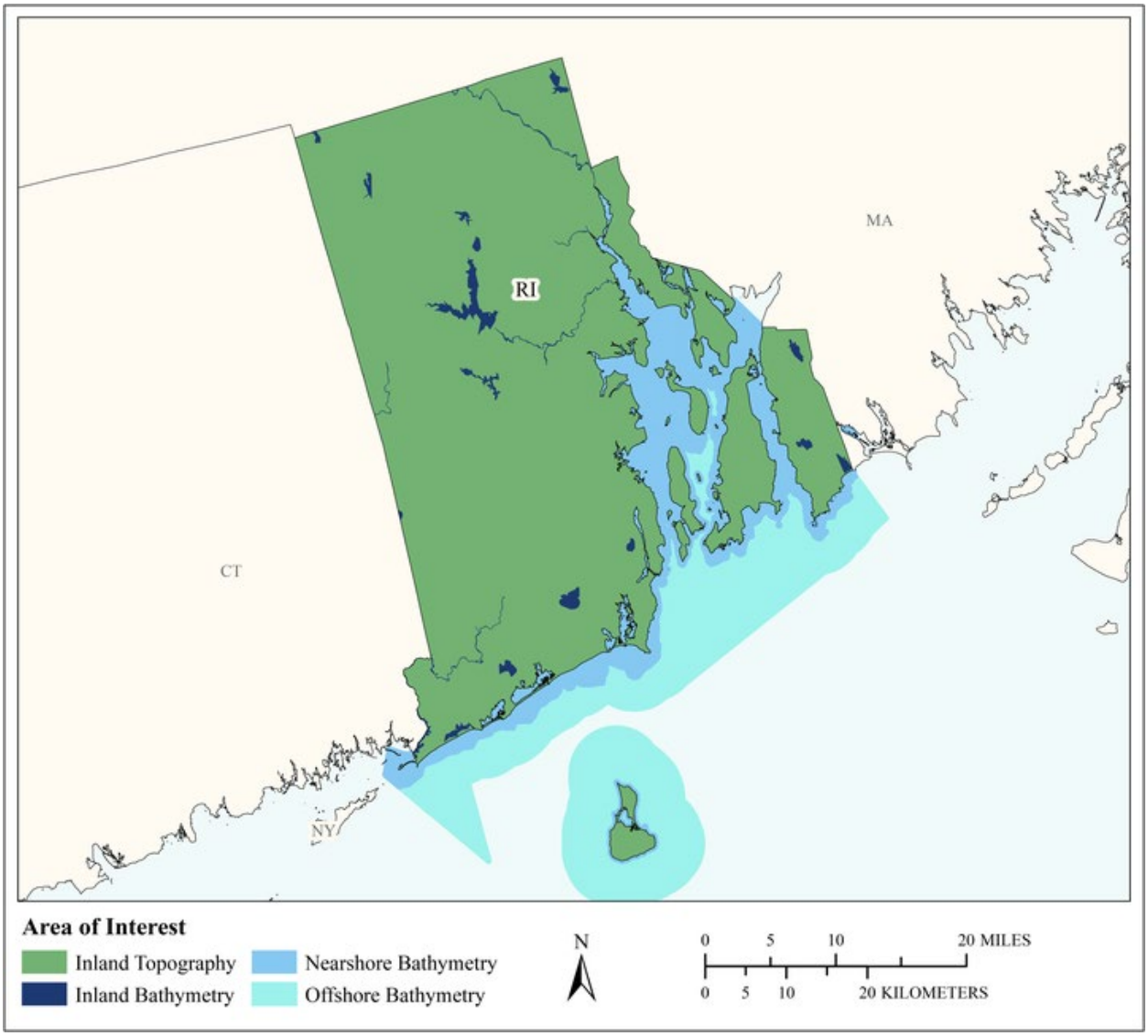
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	I don't know	I don't know	I don't know
Improved customer experience	Moderate	I don't know	I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	I don't know	I don't know	I don't know
Environmental	Minor	I don't know	I don't know	I don't know
Public safety, including life and property	Minor	I don't know	I don't know	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Moderate	Unable to provide		I don't know	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Increased revenues	None			I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$475					Annual dollars saved/ realized	$14,690			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			I don't know			Major			I don't know		
Environmental	Major			I don't know			Major			I don't know		
Public safety, including life and property	Major			I don't know			Major			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes		Yes	Yes
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids		Yes	Yes	
Hydrologic Flow Accumulation Grids		Yes	Yes	
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Cultural Resources Preservation and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Discovery and analysis of underwater archaeological and historical cultural sites. Site protection and preservation planning. Discovery and analysis of Native American and other historical cultural sites and subsistence activities.
MCA Title	Cultural Resources Preservation and Management
MCA ID	60381
Organization Type	State or U.S. Territorial government
Organization Name	State of Rhode Island
Sub-Agency or Division	University of Rhode Island
Organization Mission	
Program Name	Department of Marine Archaeology, Department of History
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	Order 1a
Update Frequency	4-5 years	6-10 years	4-5 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Not required	Nice to have	Nice to have	Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	Required
DTM	Required	Highly desirable	Nice to have	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Not required	Not required	Not required	Not required
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Not required	Nice to have
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Nice to have	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Highly desirable
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Nice to have	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Required
Nautical and/or navigation charts			Highly desirable	Required
Acoustic imagery of the seafloor			Highly desirable	Required
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Nice to have
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Required	Required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have	Highly desirable	Highly desirable	Highly desirable
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Highly desirable	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Highly desirable	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Required	Required
Floating observation/navigation systems			Highly desirable	Required
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Required	
Land use/land cover	Nice to have	Highly desirable	Nice to have	Highly desirable
Wetlands	Nice to have	Highly desirable	Nice to have	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Nice to have	Highly desirable	Nice to have	
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Nice to have	Highly desirable	Highly desirable	
Cultural resources	Required	Highly desirable	Required	
Coastal and riverine structures	Nice to have	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	Moderate
Cost savings/cost reduction	Moderate	Minor	Minor	Minor
Cost avoidance	Minor	Minor	Minor	Minor
Increased revenues	None	Minor	None	None
Mission-driven performance improvements	Moderate	Moderate	Minor	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor	None	Minor

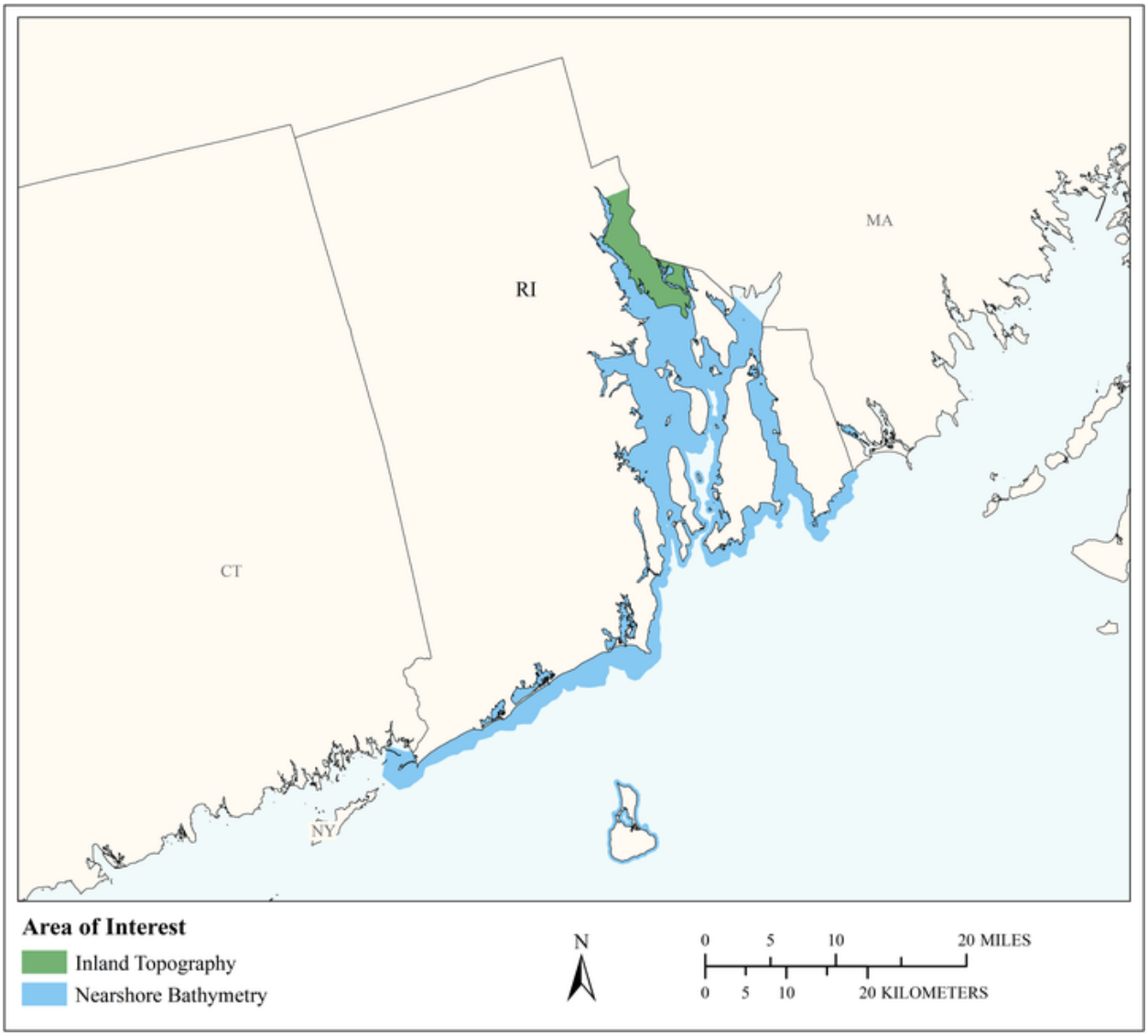
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major	Minor	Moderate
Improved customer experience	Moderate	Moderate	Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	Minor	Minor
Environmental	Minor	Moderate	Minor	Moderate
Public safety, including life and property	Minor	Moderate	None	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Increased revenues	None			None			None			None		
Mission-driven performance improvements	Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$198		Annual dollars saved/ realized	$475		Annual dollars saved/ realized	$518		Annual dollars saved/ realized	$693
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$173									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Moderate			Minor			Minor		
Environmental	Minor			Minor			Moderate			Moderate		
Public safety, including life and property	Minor			Minor			Minor			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				Yes

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Coastal and Riverine Flood Inundation Mapping



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	Custom description		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements	East Providence and Barrington, RI			

MCA Description	Response
Mission Critical Activity	Coastal and riverine flood inundation mapping.
MCA Title	Coastal and Riverine Flood Inundation Mapping
MCA ID	1251
Organization Type	Regional, County, City, or other local government
Organization Name	City of East Providence, RI
Sub-Agency or Division	
Organization Mission	The East Providence Emergency Management Agency (EMA), housed within the Planning Department, plans and prepares for natural and manmade disasters. The agency serves as the City's Floodplain Coordination Office, educates the public, coordinates evacuations and the opening of shelters, and provides meteorological support for the City. City EMA works closely with other local, state and federal agencies including the RI Department of Health, the RI Emergency Management Agency (RIEMA), and FEMA on emergency management initiatives.
Program Name	Floodplain Program
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 23 - Urban and Regional Planning
Tertiary Business Use	BU 03 - Coastal Zone Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Not required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	Neighborhood scale landscapes

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2		I don't know	
Update Frequency	6-10 years		Event driven only – Data need to coincide with a specific event.	
Event type(s)			A flood, hurricane, or other disaster event.	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter		I don't know	
Acceptable Vertical Error	Up to 30 cm		I don't know	
How far onshore needed			>1 kilometer inland	
How far down the beach profile needed	To MHW		To MHW	
Tide correction requirement			MHW	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Not required
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have		Nice to have			Nice to have
Entire AOI under same environmental conditions	Highly desirable		Not required			Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable		Nice to have			Nice to have
DEM for entire AOI needs to be seamless	Highly desirable		Nice to have			Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required		Nice to have	
DTM	Required		Nice to have	
DEM	Highly desirable		Nice to have	
Raw point cloud data	Nice to have		Nice to have	
Classified point cloud	Nice to have		Not required	
Edited/cube XYZ			Not required	
Full waveform	Nice to have		Not required	
Bathymetric Attributed Grid (BAG)			Not required	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Not required		Nice to have	
Ground control/ground truthing	Nice to have		Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Highly desirable		Highly desirable	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Not required	
Submerged features			Highly desirable	
Subbottom characteristics			Not required	
Geologic and seismic data	Not required		Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Highly desirable	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Not required	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have		Highly desirable	
Land use/land cover	Highly desirable		Required	
Wetlands	Highly desirable		Required	
Estuaries			Nice to have	
Inland surface water features	Required		Required	
Bridges/culverts	Highly desirable			
Landmark features	Nice to have		Highly desirable	
Cultural resources	Nice to have		Nice to have	
Coastal and riverine structures	Highly desirable		Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Currently not using 3D topographic data; using 2-foot LIDAR contours.		None	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Rhode Island GIS Server at the URI Environmental Data Center.			
Data that meet my needs are not available				

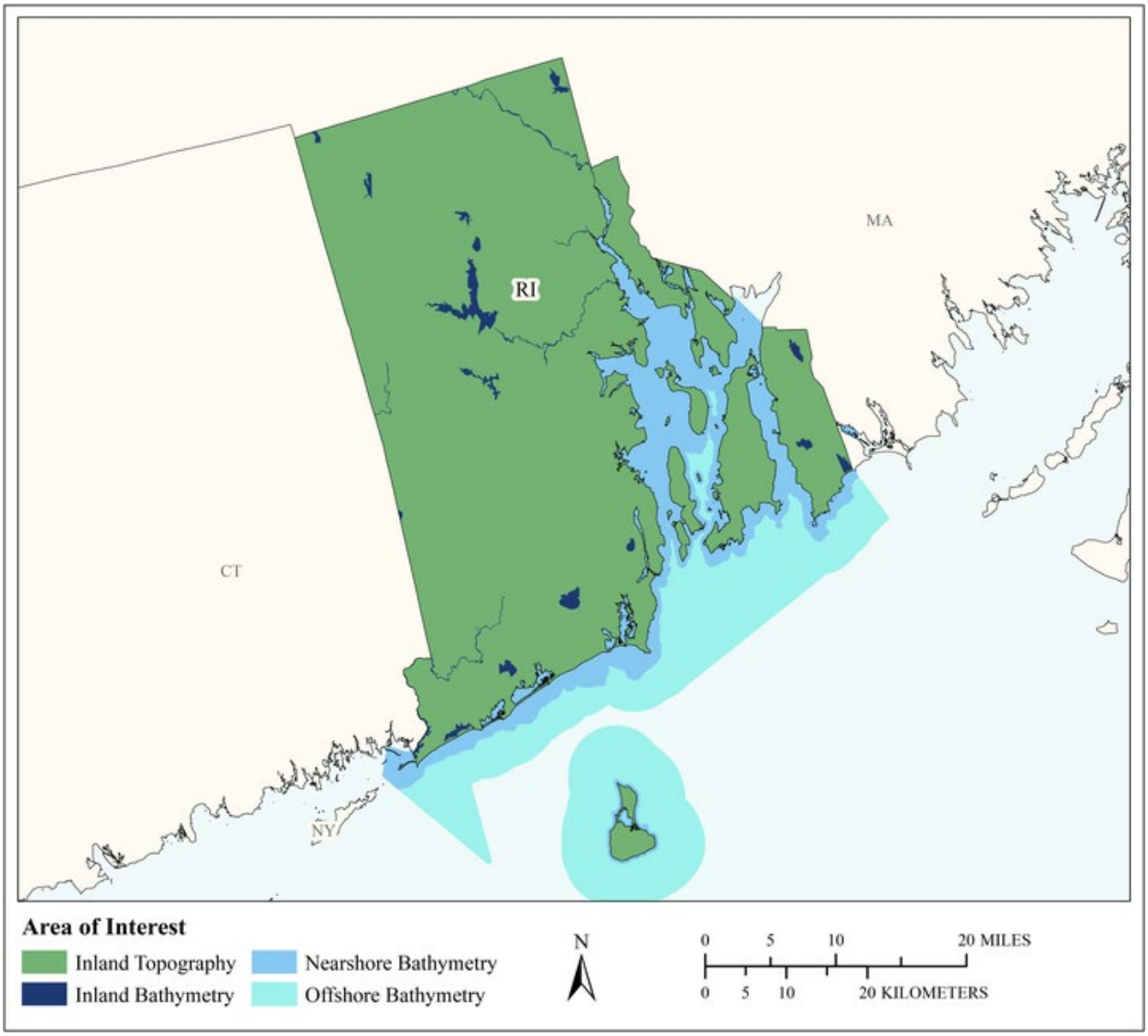
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know		I don't know	
Cost savings/cost reduction	I don't know		I don't know	
Cost avoidance	I don't know		I don't know	
Increased revenues	I don't know		I don't know	
Mission-driven performance improvements	I don't know		I don't know	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know		I don't know	
Improved response or timeliness	I don't know		I don't know	
Improved customer experience	I don't know		I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know		I don't know	
Environmental	I don't know		I don't know	
Public safety, including life and property	I don't know		I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$1,809				I don't know	Unable to provide				
Time savings description	Dependent on frequency of flood threats or actual floods. Dependent on frequency of actual floods. Single site data source would be a notable time saver.						Have not used bathymetric data, not sure of specific benefits.					
Cost savings/cost reduction	Minor	Unable to provide					I don't know	Unable to provide				
Cost savings/cost reduction description	Staff time saved by having one efficient data source.											
Cost avoidance	Minor	Unable to provide					Minor	Unable to provide				
Cost avoidance description	Staff time saved by having one efficient data source.											
Increased revenues	None						I don't know	Unable to provide				
Mission-driven performance improvements	Moderate	Unable to provide					I don't know	Unable to provide				
Mission-driven performance improvements description	More accurate and timely flood notifications can be issued with accurate single-source data.											
Other operational benefits							Minor	Unable to provide				
Other operational benefits description												
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide					Minor	Unable to provide				
Value added to products or services description	Flood extent prediction, land development review.											
Improved response or timeliness	Moderate	Unable to provide					Minor	Unable to provide				
Improved response or timeliness description	Hopefully would aid in more accurate flood maps. Flood and storm surge forecasts would be more timely and accurate. Significant aid in the event of evacuations being needed. May or may not realize this benefit.						Don't know but assume there will be same benefit.					
Improved customer experience	Moderate	Unable to provide					I don't know	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate						Minor					
Environmental	Minor						I don't know					
Public safety, including life and property	Moderate						Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids			Yes	
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes		Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Flood Risk Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Flood risk modeling and mapping of riverine and coastal areas. Dam/dike/levee safety analysis. Emergency management. Flood forecasts.
MCA Title	Flood Risk Management
MCA ID	60382
Organization Type	State or U.S. Territorial government
Organization Name	State of Rhode Island
Sub-Agency or Division	Rhode Island Emergency Management Agency
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL2B	Special Order
Update Frequency	4-5 years	4-5 years	4-5 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Required	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable	Required	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Required	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Required	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	Nice to have
Classified point cloud	Required	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Highly desirable
Ground control/ground truthing	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Highly desirable
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Nice to have	Highly desirable
Submerged features			Nice to have	Highly desirable
Subbottom characteristics			Not required	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Not required	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Not required	Nice to have
Water column properties - Biological			Not required	Nice to have
Currents			Nice to have	Highly desirable
Tide/wave heights			Highly desirable	Required
Sea ice conditions			Not required	Nice to have
Habitat distribution and classification			Nice to have	Required
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Not required	Nice to have
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Nice to have
Wetlands	Highly desirable	Highly desirable	Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Required
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Minor	Minor
Cost savings/cost reduction	Major	Minor	Minor	Minor
Cost avoidance	Major	Moderate	Minor	Moderate
Increased revenues	Minor	Minor	None	Minor
Mission-driven performance improvements	Major	Minor	Minor	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Minor	Moderate

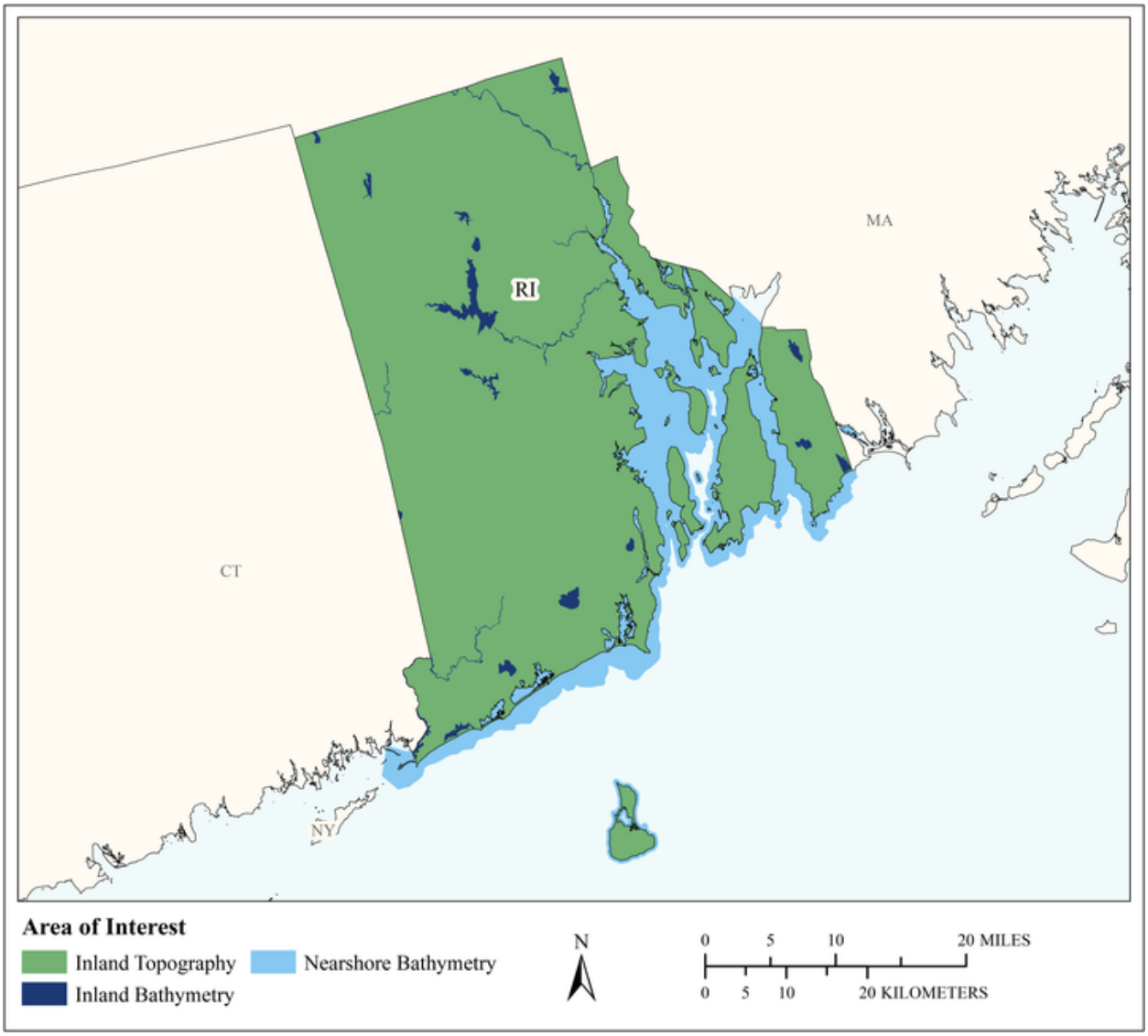
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	Minor	Major
Improved customer experience	Major	Moderate	Minor	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor	Minor	Minor
Environmental	Major	Moderate	Moderate	Moderate
Public safety, including life and property	Major	Moderate	Minor	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		None			Minor	Unable to provide		Moderate	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$152,044		Annual dollars saved/ realized	$10,562		Annual dollars saved/ realized	$34,280			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$26,603		Annual dollars saved/ realized	$11,858		Annual dollars saved/ realized	$25,406			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate			Major			Major		
Environmental	Moderate			Moderate			Moderate			Major		
Public safety, including life and property	Major			Major			Major			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			Yes
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		Yes
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Sea Level Rise and Subsidence



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Modeling and mapping the effects of sea level rise or subsidence. Population and economic vulnerability assessments. Coastal inundation and infrastructure assessment.
MCA Title	Sea Level Rise and Subsidence
MCA ID	60383
Organization Type	State or U.S. Territorial government
Organization Name	State of Rhode Island
Sub-Agency or Division	Rhode Island Geological Survey
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 16 - Sea Level Rise and Subsidence
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL1B	QL2B	
Update Frequency	4-5 years	4-5 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Required	Required		Highly desirable	Required
Entire AOI under same environmental conditions	Highly desirable	Required	Required		Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Required		Highly desirable	Required
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have	Highly desirable	
DTM	Required	Required	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Highly desirable	Nice to have	
Classified point cloud	Required	Nice to have	Highly desirable	
Edited/cube XYZ		Not required	Not required	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Not required	Not required	
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Highly desirable	
Ground control/ground truthing	Required	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Required	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Required	Required	Highly desirable	
Wetlands	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Required	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes	Yes	Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Major	
Cost savings/cost reduction	Major	Major	Major	
Cost avoidance	Major	Major	Major	
Increased revenues	None	Minor	Minor	
Mission-driven performance improvements	Major	Major	Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	

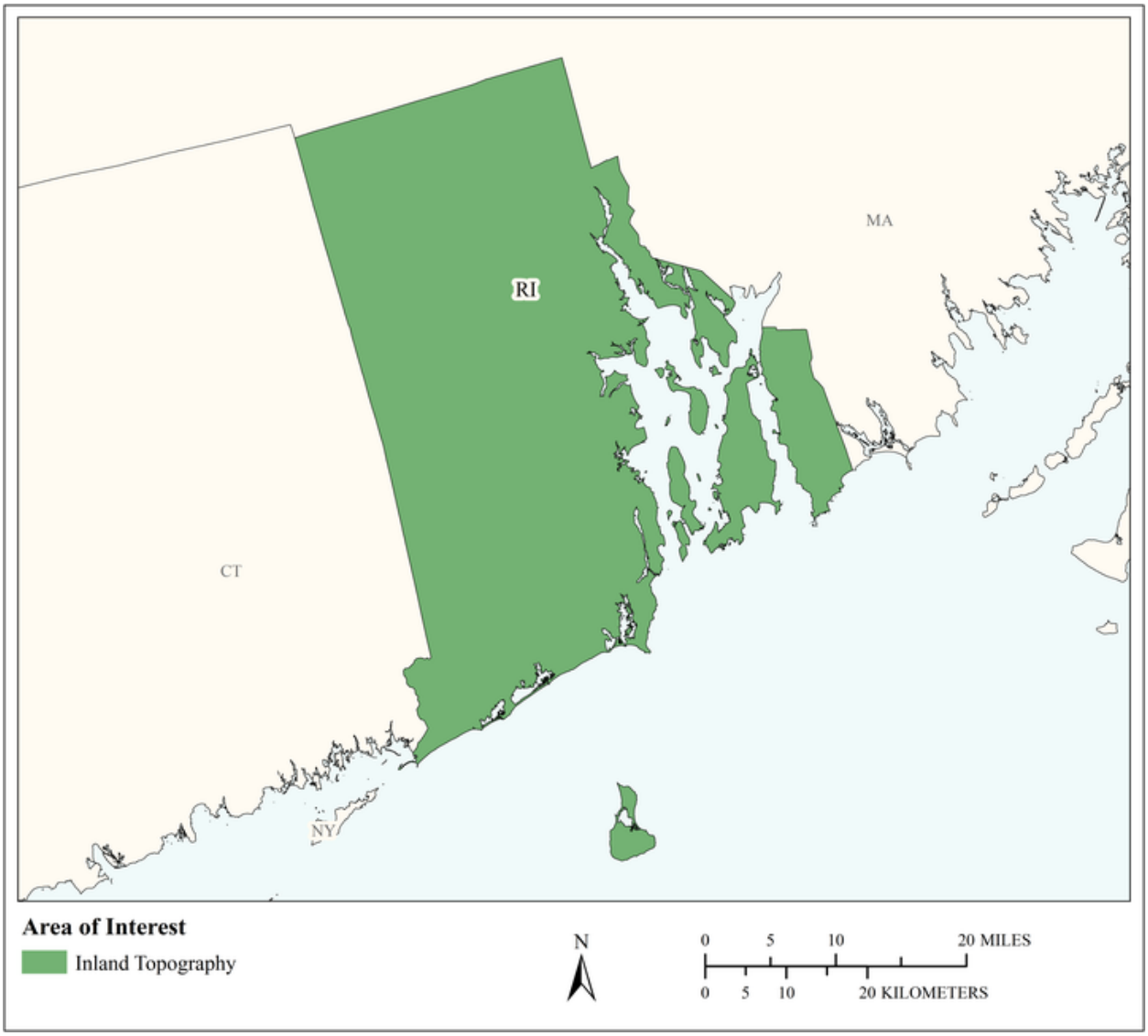
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Minor	Major	
Improved customer experience	Moderate	Moderate	Major	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Major	
Environmental	Moderate	Moderate	Major	
Public safety, including life and property	Major	Moderate	Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Increased revenues	Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$57,011									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Major					
Environmental	Moderate			Major			Major					
Public safety, including life and property	Moderate			Major			Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Wildfire Management, Planning, and Response



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of forest fuel and fire susceptibility. Fire behavior modeling to support wildfire suppression activities. Wildland/urban interface building identification. Post fire analysis to determine landslide prone areas.
MCA Title	Wildfire Management, Planning, and Response
MCA ID	60384
Organization Type	State or U.S. Territorial government
Organization Name	State of Rhode Island
Sub-Agency or Division	Rhode Island Department of Environmental Management
Organization Mission	
Program Name	Division of Forest Environment
Total Annual Program Budget	
Primary Business Use	BU 17 - Wildfire Management, Planning, and Response
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

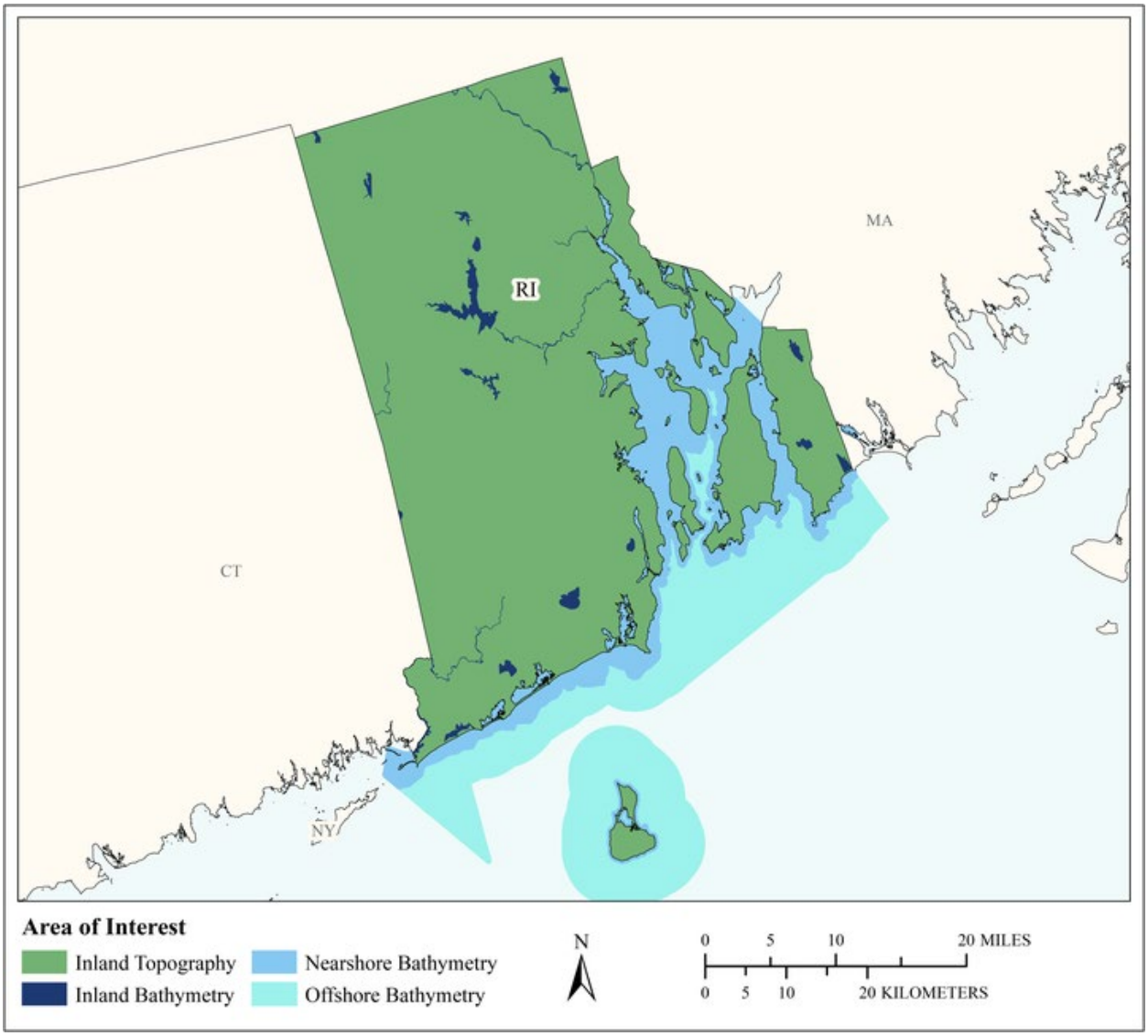
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$5,818									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Homeland Security, Law Enforcement, Disaster Response, and Emergency Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Scientific support for environmental emergency response. Infrastructure and border protection. Coastal search and rescue. Population dynamics. Emergency fuel supply and movement. Line of sight analysis in urban areas. Disaster response. Flood risk analysis resulting from acts of terrorism.
MCA Title	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
MCA ID	60385
Organization Type	State or U.S. Territorial government
Organization Name	State of Rhode Island
Sub-Agency or Division	Rhode Island Emergency Management Agency
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable

Inland Bathy Feature Size Requirements	Response
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B	QL1B	Order 2
Update Frequency	4-5 years	4-5 years	6-10 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 20 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Up to 2 meters
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable	Highly desirable	Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Required	Required
DTM	Required	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Nice to have	Highly desirable	Highly desirable	Required
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Highly desirable	Highly desirable	Highly desirable
Full waveform	Nice to have	Nice to have	Highly desirable	Highly desirable
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Highly desirable
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Nice to have	Highly desirable
Bottom texture			Nice to have	Highly desirable
Bottom type			Nice to have	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Highly desirable	Highly desirable
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Highly desirable	Required
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Nice to have	Nice to have
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Highly desirable	Highly desirable
Routes			Highly desirable	Highly desirable
Offshore cadastral			Nice to have	Highly desirable
Lease areas			Nice to have	Highly desirable
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Required
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	Major
Cost savings/cost reduction	Major	Major	Major	Major
Cost avoidance	Major	Moderate	Moderate	Major
Increased revenues	None	None	None	Major
Mission-driven performance improvements	Major	Moderate	Moderate	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Minor	Major

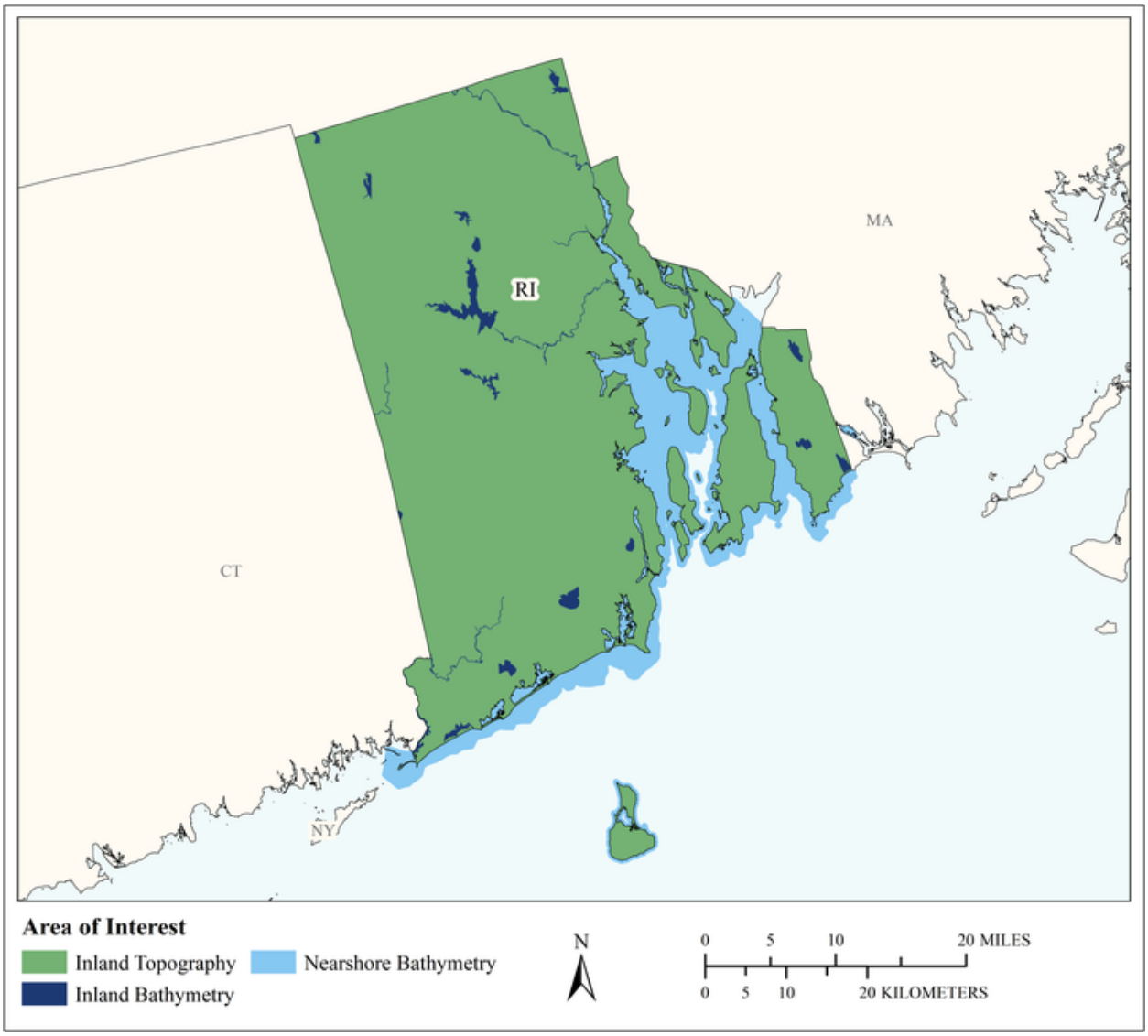
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major	Minor	Major
Improved customer experience	Major	Moderate	Minor	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	Minor	Major
Environmental	Minor	Moderate	Minor	Major
Public safety, including life and property	Major	Major	Moderate	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$31,945		Annual dollars saved/ realized	$8,996		Annual dollars saved/ realized	$1,667			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$564		Annual dollars saved/ realized	$574		Annual dollars saved/ realized	$47			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate			Major		
Environmental	Moderate			Moderate			Moderate			Major		
Public safety, including life and property	Major			Major			Major			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes		Yes
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Land Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Cut and fill analysis. Road, bridge, and culvert planning and design. Road and railroad route selection and maintenance. Slope analysis for autonomous cars. GPS navigation visualization.
MCA Title	Land Navigation and Safety
MCA ID	60386
Organization Type	State or U.S. Territorial government
Organization Name	State of Rhode Island
Sub-Agency or Division	Rhode Island Department of Transportation
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 19 - Land Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL0B	QL0B	
Update Frequency	2-3 years	2-3 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable		Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Highly desirable	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	
Classified point cloud	Highly desirable	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Highly desirable	
Full waveform	Nice to have	Nice to have	Highly desirable	
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	
Ground control/ground truthing	Required	Required	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Highly desirable	Highly desirable	Highly desirable	
Water column properties - Physical			Highly desirable	
Water column properties - Chemical			Highly desirable	
Water column properties - Biological			Highly desirable	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Highly desirable	
Boundaries			Highly desirable	
Routes			Highly desirable	
Offshore cadastral			Highly desirable	
Lease areas			Highly desirable	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Nice to have	Required	Highly desirable	
Land use/land cover	Highly desirable	Required	Highly desirable	
Wetlands	Required	Required	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Highly desirable	Highly desirable	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Minor	
Cost savings/cost reduction	Major	Minor	Minor	
Cost avoidance	Moderate	Minor	Minor	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	None	

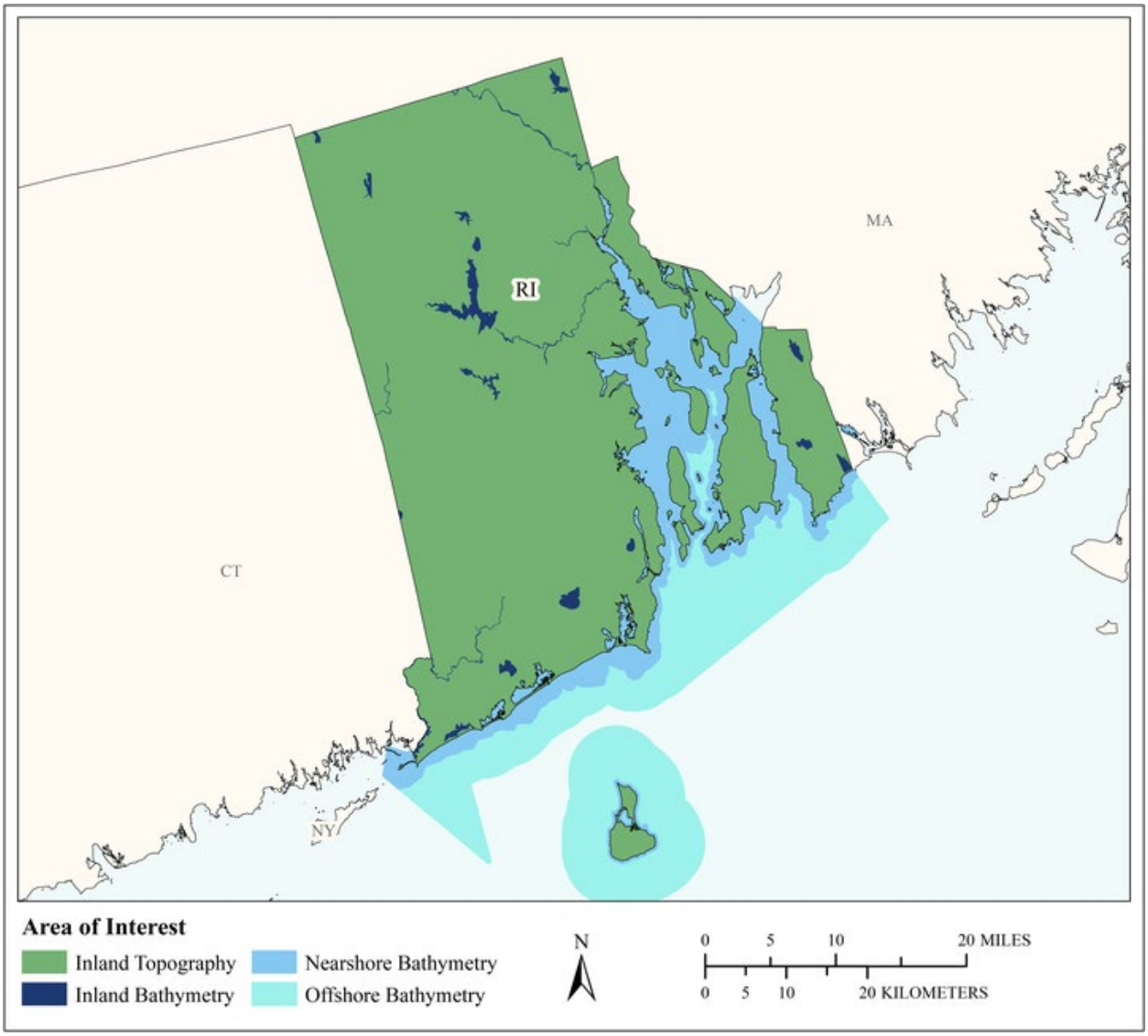
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	None	
Improved customer experience	Major	Minor	None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	None	
Environmental	Moderate	Moderate	Moderate	
Public safety, including life and property	Major	Minor	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		None					
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$14,028		Annual dollars saved/ realized	$598						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,132		Annual dollars saved/ realized	$6						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			None					
Environmental	Major			Moderate			Moderate					
Public safety, including life and property	Major			Moderate			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps	Yes		Yes	
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes		Yes	
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Marine and Riverine Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Nautical charting. Bathymetric measurements of nearshore submerged coastal topography. Identification of hazards to navigation. Sediment management at coastal navigation projects. Precision marine navigation. Movement of goods and fishing vessels.
MCA Title	Marine and Riverine Navigation and Safety
MCA ID	60387
Organization Type	State or U.S. Territorial government
Organization Name	State of Rhode Island
Sub-Agency or Division	Rhode Island Port Authority
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Nice to have
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B	QL0B	I don't know
Update Frequency	2-3 years	2-3 years	2-3 years	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	Up to 2 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have	Nice to have	I don't know	Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Nice to have	Nice to have	I don't know	Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required	I don't know	Required	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required	I don't know	Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Required	I don't know
DTM	Required	Highly desirable	Required	I don't know
DEM	Required	Required	Required	I don't know
Raw point cloud data	Required	Nice to have	Required	I don't know
Classified point cloud	Required	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Highly desirable	I don't know
Full waveform	Not required	Not required	Not required	I don't know
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	I don't know
Breaklines required for standard hydro-flattening	Highly desirable	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	I don't know
Tide Predictions			Required	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	I don't know
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Highly desirable	I don't know
Ground control/ground truthing	Required	Nice to have	Highly desirable	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	I don't know
Nautical and/or navigation charts			Highly desirable	I don't know
Acoustic imagery of the seafloor			Highly desirable	I don't know
Aerial and/or satellite imagery	Required	Required	Highly desirable	I don't know
Underwater videography			Nice to have	I don't know
Bottom texture			Highly desirable	I don't know
Bottom type			Highly desirable	I don't know
Submerged features			Highly desirable	I don't know
Subbottom characteristics			Nice to have	I don't know
Geologic and seismic data	Not required	Not required	Nice to have	I don't know
Water column properties - Physical			Nice to have	I don't know
Water column properties - Chemical			Nice to have	I don't know
Water column properties - Biological			Nice to have	I don't know
Currents			Highly desirable	I don't know
Tide/wave heights			Highly desirable	I don't know
Sea ice conditions			Nice to have	I don't know
Habitat distribution and classification			Highly desirable	I don't know
Boundaries			Nice to have	I don't know
Routes			Required	I don't know
Offshore cadastral			Nice to have	I don't know
Lease areas			Nice to have	I don't know
Fixed obstructions			Required	I don't know
Floating observation/navigation systems			Required	I don't know
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Nice to have	Nice to have	Nice to have	I don't know
Wetlands	Highly desirable	Required	Highly desirable	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	I don't know
Inland surface water features	Highly desirable	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Required	Nice to have	Nice to have	
Cultural resources	Highly desirable	Highly desirable	Nice to have	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts		Yes	Yes	
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	I don't know
Cost savings/cost reduction	Major	I don't know	Minor	I don't know
Cost avoidance	Moderate	Major	Minor	I don't know
Increased revenues	Moderate	None	Minor	I don't know
Mission-driven performance improvements	Moderate	Minor	Minor	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	None	Minor	I don't know

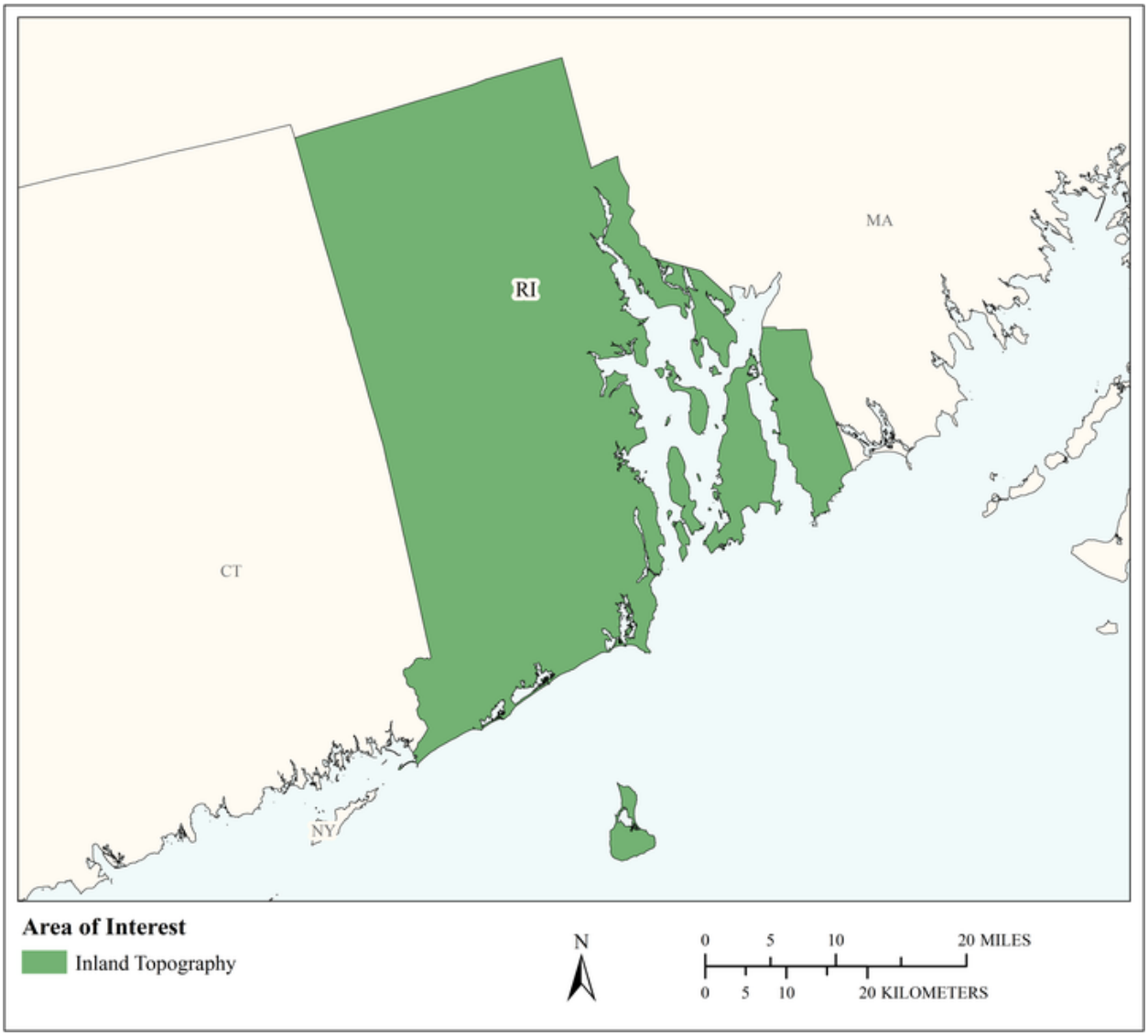
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor	None	Minor	I don't know
Improved customer experience	Moderate	None	Minor	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	None	Minor	I don't know
Environmental	Moderate	None	Minor	I don't know
Public safety, including life and property	Major	None	Major	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Increased revenues	None			Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$41,483		Annual dollars saved/ realized	$19,752		Annual dollars saved/ realized	$138,793			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Future annual customer service benefits added during validation					Annual dollars saved/ realized	$2,599		Annual dollars saved/ realized	$4,699			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			Moderate			Minor			I don't know		
Environmental	None			Moderate			Major			I don't know		
Public safety, including life and property	Minor			Moderate			Major			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			
Slope maps				
Aspect maps				
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps				Yes
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				Yes

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Aviation Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of in-flight hazards and path obstructions. Aeronautical charting. Runway construction and repair.
MCA Title	Aviation Navigation and Safety
MCA ID	60388
Organization Type	State or U.S. Territorial government
Organization Name	State of Rhode Island
Sub-Agency or Division	Rhode Island Airport Corporation
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 21 - Aviation Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes			
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Major			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

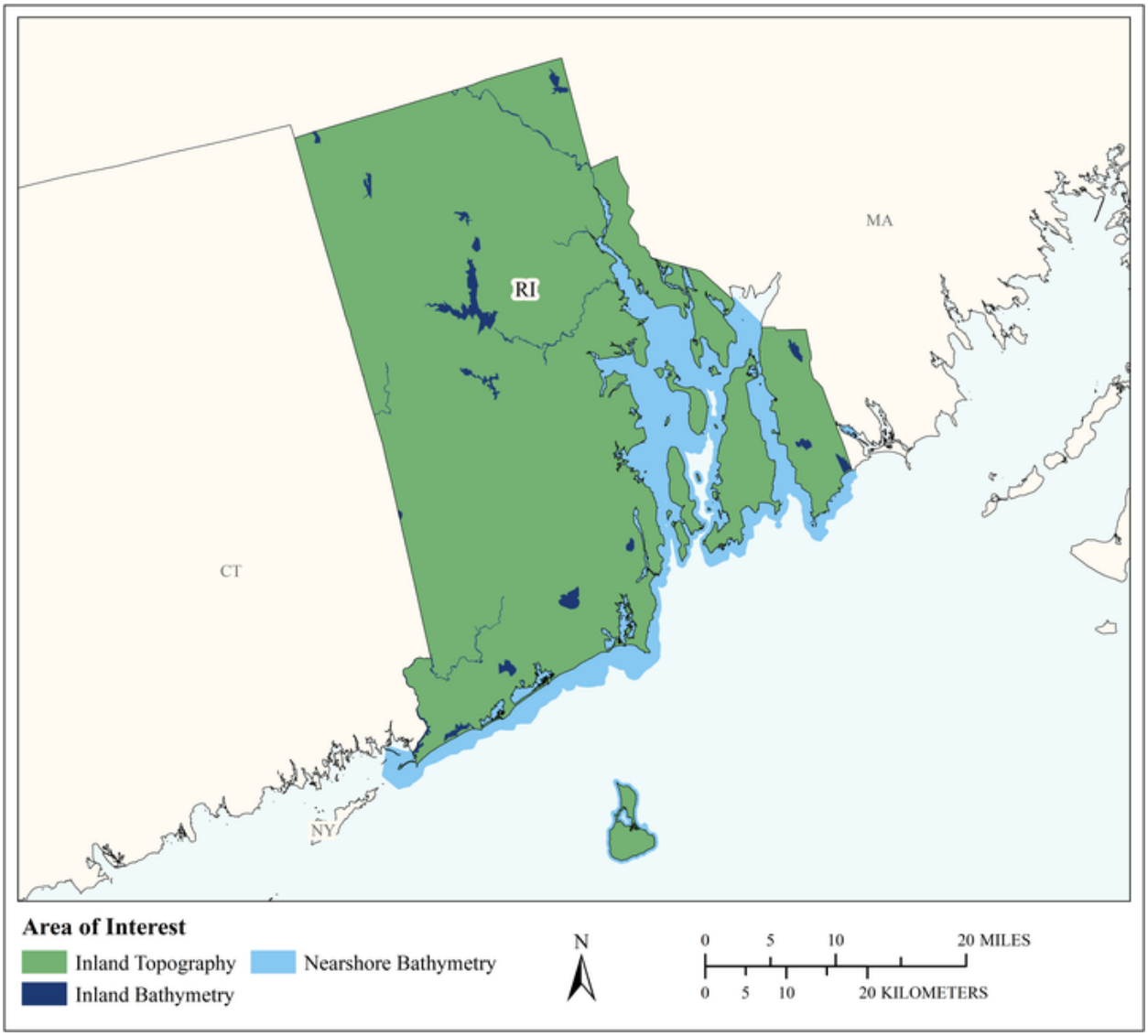
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$3,660									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$4,559									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Moderate											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Transportation Asset Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Transportation asset management. Statewide elevation data can be used for planning, project information purposes; detailed survey grade site specific or project specific data are needed for design and construction. Engineering and drainage design are done outside of GIS. Point clouds are needed for bridge surfaces and bridge deck elevations for evaluation of potential sea level rise effects on bridges. Accurate and updated 3D elevation data is also required by RIDOT's contractors to create derivative products such as transportation asset design models, geospatial datasets, reports, maps, or graphics. RIDOT relies upon the work performed by other State and Federal agencies that use 3D elevation data to create models which predict changes in inland and coastal flooding elevations.
MCA Title	Transportation Asset Management
MCA ID	21678
Organization Type	State or U.S. Territorial government
Organization Name	Rhode Island Department of Transportation (RIDOT)
Sub-Agency or Division	
Organization Mission	The Rhode Island Department of Transportation (RIDOT) designs, constructs, and maintains the state's surface transportation system. This includes not only roads and bridges but also the state's rail stations, tolling program, bike paths and ferry service.
Program Name	Operations
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 19 - Land Navigation and Safety
Tertiary Business Use	BU 30 - Maritime and Land Boundary Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Manholes, stormwater grates, curb inlets, pavement striping, sign posts

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL1B	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 30 cm	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 30 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed	To MHHW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Nice to have	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Nice to have	Highly desirable	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Nice to have	Nice to have	
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Nice to have	
Ground control/ground truthing	Required	Highly desirable	Highly desirable	
Other	Required			
Other description	Contour Lines (2-foot interval)			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Highly desirable	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Nice to have	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Highly desirable	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Required	Highly desirable	Required	
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Nice to have	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			
Other	Required			
Other description	Road Centerlines			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	http://www.rigis.org/pages/2011-statewide-lidar-project-details			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	http://www.rigis.org/datasets?t=TOPO			
Data that meet my needs are not available				

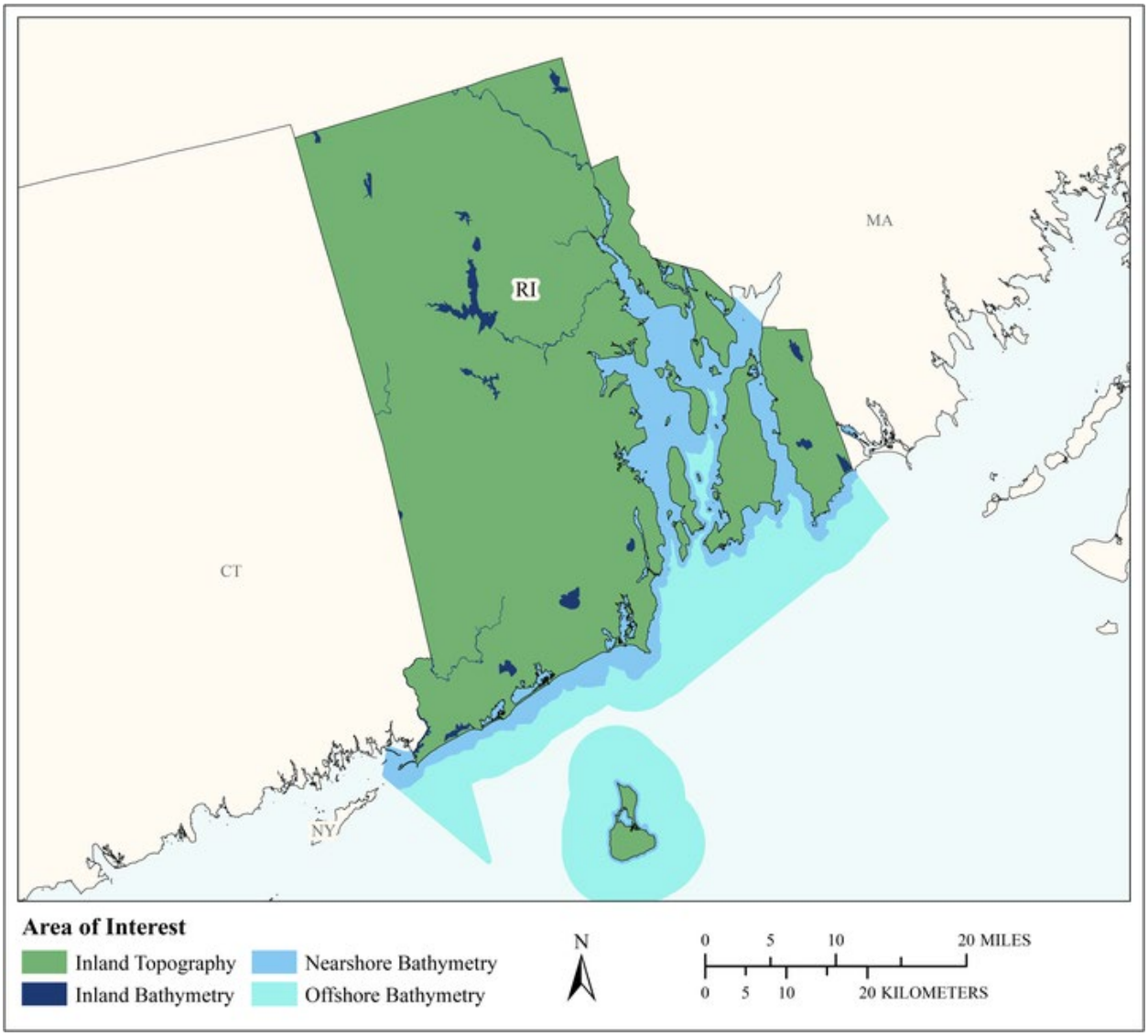
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	
Cost savings/cost reduction	Major	Major	Minor	
Cost avoidance	Moderate	Moderate	Minor	
Increased revenues	Minor	None	None	
Mission-driven performance improvements	Moderate	Moderate	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate	Minor	
Improved response or timeliness	Minor	Major	Minor	
Improved customer experience	Moderate	Minor	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	Minor	
Environmental	Moderate	Minor	Minor	
Public safety, including life and property	Major	Moderate	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	I don't know	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance	I don't know	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Increased revenues	I don't know	Unable to provide		None			Minor	Unable to provide				
Mission-driven performance improvements	I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$48,665		Annual dollars saved/ realized	$16,396		Annual dollars saved/ realized	$3,783			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	I don't know	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Improved customer experience	I don't know	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$143,211		Annual dollars saved/ realized	$1,702		Annual dollars saved/ realized	$520			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			Minor					
Education or outreach description	RIDOT website, online and published maps											
Environmental	Major			Moderate			Moderate					
Environmental description	Stormwater management, project area pre-scoping information											
Public safety, including life and property	Moderate			Moderate			Major					
Public safety, including life and property description	Emergency Management support, Traffic Safety crash analysis											
Other	Inland flooding analysis, Bridge deck elevations, Sea Level Rise analysis											
Other benefits	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Urban and Regional Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Land development and zoning. Municipal mapping of building footprints and elevations. Port resilience planning. Parks and transportation planning. Virtual city creation. Urban ecology planning. Elevation data are needed for development of land use, land cover, and impervious surfaces.
MCA Title	Urban and Regional Planning
MCA ID	60389
Organization Type	State or U.S. Territorial government
Organization Name	State of Rhode Island
Sub-Agency or Division	Rhode Island Statewide Planning Program
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required

Inland Bathy Feature Size Requirements	Response
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL2B	Cross sections and/or transects meet needs
Update Frequency	4-5 years	6-10 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				Yes
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Required	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Required	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Required	Required
DTM	Required	Required	Required	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Required	Nice to have	Highly desirable	Highly desirable
Classified point cloud	Required	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Highly desirable
Full waveform	Nice to have	Nice to have	Nice to have	Required
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Highly desirable
Tide Predictions			Nice to have	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Highly desirable
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Highly desirable
Ground control/ground truthing	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	Required
Nautical and/or navigation charts			Highly desirable	Required
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Highly desirable
Underwater videography			Not required	Nice to have
Bottom texture			Nice to have	Highly desirable
Bottom type			Nice to have	Highly desirable
Submerged features			Nice to have	Highly desirable
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Not required	Highly desirable
Water column properties - Chemical			Not required	Highly desirable
Water column properties - Biological			Not required	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Nice to have	Required
Routes			Nice to have	Highly desirable
Offshore cadastral			Nice to have	Highly desirable
Lease areas			Nice to have	Highly desirable
Fixed obstructions			Nice to have	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Required	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Nice to have	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Minor	Major
Cost savings/cost reduction	Major	Minor	Minor	Major
Cost avoidance	Major	Minor	Minor	Major
Increased revenues	Minor	Minor	None	Moderate
Mission-driven performance improvements	Major	Minor	Minor	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Minor	Major

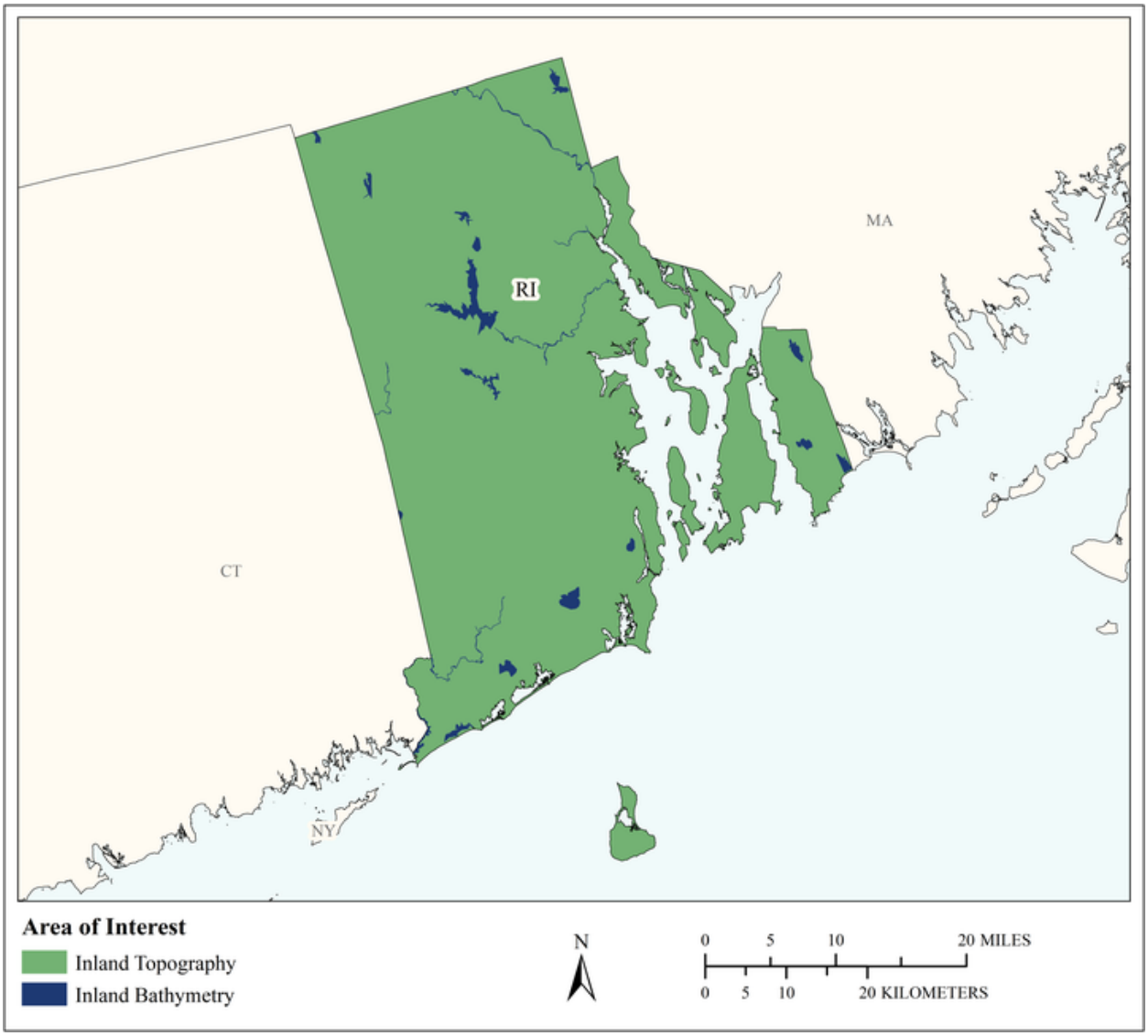
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	Minor	Major
Improved customer experience	Major	Moderate	Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	Major
Environmental	Major	Minor	Minor	Major
Public safety, including life and property	Major	Minor	Minor	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide		Major	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Major	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$291,364		Annual dollars saved/ realized	$11,866		Annual dollars saved/ realized	$33,138			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$33,638		Annual dollars saved/ realized	$15,012		Annual dollars saved/ realized	$34,959			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate			Major		
Environmental	Major			Moderate			Moderate			Major		
Public safety, including life and property	Major			Major			Moderate			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes		Yes	
Aspect maps	Yes			Yes
Curvature maps				Yes
Cross sections		Yes	Yes	Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Health and Human Services



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Health emergency response. Habitat modeling and disease prevention. Defining boundaries for health advisories for swimming and fishing. Marine-based bioproducts and pharmaceuticals. Public health and safety. Prevention of waterborne diseases. Mosquito abatement.
MCA Title	Health and Human Services
MCA ID	60390
Organization Type	State or U.S. Territorial government
Organization Name	State of Rhode Island
Sub-Agency or Division	Rhode Island Department of Health
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 24 - Health and Human Services
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	I don't know
Rivers and Streams	
Less than 10 ft	I don't know
10 - 50 ft	I don't know
51 - 100 ft	I don't know
101 - 500 ft	I don't know
501 - 2,500 ft	I don't know
Greater than 2,500 ft	I don't know
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	I don't know
½ - 1 acre	I don't know
1.1 – 2 acres	I don't know
2.1 – 5 acres	I don't know
5.1 – 10 acres	I don't know
Greater than 10 acres	I don't know

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	I don't know		
Update Frequency	6-10 years	I don't know		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	I don't know		
Acceptable Vertical Error	Up to 20 cm	I don't know		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					I don't know	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	I don't know			I don't know	
Entire AOI under same environmental conditions	Not required	I don't know			I don't know	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	I don't know			I don't know	
DEM for entire AOI needs to be seamless	Highly desirable	I don't know			I don't know	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	I don't know		
DTM	Required	I don't know		
DEM	Highly desirable	I don't know		
Raw point cloud data	Highly desirable	I don't know		
Classified point cloud	Highly desirable	I don't know		
Edited/cube XYZ		I don't know		
Full waveform	Highly desirable	I don't know		
Bathymetric Attributed Grid (BAG)		I don't know		
Breaklines required for standard hydro-flattening	Not required	I don't know		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	I don't know		
Ground control/ground truthing	Nice to have	I don't know		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	I don't know		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	I don't know		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	I don't know		
Land use/land cover	Nice to have	I don't know		
Wetlands	Not required	I don't know		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Not required	I don't know		
Bridges/culverts	Nice to have	I don't know		
Landmark features	Nice to have	I don't know		
Cultural resources	Nice to have	I don't know		
Coastal and riverine structures	Not required	I don't know		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	I don't know		
Cost savings/cost reduction	Major	I don't know		
Cost avoidance	Major	I don't know		
Increased revenues	None	I don't know		
Mission-driven performance improvements	Major	I don't know		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	I don't know		

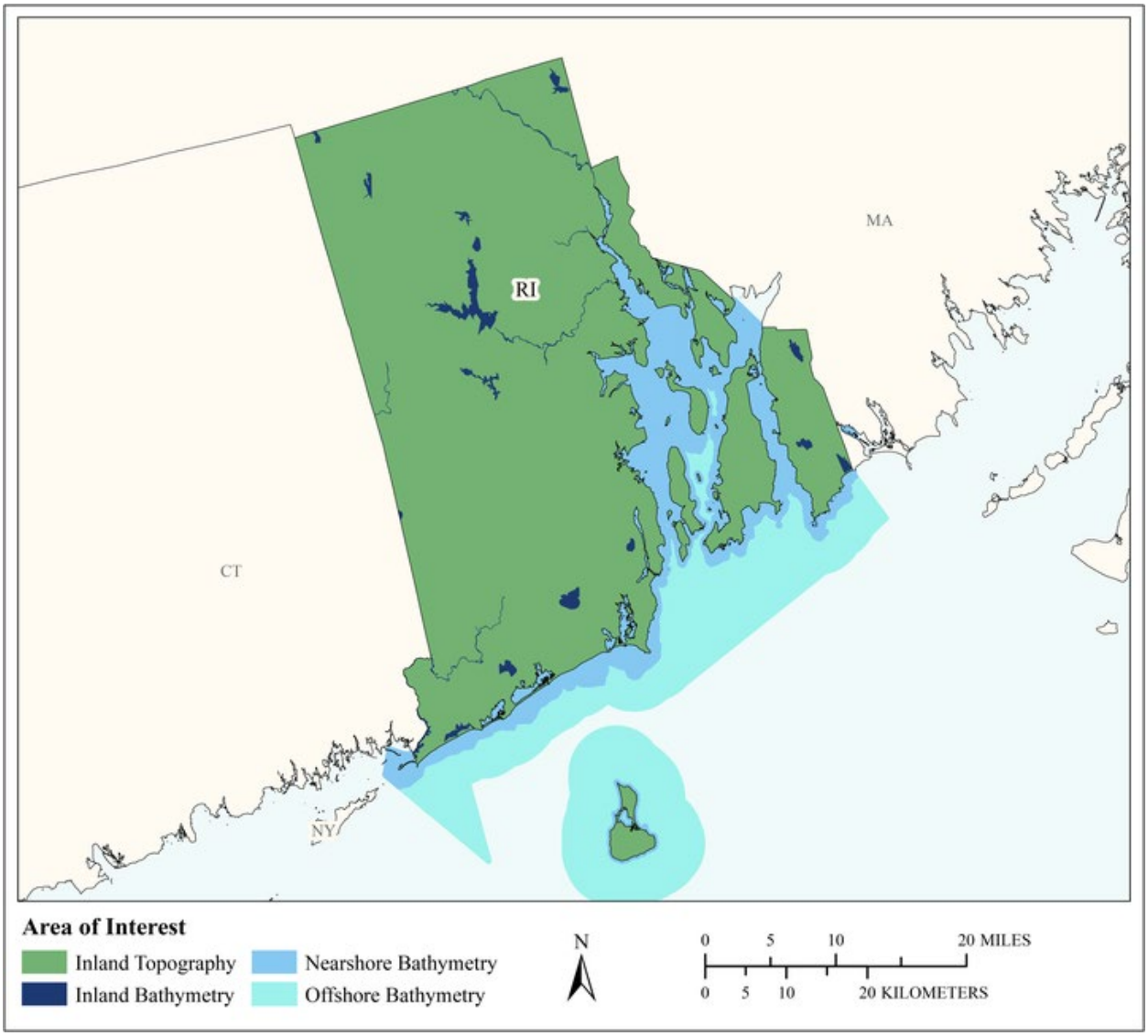
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor	I don't know		
Improved customer experience	Minor	I don't know		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	I don't know		
Environmental	Moderate	I don't know		
Public safety, including life and property	Major	I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		I don't know	Unable to provide							
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide							
Increased revenues	None			I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$386									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	Minor	Unable to provide		I don't know	Unable to provide							
Improved customer experience	Minor	Unable to provide		I don't know	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$0									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			I don't know								
Environmental	Moderate			I don't know								
Public safety, including life and property	Major			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Real Estate, Banking, Mortgage, and Insurance



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Assessment of risk for natural hazards (e.g., sinkholes, flooding) to inform insurance policy rates and the determination of mandatory insurance. Building permit compliance. Tsunami modeling. Wildfire hazards. Seismic hazards.
MCA Title	Real Estate, Banking, Mortgage, and Insurance
MCA ID	60391
Organization Type	State or U.S. Territorial government
Organization Name	State of Rhode Island
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 25 - Real Estate, Banking, Mortgage, and Insurance
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	I don't know
Rivers and Streams	
Less than 10 ft	I don't know
10 - 50 ft	I don't know
51 - 100 ft	I don't know
101 - 500 ft	I don't know
501 - 2,500 ft	I don't know
Greater than 2,500 ft	I don't know
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	I don't know
½ - 1 acre	I don't know
1.1 – 2 acres	I don't know
2.1 – 5 acres	I don't know
5.1 – 10 acres	I don't know
Greater than 10 acres	I don't know

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	I don't know	QL2B	I don't know
Update Frequency	4-5 years	I don't know	2-3 years	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	I don't know	Up to 5 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	I don't know	Up to 40 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					I don't know	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	I don't know	Nice to have	I don't know	I don't know	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	I don't know	Highly desirable	I don't know	I don't know	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	I don't know	Nice to have	I don't know	I don't know	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	I don't know	Highly desirable	I don't know	I don't know	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	I don't know	Up to triple the required TVU at the 95% confidence level	I don't know	I don't know	Up to triple the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	I don't know	Highly desirable	I don't know
DTM	Required	I don't know	Highly desirable	I don't know
DEM	Required	I don't know	Required	I don't know
Raw point cloud data	Nice to have	I don't know	Nice to have	I don't know
Classified point cloud	Required	I don't know	Nice to have	
Edited/cube XYZ		I don't know	Nice to have	I don't know
Full waveform	Nice to have	I don't know	Nice to have	I don't know
Bathymetric Attributed Grid (BAG)		I don't know	Highly desirable	I don't know
Breaklines required for standard hydro-flattening	Nice to have	I don't know		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	I don't know
Tide Predictions			Nice to have	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	I don't know
Intensity imagery/sidescan imagery	Highly desirable	I don't know	Highly desirable	I don't know
Ground control/ground truthing	Required	I don't know	Required	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	I don't know
Nautical and/or navigation charts			Nice to have	I don't know
Acoustic imagery of the seafloor			Nice to have	I don't know
Aerial and/or satellite imagery	Highly desirable	I don't know	Highly desirable	I don't know
Underwater videography			Nice to have	I don't know
Bottom texture			Highly desirable	I don't know
Bottom type			Nice to have	I don't know
Submerged features			Highly desirable	I don't know
Subbottom characteristics			Nice to have	I don't know
Geologic and seismic data	Nice to have	I don't know	Required	I don't know
Water column properties - Physical			Nice to have	I don't know
Water column properties - Chemical			Nice to have	I don't know
Water column properties - Biological			Nice to have	I don't know
Currents			Nice to have	I don't know
Tide/wave heights			Highly desirable	I don't know
Sea ice conditions			Nice to have	I don't know
Habitat distribution and classification			Nice to have	I don't know
Boundaries			Highly desirable	I don't know
Routes			Nice to have	I don't know
Offshore cadastral			Highly desirable	I don't know
Lease areas			Highly desirable	I don't know
Fixed obstructions			Highly desirable	I don't know
Floating observation/navigation systems			Nice to have	I don't know
Shorelines – current, historic, change rates	Highly desirable	I don't know	Required	
Land use/land cover	Nice to have	I don't know	Highly desirable	I don't know
Wetlands	Nice to have	I don't know	Highly desirable	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	I don't know
Inland surface water features	Highly desirable	I don't know	Nice to have	
Bridges/culverts	Nice to have	I don't know		
Landmark features	Nice to have	I don't know	Nice to have	
Cultural resources	Nice to have	I don't know	Nice to have	
Coastal and riverine structures	Nice to have	I don't know	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	I don't know	Major	I don't know
Cost savings/cost reduction	Major	I don't know	Major	I don't know
Cost avoidance	Major	I don't know	Moderate	I don't know
Increased revenues	None	I don't know	None	I don't know
Mission-driven performance improvements	Moderate	I don't know	Moderate	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	I don't know	Major	I don't know

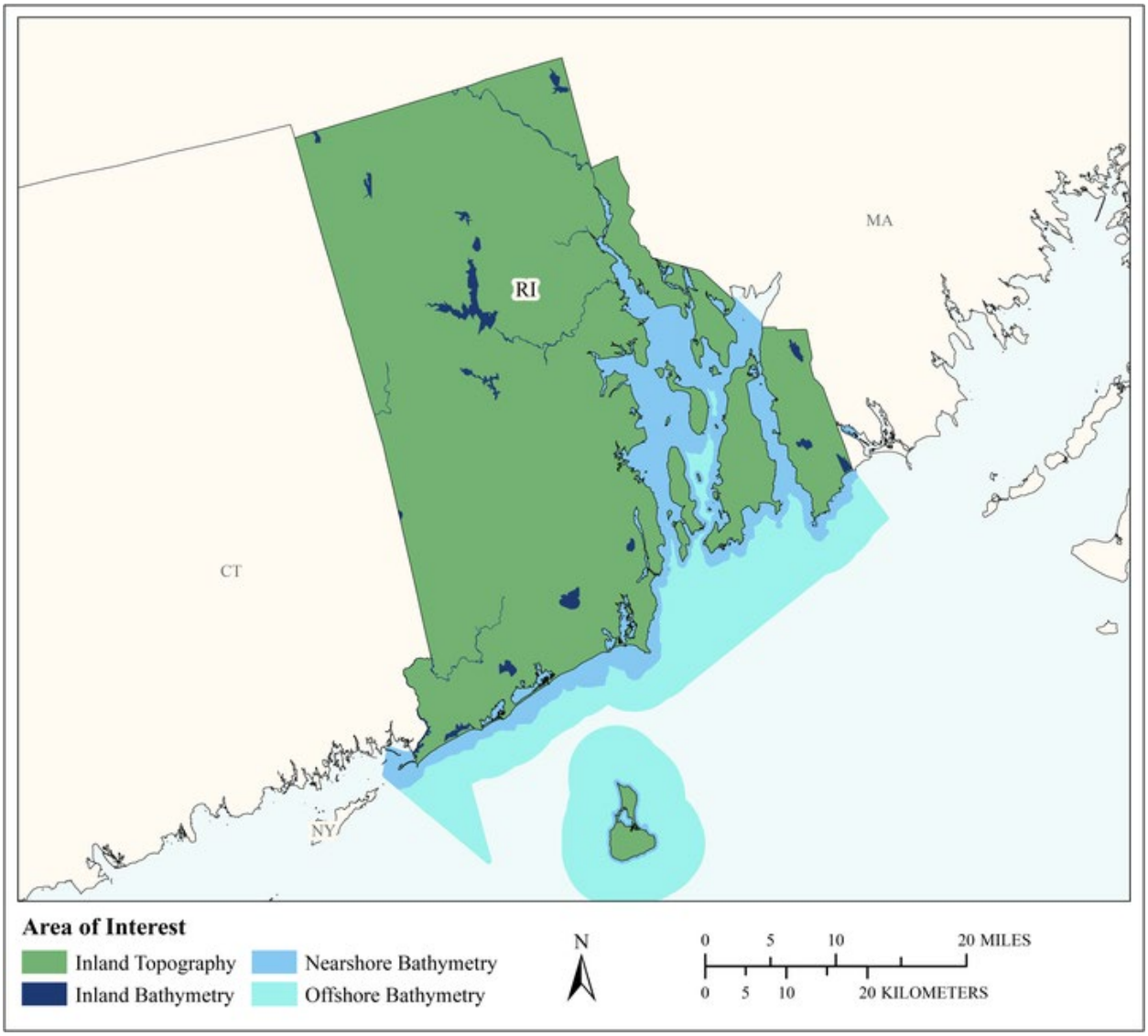
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	I don't know	Minor	I don't know
Improved customer experience	Major	I don't know	Major	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	I don't know	Major	I don't know
Environmental	Moderate	I don't know	Minor	I don't know
Public safety, including life and property	Moderate	I don't know	Major	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Increased revenues	Minor	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$37,625									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Moderate	Unable to provide		I don't know	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			I don't know			Major			I don't know		
Environmental	Minor			I don't know			Moderate			I don't know		
Public safety, including life and property	Major			I don't know			Major			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	
Contours	Yes		Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids			Yes	
Hydrologic Flow Accumulation Grids			Yes	
Hydrologic networks (e.g. streams, lakes)	Yes		Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)			Yes	
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Education K12 and Beyond, Basic Research



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Development of 3-D visualizations to help students understand the Earth they live on. Understanding of continental-scale climate change impacts. Ocean science. Ocean education. Scientific research. Data dissemination. Development of training simulators.
MCA Title	Education K12 and Beyond, Basic Research
MCA ID	60392
Organization Type	State or U.S. Territorial government
Organization Name	State of Rhode Island
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 26 - Education K12 and Beyond, Basic Research
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL1B	QL2B	Order 1a
Update Frequency	2-3 years	4-5 years	4-5 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Nice to have	Not required	Highly desirable	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Required	Nice to have	Not required	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required	Highly desirable	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Required	Required
DTM	Required	Highly desirable	Required	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Required	Required	Required	Required
Classified point cloud	Required	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Nice to have	Nice to have
Ground control/ground truthing	Highly desirable	Highly desirable	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Highly desirable
Underwater videography			Nice to have	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Highly desirable	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Highly desirable
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Required	Highly desirable	Highly desirable	Nice to have
Wetlands	Required	Highly desirable	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Nice to have	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Major	Minor
Cost savings/cost reduction	Major	Minor	Moderate	Minor
Cost avoidance	Major	Minor	Major	Moderate
Increased revenues	Minor	None	Minor	None
Mission-driven performance improvements	Major	Moderate	Major	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Major	Moderate

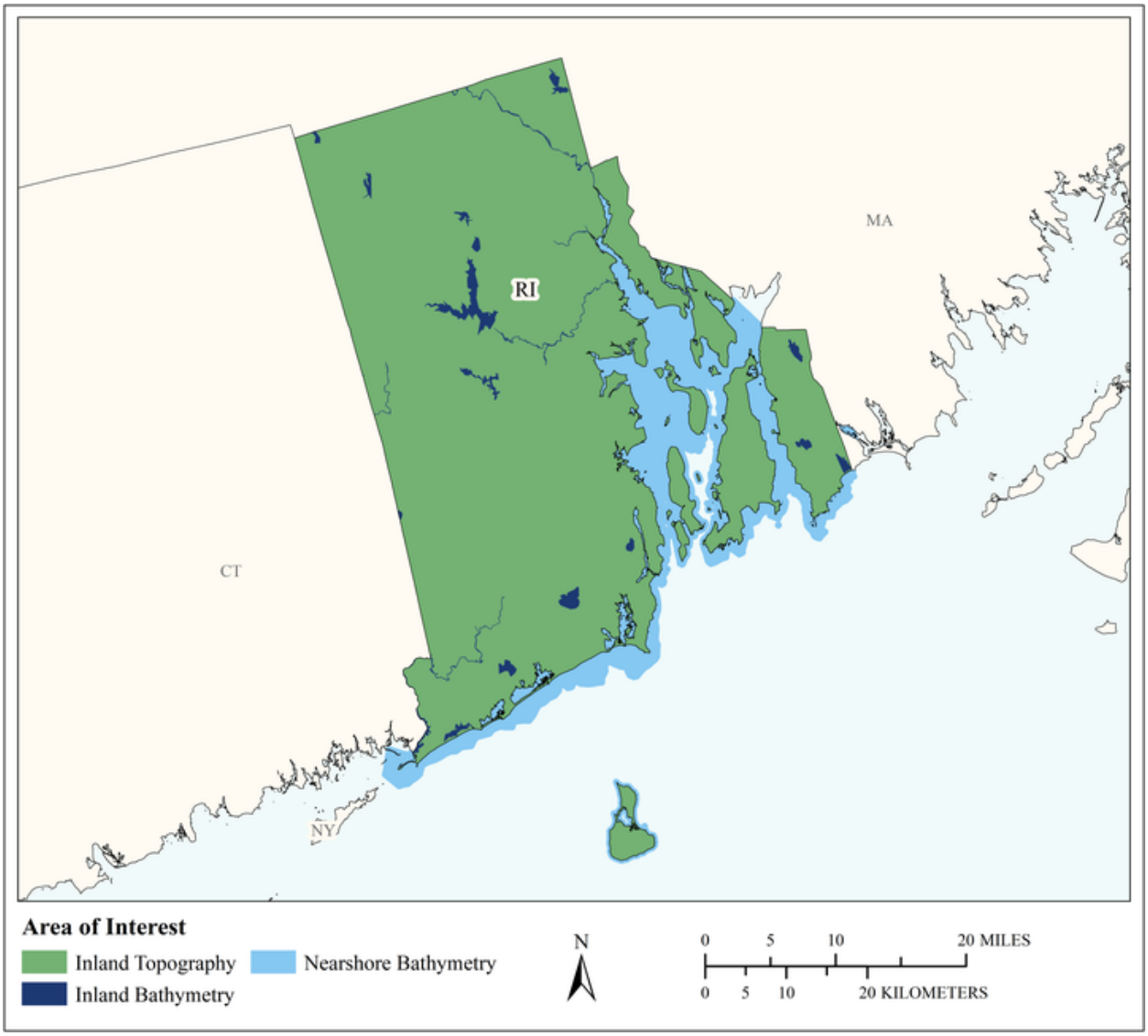
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	Minor	Minor
Improved customer experience	Major	Minor	Moderate	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major	Major	Major
Environmental	Major	Minor	Minor	Minor
Public safety, including life and property	Major	Moderate	Minor	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$5,690		Annual dollars saved/ realized	$1,488		Annual dollars saved/ realized	$1,187		Annual dollars saved/ realized	$554
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$13,602					Annual dollars saved/ realized	$46			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major			Major		
Environmental	Major			Major			Major			Minor		
Public safety, including life and property	Major			Major			Minor			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes			Yes
Aspect maps	Yes			Yes
Curvature maps	Yes			
Cross sections	Yes		Yes	Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Recreation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Elevation data are needed for parks and recreation site landscape evaluation. Planning and development of recreational facilities such as rafting, boating, swimming, diving, and fishing areas; ski slopes; and golf courses. Location- based products and services such as maps and guides. Tourism. Trail and vista site planning. Orienteering.
MCA Title	Recreation
MCA ID	60393
Organization Type	State or U.S. Territorial government
Organization Name	State of Rhode Island
Sub-Agency or Division	Rhode Island Department of Environmental Management
Organization Mission	
Program Name	Division of Tourism
Total Annual Program Budget	
Primary Business Use	BU 27 - Recreation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required	Highly desirable		Not required	Not required
Entire AOI under same environmental conditions	Required	Not required	Highly desirable		Not required	Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Nice to have		Nice to have	Not required
DEM for entire AOI needs to be seamless	Required	Nice to have	Nice to have		Nice to have	Not required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	
DTM	Nice to have	Highly desirable	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Nice to have	Not required	
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Nice to have	
Full waveform	Not required	Nice to have	Not required	
Bathymetric Attributed Grid (BAG)		Highly desirable	Nice to have	
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Not required	Nice to have	Not required	
Ground control/ground truthing	Nice to have	Nice to have	Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required	Required	Not required	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Not required	Highly desirable	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Not required	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Not required	Highly desirable	Highly desirable	
Land use/land cover	Nice to have	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Not required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Minor	
Cost savings/cost reduction	Moderate	Minor	Minor	
Cost avoidance	Major	Minor	Minor	
Increased revenues	None	Minor	Minor	
Mission-driven performance improvements	Major	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor	Minor	

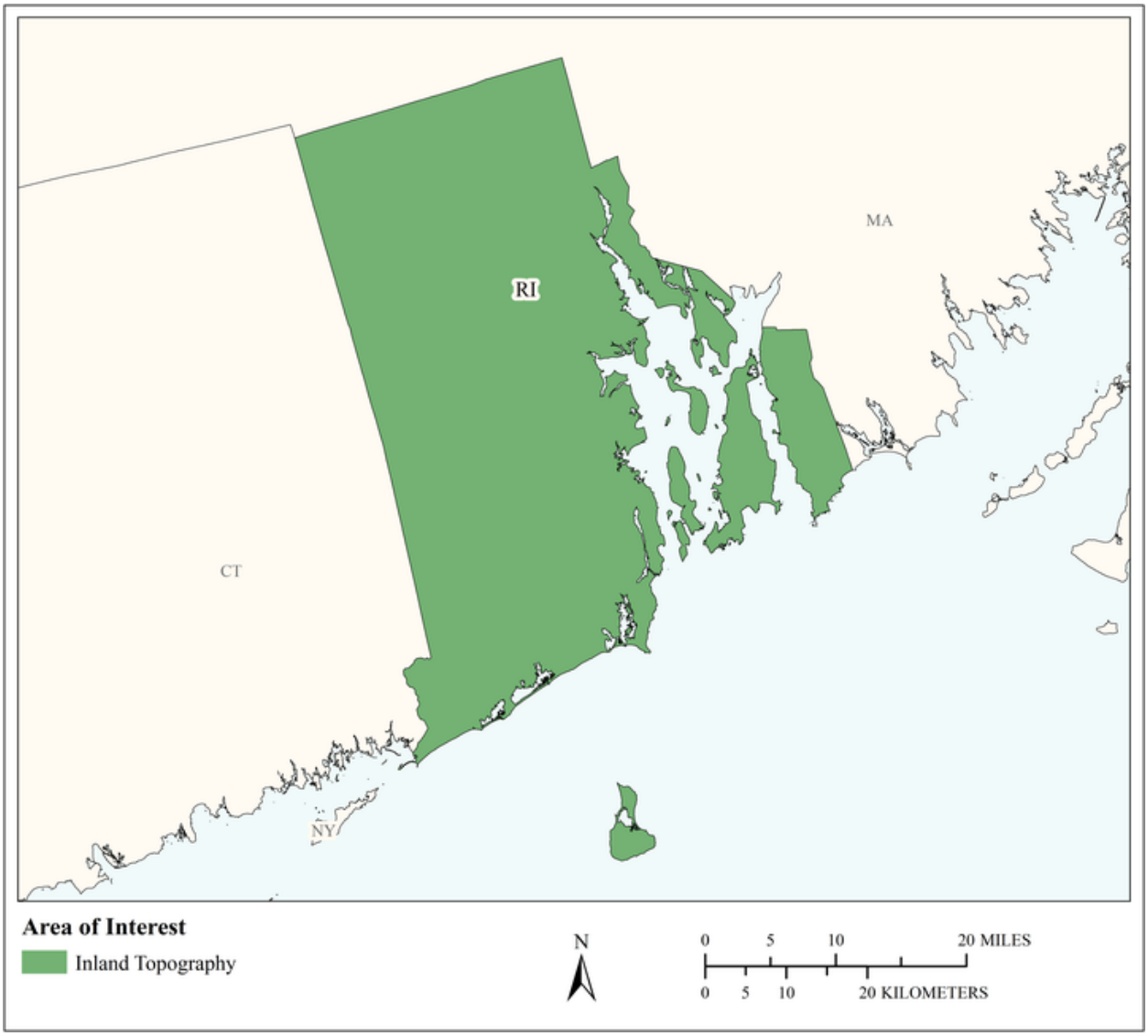
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Minor	Minor	
Improved customer experience	Moderate	Minor	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	
Environmental	Major	Minor	Minor	
Public safety, including life and property	Major	Minor	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	None			Moderate	Unable to provide		Moderate	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$248		Annual dollars saved/ realized	$149		Annual dollars saved/ realized	$23,432			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Major					
Environmental	Moderate			Major			Major					
Public safety, including life and property	Moderate			Moderate			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes		
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Telecommunications



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Telecommunication tower site selection. Design of radio and radar systems. Interference analysis. Path profiles. Undersea telecommunication route selection and deployment. Elevation data are needed for evaluating signal quality over service areas for cellular and broadband wireless data.
MCA Title	Telecommunications
MCA ID	60394
Organization Type	State or U.S. Territorial government
Organization Name	State of Rhode Island
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 28 - Telecommunications
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Highly desirable			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

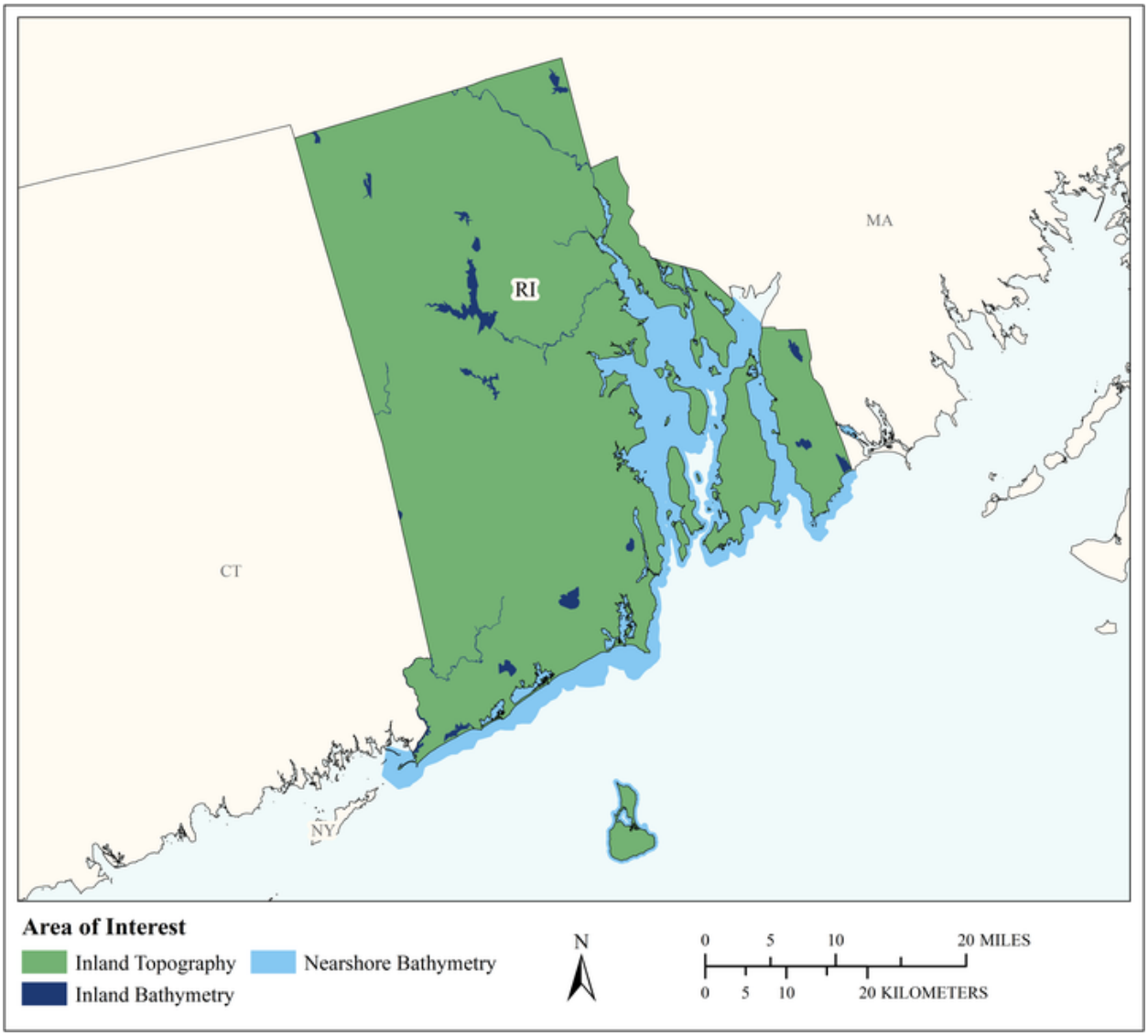
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Military



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Tactical military operations. Strategic defense. Amphibious landings and logistics over-the-shore. Operation of ships and submarines. Weapons system testing. Management of flight facilities and offshore launch or target areas.
MCA Title	Military
MCA ID	60395
Organization Type	State or U.S. Territorial government
Organization Name	State of Rhode Island
Sub-Agency or Division	Rhode Island Army National Guard and Air National Guard
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 29 - Military
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	I don't know
Tops of vegetation	I don't know
Tops of submerged structures, objects	I don't know
Tops of submerged vegetation	I don't know
Subcanopy of vegetation/understory	I don't know
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	I don't know
Ocean/sea bottom (>10 m deep)	I don't know

General Geographic Area and Size	
Average geographic extent of day-to-day area	
Smallest 3D features needed	
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	I don't know
Rivers and Streams	
Less than 10 ft	I don't know
10 - 50 ft	I don't know
51 - 100 ft	I don't know
101 - 500 ft	I don't know
501 - 2,500 ft	I don't know
Greater than 2,500 ft	I don't know
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	I don't know
½ - 1 acre	I don't know
1.1 – 2 acres	I don't know
2.1 – 5 acres	I don't know
5.1 – 10 acres	I don't know
Greater than 10 acres	I don't know

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	I don't know	I don't know	I don't know	
Update Frequency	I don't know	I don't know	I don't know	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	I don't know	I don't know	I don't know	
Acceptable Vertical Error	I don't know	I don't know	I don't know	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	I don't know
Hydro-enforcement	I don't know
Hydro-conditioning	I don't know
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					I don't know	
Temporal Seamlessness						
Entire AOI in same acquisition season	I don't know	I don't know	I don't know		I don't know	I don't know
Entire AOI under same environmental conditions	I don't know	I don't know	I don't know		I don't know	I don't know
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	I don't know	I don't know	I don't know		I don't know	I don't know
DEM for entire AOI needs to be seamless	I don't know	I don't know	I don't know		I don't know	I don't know
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	I don't know	I don't know	I don't know	
DTM	I don't know	I don't know	I don't know	
DEM	I don't know	I don't know	I don't know	
Raw point cloud data	I don't know	I don't know	I don't know	
Classified point cloud	I don't know	I don't know	I don't know	
Edited/cube XYZ		I don't know	I don't know	
Full waveform	I don't know	I don't know	I don't know	
Bathymetric Attributed Grid (BAG)		I don't know	I don't know	
Breaklines required for standard hydro-flattening	I don't know	I don't know		
Additional breaklines for hydro-enforcement of culverts	I don't know			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			I don't know	
Tide Predictions			I don't know	
Tidal Constituent And Residual Interpolation (TCARI)			I don't know	
Intensity imagery/sidescan imagery	I don't know	I don't know	I don't know	
Ground control/ground truthing	I don't know	I don't know	I don't know	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			I don't know	
Nautical and/or navigation charts			I don't know	
Acoustic imagery of the seafloor			I don't know	
Aerial and/or satellite imagery	I don't know	I don't know	I don't know	
Underwater videography			I don't know	
Bottom texture			I don't know	
Bottom type			I don't know	
Submerged features			I don't know	
Subbottom characteristics			I don't know	
Geologic and seismic data	I don't know	I don't know	I don't know	
Water column properties - Physical			I don't know	
Water column properties - Chemical			I don't know	
Water column properties - Biological			I don't know	
Currents			I don't know	
Tide/wave heights			I don't know	
Sea ice conditions			I don't know	
Habitat distribution and classification			I don't know	
Boundaries			I don't know	
Routes			I don't know	
Offshore cadastral			I don't know	
Lease areas			I don't know	
Fixed obstructions			I don't know	
Floating observation/navigation systems			I don't know	
Shorelines – current, historic, change rates	I don't know	I don't know	I don't know	
Land use/land cover	I don't know	I don't know	I don't know	
Wetlands	I don't know	I don't know	I don't know	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			I don't know	
Inland surface water features	I don't know	I don't know	I don't know	
Bridges/culverts	I don't know	I don't know		
Landmark features	I don't know	I don't know	I don't know	
Cultural resources	I don't know	I don't know	I don't know	
Coastal and riverine structures	I don't know	I don't know	I don't know	
Overhead structures			I don't know	
Lowest Floor Elevation of Buildings	I don't know			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know	I don't know	I don't know	
Cost savings/cost reduction	I don't know	I don't know	I don't know	
Cost avoidance	I don't know	I don't know	I don't know	
Increased revenues	I don't know	I don't know	I don't know	
Mission-driven performance improvements	I don't know	I don't know	I don't know	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know	I don't know	I don't know	

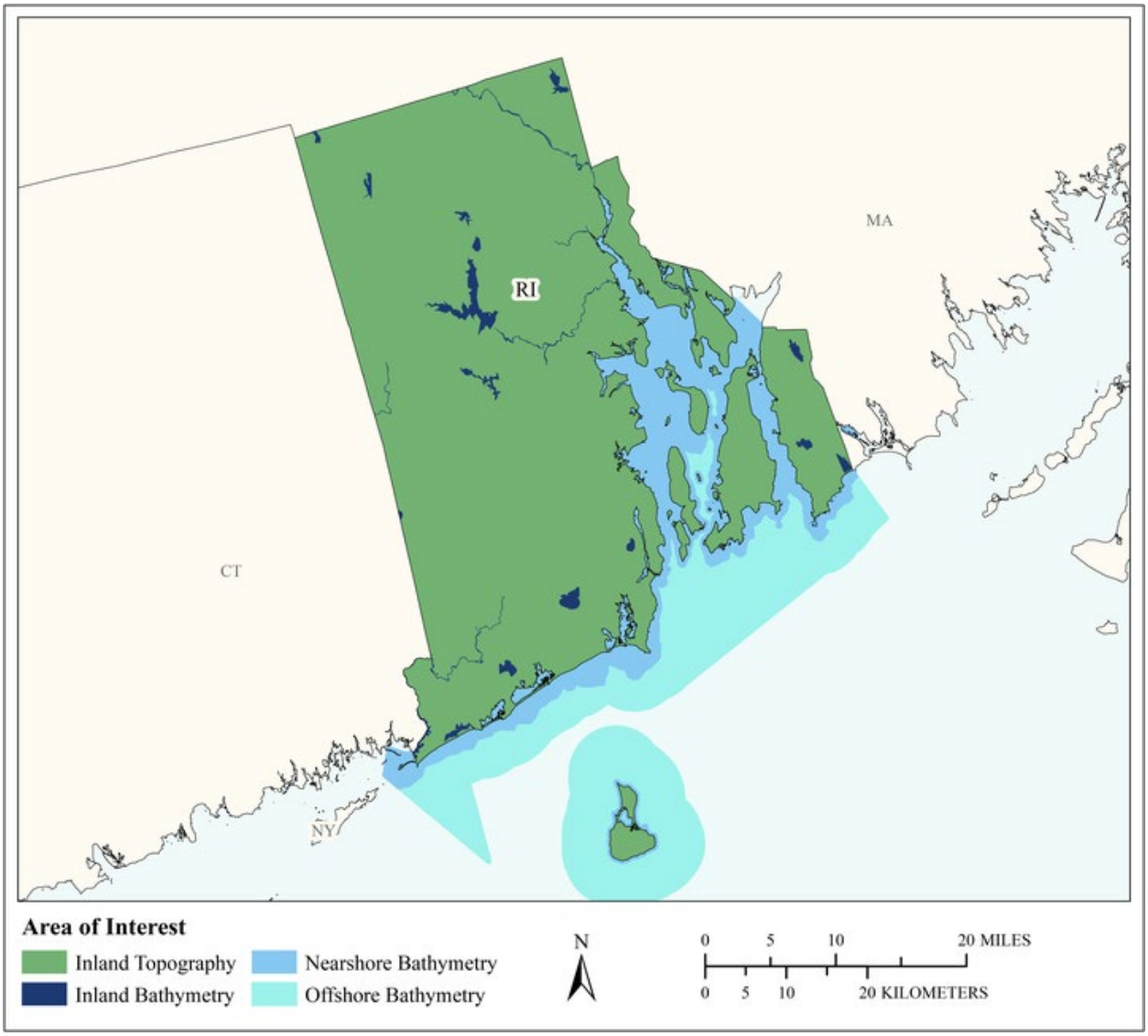
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	I don't know	I don't know	I don't know	
Improved customer experience	I don't know	I don't know	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	I don't know	I don't know	
Environmental	I don't know	I don't know	I don't know	
Public safety, including life and property	I don't know	I don't know	I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know			I don't know					
Environmental	I don't know			I don't know			I don't know					
Public safety, including life and property	I don't know			I don't know			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Maritime and Land Boundary Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Delimitation of legal and other coastal boundaries, inland boundaries, and ordinary high water lines (OHWL).
MCA Title	Maritime and Land Boundary Management
MCA ID	60396
Organization Type	State or U.S. Territorial government
Organization Name	State of Rhode Island
Sub-Agency or Division	RI Coastal Resources Management Council
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 30 - Maritime and Land Boundary Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B	QL0B	I don't know
Update Frequency	6-10 years	6-10 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Highly desirable	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Nice to have	Nice to have	Highly desirable	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable	Highly desirable	Required	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable	Highly desirable	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	Required
DTM	Required	Required	Required	Required
DEM	Highly desirable	Required	Required	Required
Raw point cloud data	Nice to have	Highly desirable	Required	Required
Classified point cloud	Highly desirable	Highly desirable	Required	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Not required	Nice to have
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Not required
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Nice to have	Required	Not required	Not required
Ground control/ground truthing	Highly desirable	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Required	Highly desirable	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Nice to have
Water column properties - Biological			Not required	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Highly desirable	Nice to have
Routes			Nice to have	Highly desirable
Offshore cadastral			Highly desirable	Nice to have
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Required	Required
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Nice to have
Wetlands	Required	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Highly desirable	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Minor	None	I don't know
Cost savings/cost reduction	Moderate	None	Minor	Moderate
Cost avoidance	Moderate	None	Minor	Moderate
Increased revenues	Minor	None	None	I don't know
Mission-driven performance improvements	Major	None	Moderate	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None	None	I don't know

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	None	Minor	Moderate
Improved customer experience	Major	None	Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	Moderate
Environmental	Major	Minor	Minor	Moderate
Public safety, including life and property	Moderate	None	Minor	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	Minor	Unable to provide		None			None			I don't know	Unable to provide	
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,218		Annual dollars saved/ realized	$914		Annual dollars saved/ realized	$41,590			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$4,671									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Moderate			Moderate		
Environmental	Minor			Major			Major			Major		
Public safety, including life and property	None			Moderate			Moderate			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps		Yes		
Cross sections		Yes		
Height-Above-Ground maps		Yes		
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

South Carolina

Current status of elevation data for South Carolina

South Carolina began the first statewide lidar collection in 2007 as a Quality Level (QL3) product. A consortium of state, local, and federal agencies participated in the needs assessment, funding, and coordination of the collection. As part of the statewide lidar program, one of the first statewide elevation-derived hydrography products was also collected.

A refresh of the statewide lidar product was sought after the USGS 3DEP program released updated standards for QL2 data and provided funding for collection of lidar to meet the Lidar Base Specification. Major contributors have been the South Carolina Department of Natural Resources (DNR), South Carolina Department of Health and Environmental Control (DHEC), NRCS, county and local governments, USGS, and FEMA. Most recently, the County of Lexington, in partnership with the NRCS, USGS, FEMA, one private utility, and several counties (11) and municipalities (5), was awarded Broad Agency Announcement funds for a new lidar collection covering 32 counties and part of two counties. Portions of nine counties will be covered by QL1 collection areas. York County completed an update of their lidar data in 2019 and intends to make the data publicly available through the USGS. South Carolina DNR, FEMA, and USGS will be providing lidar for the remaining sections of the state as a QL2 collection. All 46 South Carolina counties are either complete or in progress with 3DEP compliant lidar collections.

Historic lidar data are hosted and served, free of charge through SC DNR Download site (http://www.dnr.sc.gov/GIS/lidar.html).

Elevation will be shared with NOAA and USGS and historic data has been incorporated into the NOAA Digital Coast and USGS National Map for download, along with the topobathy and bathymetry provided by NOAA.

Importance of elevation data to South Carolina

South Carolina users of topography and bathymetry include state agencies responsible for natural resource management, coastal hazards modeling, emergency response, geologic mapping, archaeological site management, transportation planning, wetland mapping and many other agency critical mission areas. Local and county governments also use the data for similar flood risk mapping, infrastructure and construction management, airspace hazard determination, economic development, topological basemaps, stormwater management, planning and management of resources, and response to emergency incidents.

Because about half of South Carolina is in the coastal plain, flooding from hurricanes and extreme weather events are frequent, and require both inland elevation, riverine bathymetry, and nearshore bathymetry, as well as a detailed hydrographic network, to respond effectively to risks.

The needs for bathymetry of inland lakes and rivers are still unmet; bathymetry can have a large impact on flooding and drought management, but currently very few rivers and lakes have mapped bathymetry. Bathymetry of inland lakes would be highly beneficial for search and rescue operations. It would also be beneficial for erosion studies. Coastal change is also a concern for South Carolina – the impacts from hurricanes and sea level change, as well as a thriving coastal population and tourist market, have made the monitoring the coast a high priority. A large proportion of the state's land use is in agricultural production, and detailed elevation data helps plan best management practices, erosion control and runoff, and infiltration of surface applied irrigation and soil amendments.

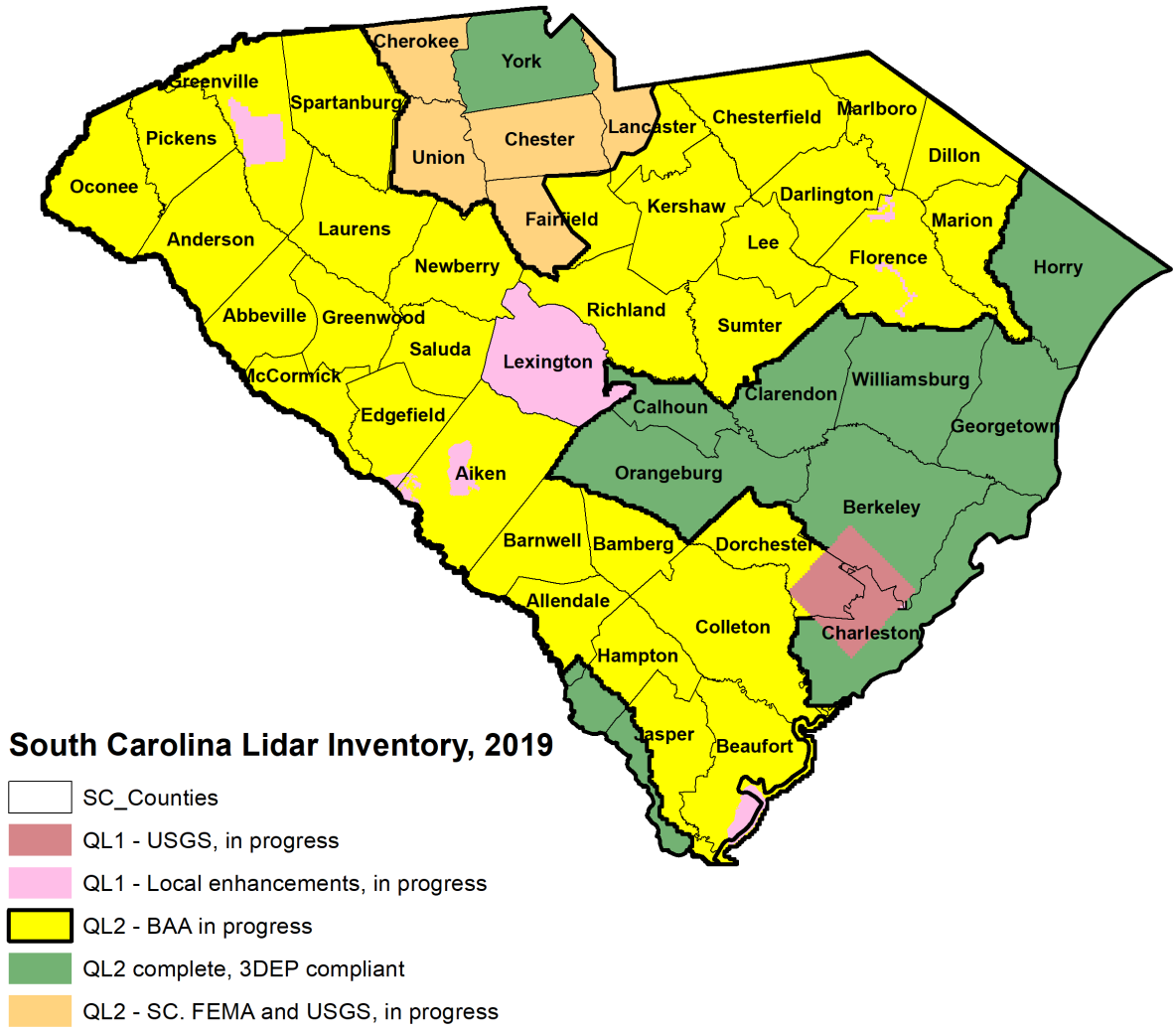


Figure 1. Lidar collection for South Carolina, quality levels, and production status

High-level summary of elevation data requirements

As data are updated to QL2, some cities and local governments have chosen to upgrade the collection over intensely developed or developing areas to a QL1 product. Infrastructure and local government needs are best met with a QL1 product. QL2 has been sufficient for most of the less-intensely developed areas of the state.

Elevation-derived hydrography, riverine and lake bathymetry appear to be a large, unmet need in the state. QL0B inland bathymetry is required for coastal hazards and management, identification of submerged channels in shallow lakes, alternative energy production, fisheries management, flood inundation mapping, and geologic mapping and should be updated every 6-10 years.

Reliable, current, and easily accessible nearshore and offshore bathymetry could have major positive effects on tourism, commercial and recreational fishing, erosion control, coastal mapping, flood mitigation, and emergency response. Emergency management, DHEC-Ocean and Coastal Resource Management, and other local and regional governments would benefit from bathymetry for storm surge modeling, monitoring of coastal change, and permitting activities on the coast and tidelands. Port planning and maintenance, shoreline engineering review, monitoring for shellfish harvest areas, programs for siting of ocean wind power infrastructure, and fisheries would also benefit from bathymetry data. QL1B nearshore bathymetry and Order 1a offshore bathymetry is required and in general should be updated every 4-5 years.

Local government requires an update frequency of every five years in developing/high-growth areas. Other areas an eight to ten-year cycle is needed. Coastal areas require even more frequent updates because of change and development. Coastal erosion is an annual event.

There will be a need to coordinate future lidar collections across the state between local, state, and federal users.

The State of South Carolina has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

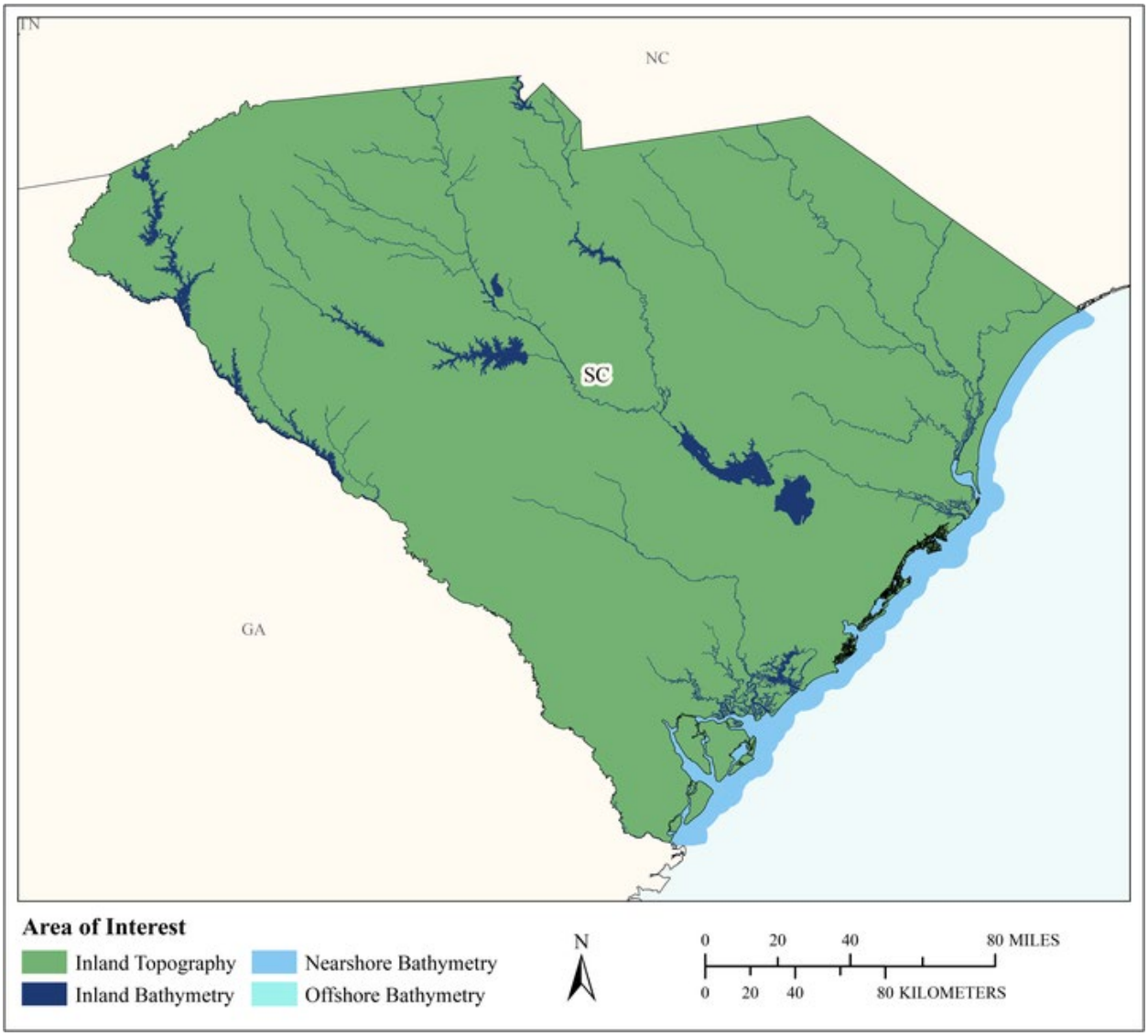
Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	State of South Carolina	60397	Water Supply and Quality	Inland Topo	QL1	6-10 years	$171,625	$45,970	Moderate	Major	Moderate
				Inland Bathy	QL0B	6-10 years	$742,465	$77,590	Moderate	Major	Moderate
				Nearshore Bathy	QL1B	6-10 years	$39,944	$65,803	Moderate	Moderate	Moderate
				Offshore Bathy	Order 1a	4-5 years	Unable to quantify	$2	Minor	Major	Major
BU 02 – Riverine Ecosystem Management	State of South Carolina	60398	Riverine Ecosystem Management	Inland Topo	QL1	6-10 years	$47,378	$4,732	Major	Major	Major
				Inland Bathy	QL0B	6-10 years	$25,221	$1,778	Major	Major	Major
				Nearshore Bathy	QL1B	6-10 years	$121,142	$92,571	Moderate	Moderate	Moderate
BU 03 – Coastal Zone Management	Coastal Carolina University	21491	Coastal Hazard Modeling and Mapping	Inland Topo	QL1	6-10 years	$1,595,850	$278,988	Major	Moderate	Moderate
				Inland Bathy	QL0B	6-10 years	$684,818	$401,473	Major	Major	Minor
				Nearshore Bathy	QL1B	4-5 years	$271,267	$458,881	Major	Major	None
BU 04 – Forest Resource Management	State of South Carolina	60399	Forest Resources Management	Inland Topo	QL1	2-3 years	$250,000	$177,410	Major	Major	Major
				Inland Bathy	QL0B	6-10 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	I don't know
BU 06 – Natural Resource Management	SCDNR Land, Water, and Conservation Division	21485	Management of Land and Water Resources	Inland Topo	(a) QL1 (b) QL2	6-10 years	$416,700	$70,000	Major	Major	Major
				Inland Bathy	QL0B	6-10 years	$95,100	$23,771	Moderate	Moderate	Moderate
				Nearshore Bathy	QL1B	6-10 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate
				Offshore Bathy	Cross sections and/or transects meet needs	I don't know, my work is not offshore	Unable to quantify	Unable to quantify	I don't know	I don't know	Major
BU 07 – Wildlife and Habitat Management	State of South Carolina	60400	Wildlife and Habitat Management	Inland Topo	QL1	6-10 years	$416,700	$700,000	Moderate	Major	Moderate
				Inland Bathy	QL0B	6-10 years	$95,100	$23,771	Moderate	Moderate	Moderate
				Nearshore Bathy	QL1B	6-10 years	$1,199	$70	Moderate	Major	Moderate
				Offshore Bathy	Special Order	4-5 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
BU 09 – Fisheries Management and Aquaculture	State of South Carolina	60401	Fisheries Management and Aquaculture	Inland Topo	QL1	2-3 years	$416,700	$70,000	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	6-10 years	$95,100	$23,771	Major	Major	Moderate
				Nearshore Bathy	QL1B	6-10 years	$190,267	$13,973	Moderate	Major	Minor
				Offshore Bathy	Special Order	6-10 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Minor

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 10 – Geologic Assessment	South Carolina Dept Natural Resources-Geological Survey	21484	Geologic Mapping and Analysis	Inland Topo	(a) QL1 (b) QL2	4-5 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL2B	Event driven	Unable to quantify	Unable to quantify	Moderate	Major	Major
				Nearshore Bathy	QL3B	2-3 years	$1,507	$603	Moderate	Moderate	Moderate
				Offshore Bathy	I don't know	4-5 years	$1,356	Unable to quantify	Moderate	Moderate	I don't know
BU 14 – Cultural Resource Management	South Carolina Institute of Archaeology and Anthropology Maritime Research Division	22156	Underwater Archaeological Investigations	Inland Topo	QL1	6-10 years	$60,000	$30,000	Moderate	Minor	Minor
				Inland Bathy	QL0B	6-10 years	$20,000	Unable to quantify	Moderate	Minor	Minor
				Nearshore Bathy	QL1B	4-5 years	$20,000	Unable to quantify	Minor	Moderate	Minor
				Offshore Bathy	Order 1a	6-10 years	Unable to quantify	Unable to quantify	Minor	Moderate	Minor
BU 15 – Flood Risk Management	SC Emergency Management Division	1164	Flood Response	Inland Topo	QL1	6-10 years	$4,346,055	$760,423	Major	Moderate	Major
				Inland Bathy	QL0B	6-10 years	$301,907	$338,964	Major	Moderate	Major
				Nearshore Bathy	QL1B	4-5 years	$229,311	$169,952	Major	Moderate	Major
				Offshore Bathy	Special Order	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 18 – Homeland Security	SC Geographic Information Council	21883	Coordinated Data Acquisition and Dissemination	Inland Topo	QL1	6-10 years	$913,133	$16,139	I don't know	Moderate	Major
				Inland Bathy	QL0B	6-10 years	$257,161	$16,407	Major	Moderate	Major
				Nearshore Bathy	QL1B	6-10 years	$11,157	$320	Moderate	Moderate	Major
				Offshore Bathy	Order 2	4-5 years	$11,157	$320	Major	Major	Major
BU 20 – Marine and Riverine Navigation	State of South Carolina	60402	Marine and Riverine Navigation and Safety	Inland Topo	QL1	2-3 years	$1,185,776	Unable to quantify	None	None	Minor
				Inland Bathy	QL0B	2-3 years	$564,617	$74,310	Moderate	Moderate	Moderate
				Nearshore Bathy	keep as QL0B	2-3 years	$928,416	$31,433	Minor	Major	Major
				Offshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 21 – Aviation Navigation	State of South Carolina	60403	Aviation Navigation and Safety	Inland Topo	QL1 HD	Annually	$104,639	$130,325	Minor	Moderate	Moderate
				Inland Bathy	QL0B	Annually	$20,836	Unable to quantify	Moderate	Major	Major
				Nearshore Bathy	I don't know	Annually	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Offshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 22 – Infrastructure Management	State of South Carolina	60404	Infrastructure and Construction Management	Inland Topo	QL1	6-10 years	$1,391,043	$4,093,559	Minor	Moderate	Major
				Inland Bathy	QL0B	6-10 years	$468,664	$48,665	Minor	Moderate	Moderate
				Nearshore Bathy	QL1B	6-10 years	$25,309	$3,480	Minor	Moderate	Major
BU 23 – Urban and Regional Planning	State of South Carolina	60405	Urban and Regional Planning	Inland Topo	QL1	4-5 years	$8,328,386	$961,516	Major	Major	Major
				Inland Bathy	QL0B	6-10 years	$339,200	$429,118	Moderate	Moderate	Major
				Nearshore Bathy	QL1B	6-10 years	$221,668	$233,851	Moderate	Moderate	Moderate
				Offshore Bathy	Cross sections and/or transects meet needs	6-10 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 26 – Education and Basic Research	University of South Carolina	21942	Inland and Coastal Hazards Wetlands Mitigation Education Through GIScience Courses	Inland Topo	QL1 HD	6-10 years	$162,664	$388,815	Major	Major	Major
				Inland Bathy	QL0B	6-10 years	$42,538	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL1B	6-10 years	$7,943	$313	Major	Major	Major
				Offshore Bathy	Order 1a	6-10 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 30 – Maritime and Land Boundary Management	State of South Carolina	60406	Maritime and Land Boundary Management	Inland Topo	QL1	6-10 years	$200,000	$133,543	Moderate	Minor	None
				Inland Bathy	QL0B	6-10 years	$200,000	Unable to quantify	Major	Major	Moderate
				Nearshore Bathy	QL1B	6-10 years	$278,206	Unable to quantify	Moderate	Major	Moderate
				Offshore Bathy	I don't know	6-10 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate

MCA Title: Water Supply and Quality



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Fate and transport of contaminants. Pollution risk mitigation. Runoff and sedimentation analyses. Point- or non-point source pollution modeling. Management of contaminants and marine debris - point, non-point, vessel, and atmospheric pollution; spills; trash.
MCA Title	Water Supply and Quality
MCA ID	60397
Organization Type	State or U.S. Territorial government
Organization Name	State of South Carolina
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL1B	Order 1a
Update Frequency	6-10 years	6-10 years	6-10 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Nice to have	Highly desirable	Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable	Required	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Nice to have	Required
DTM	Required	Highly desirable	Nice to have	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Nice to have	Nice to have	Nice to have	Nice to have
Classified point cloud	Highly desirable	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Nice to have
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Nice to have	Required
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Required
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Highly desirable
Bottom type			Nice to have	Highly desirable
Submerged features			Nice to have	Highly desirable
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Nice to have	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Not required
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Highly desirable
Floating observation/navigation systems			Nice to have	Highly desirable
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Nice to have
Wetlands	Highly desirable	Highly desirable	Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Moderate	Moderate
Cost savings/cost reduction	Major	Minor	Moderate	Moderate
Cost avoidance	Major	Minor	Minor	Moderate
Increased revenues	Minor	None	Minor	Minor
Mission-driven performance improvements	Major	Minor	Minor	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Moderate	Minor

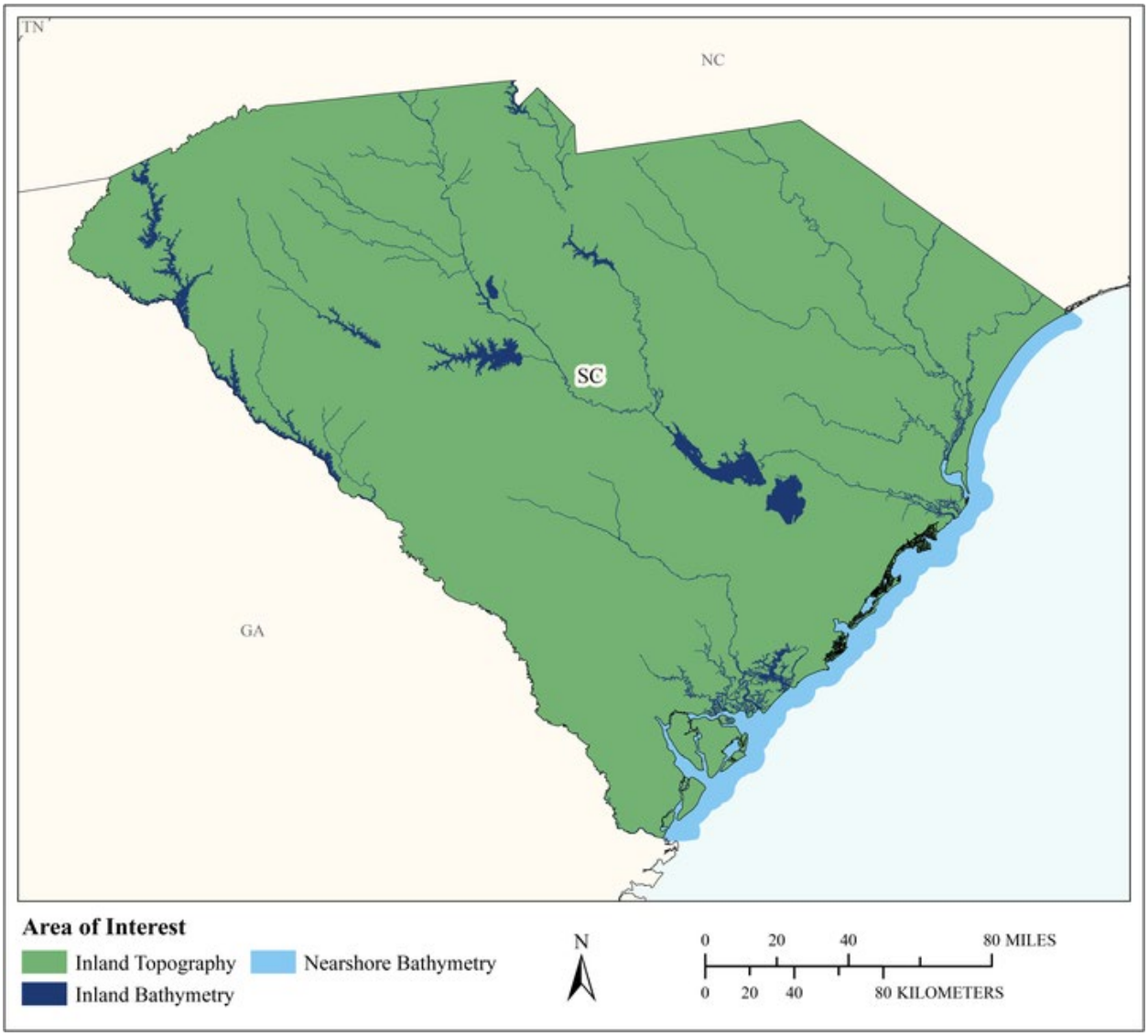
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	Moderate	Moderate
Improved customer experience	Major	Minor	Moderate	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	Minor
Environmental	Major	Moderate	Moderate	Minor
Public safety, including life and property	Major	Minor	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide		None		
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		None		
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$171,625		Annual dollars saved/ realized	$742,465		Annual dollars saved/ realized	$39,944		Annual dollars saved/ realized	$0
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$45,970		Annual dollars saved/ realized	$77,590		Annual dollars saved/ realized	$65,803		Annual dollars saved/ realized	$2
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate			Minor		
Environmental	Major			Major			Moderate			Major		
Public safety, including life and property	Moderate			Moderate			Moderate			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes		Yes	Yes
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes	Yes	
Hydrologic Flow Accumulation Grids	Yes	Yes	Yes	
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Riverine Ecosystem Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Stream channel analysis and mapping. Stream bank erosion analysis. Aquatic and terrestrial species habitat management. Environmental management.
MCA Title	Riverine Ecosystem Management
MCA ID	60398
Organization Type	State or U.S. Territorial government
Organization Name	State of South Carolina
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL1B	
Update Frequency	6-10 years	6-10 years	6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable		Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Required		Highly desirable	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Required	Required		Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	
DTM	Required	Highly desirable	Required	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Nice to have	Nice to have	
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Not required	Nice to have	
Full waveform	Nice to have	Nice to have	Highly desirable	
Bathymetric Attributed Grid (BAG)		Not required	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Nice to have	
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Highly desirable	Required	
Underwater videography			Not required	
Bottom texture			Highly desirable	
Bottom type			Required	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Nice to have	Nice to have	Not required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates	Nice to have	Nice to have	Highly desirable	
Land use/land cover	Highly desirable	Nice to have	Required	
Wetlands	Highly desirable	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have	Not required	
Cultural resources	Nice to have	Nice to have	Not required	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	
Cost savings/cost reduction	Moderate	Minor	Moderate	
Cost avoidance	Moderate	None	None	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	None	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Minor	

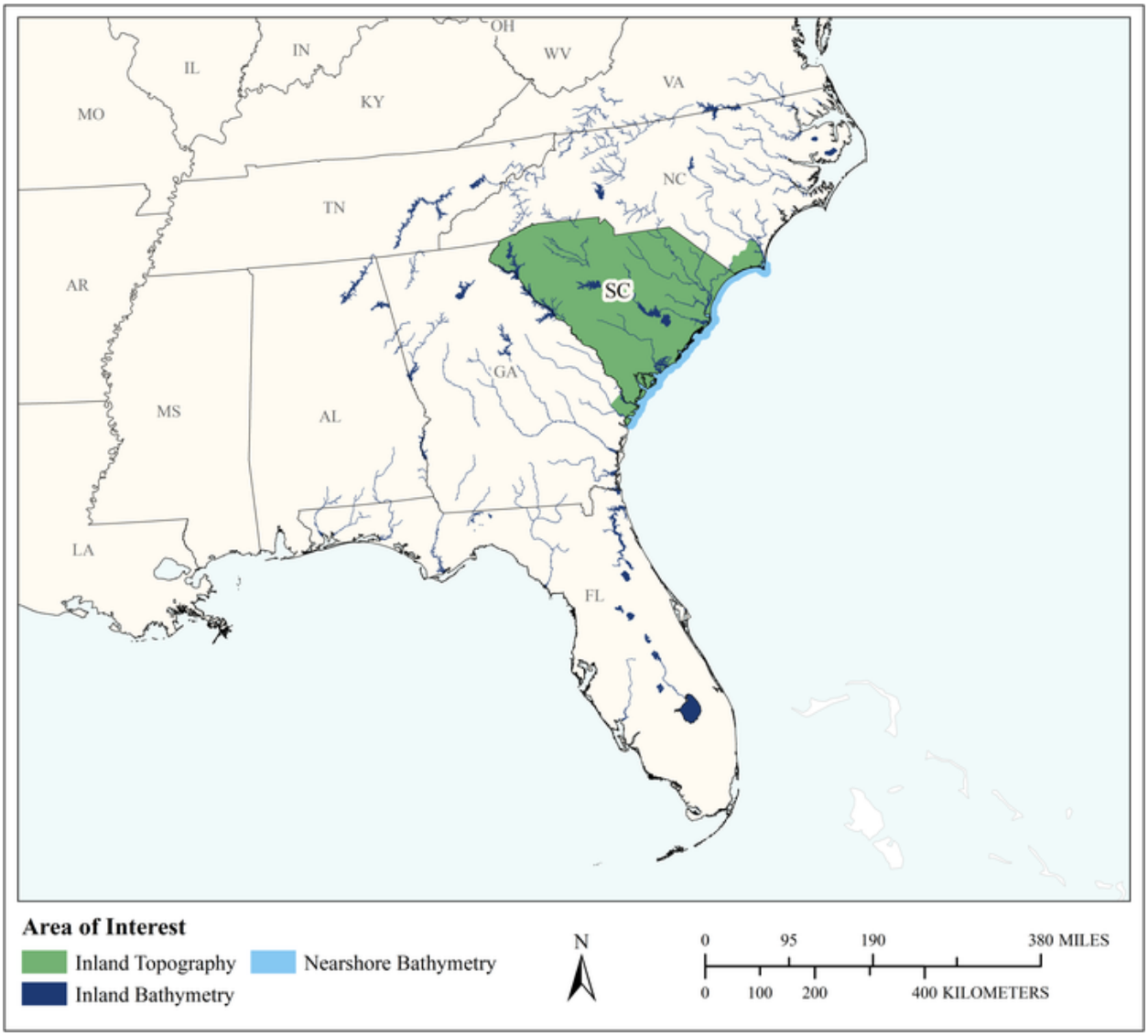
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Moderate	Minor	
Improved customer experience	Major	Minor	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Minor	
Environmental	Major	Major	Moderate	
Public safety, including life and property	Major	Moderate	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$47,378		Annual dollars saved/ realized	$25,221		Annual dollars saved/ realized	$121,142			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$4,732		Annual dollars saved/ realized	$1,778		Annual dollars saved/ realized	$92,571			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate					
Environmental	Major			Major			Moderate					
Public safety, including life and property	Major			Major			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps			Yes	
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints			Yes	
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Coastal Hazard Modeling and Mapping



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Area split by varying quality level or update frequency	One or more Hydrologic Units (HUC8s)	Custom description	
Sub Area Requirements	South Carolina and the adjacent coastal counties in North Carolina and Georgia		South Carolina and the adjacent coastal counties in North Carolina and Georgia	

MCA Description	Response
Mission Critical Activity	Coastal hazard modeling and mapping. Analysis of coastal erosion and inundation. Hurricane storm surge and wind damage modeling and assessment. Geologic mapping and analysis. Monitoring sand as a local resource. Seabed resources. Alternate energy development – solar, tidal, wind, wave, and ocean current. Flood risk modeling and mapping of riverine and coastal areas. Development of 3D visualizations to help students understand the Earth they live on.
MCA Title	Coastal Hazard Modeling and Mapping
MCA ID	21491
Organization Type	Academic or Not-for-Profit
Organization Name	Coastal Carolina University
Sub-Agency or Division	
Organization Mission	Basic and Applied Research Graduate, Undergraduate and Public Education
Program Name	Burroughs and Chapin Center for Marine and Wetland Studies Department of Coastal and Marine Systems Science
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Tertiary Business Use	BU 12 - Renewable Energy Resources

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Coastal and Marine subaqueous habitat from 1-100's of meters

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL1B	
Update Frequency	6-10 years	6-10 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI	The broader inland surface is less sensitive for repetition; it serves as base for flow modeling. Along the coast and nearshore resolution and frequency needs increase substantially. Coastal counties need QL1, rest of state OK with QL2. Coastal counties are Horry, Georgetown, Charleston, Colleton, Beaufort, and Jasper.		Resolution needs regionally are generally lower. Site specific (County Scale) data needs require higher resolution but locations where this is needed are often driven by storm-events and so it will be hard to say high resolution its nit needed to provide adequate pre-conditions regionally.	
Acceptable Horizontal Error	Less than 20 cm	Up to 2 meters	Up to 1 meter	
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 40 cm	
How far onshore needed			500 meters inland	
How far down the beach profile needed	Base of the shoreface		Base of Shoreface	
Tide correction requirement			MHW	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required

Hydrologic Processing Required	Response
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Highly desirable		Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Required	Highly desirable	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level		Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	
DTM	Highly desirable	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Nice to have	Nice to have	
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Not required	Nice to have	
Breaklines required for standard hydro-flattening	Not required	Not required		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Not required	Required	Required	
Ground control/ground truthing	Highly desirable	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Required	
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Required	
Underwater videography			Nice to have	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Required	
Geologic and seismic data	Highly desirable	Required	Required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Highly desirable	
Routes			Highly desirable	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Not required	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Highly desirable	Highly desirable	Nice to have	
Wetlands	Highly desirable	Highly desirable	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	County Level (funded) Lidar USGS-NOAA-NASA Lidar of shorelines	Best available	Most of our focus uses our own nearshore multi beam or dense single beam bath. Regionally available bathy is helpful for regional character but not time series or change for nearshore areas. National shorelines (USGS Digital Shorelines) are particularly useful albeit limited to a specific contour and fairly few survey dates.	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes	Yes	Yes	
NCEI				
Open Topography				
NOAA nautical charts		Yes		
USACE navigation charts				
USGS Inland Waters server		Yes		
USGS data series				
Marine Minerals Program GIS				
State Repositories				

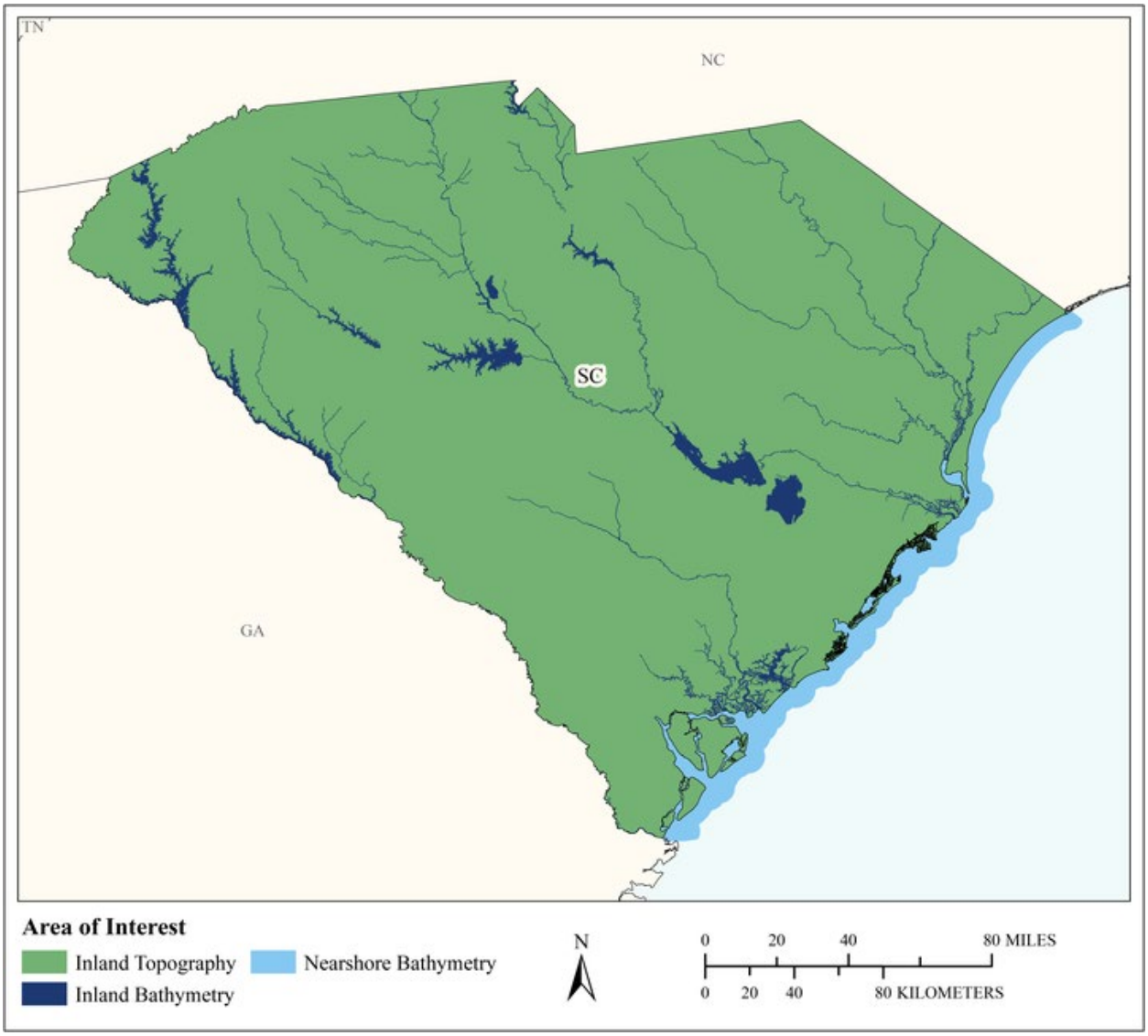
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
State repositories used				
Other	Yes			
Other description	County Funded LIDAR flights			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Major	Minor	
Cost savings/cost reduction	Moderate	Moderate	None	
Cost avoidance	Moderate	Minor	None	
Increased revenues	None	None	None	
Mission-driven performance improvements	Moderate	Minor	None	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate	Minor	
Improved response or timeliness	Moderate	Moderate	Minor	
Improved customer experience	Moderate	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major	Major	
Environmental	Major	Major	Major	
Public safety, including life and property	Major	None	None	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Cost avoidance	Minor	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Increased revenues	None			Minor	Unable to provide		None					
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,595,850		Annual dollars saved/ realized	$684,818		Annual dollars saved/ realized	$271,267			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$278,988		Annual dollars saved/ realized	$401,473		Annual dollars saved/ realized	$458,881			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major					
Education or outreach description	Increased detail and characterization ion complexity and change to students and stakeholders.											
Environmental	Moderate			Major			Major					
Environmental description	Increased resolution of habitat and critical natural resources											
Public safety, including life and property	Moderate			Minor			None					
Public safety, including life and property description	Improved boundary conditions for modeling efforts and aid in location hydrodynamic and other observing systems to characterize change.											
Other	Improved modeling											
Other benefits	Moderate											
Other description	The primary benefits are in: 1) improved too/bathymetric surface to constrain and influence ocean/wave/hydrologic modeling and 2) spatial context for more localized high resolution (often event driven) surveys and data sets collected by our organization											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours				
Hillshades				
Slope maps			Yes	
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Forest Resources Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Forest health assessment. Determination of standing inventory of forest resources. Prescribed burn planning. Analysis of carbon stocks for trade. Harvest systems planning.
MCA Title	Forest Resources Management
MCA ID	60399
Organization Type	State or U.S. Territorial government
Organization Name	State of South Carolina
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL1B	
Update Frequency	2-3 years	6-10 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Not required		Highly desirable	Nice to have
Entire AOI under same environmental conditions	Required	Required	Highly desirable		Required	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Not required	Not required	
DTM	Required	Not required	Not required	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Highly desirable	Required	
Classified point cloud	Required	Highly desirable	Required	
Edited/cube XYZ		Not required	Not required	
Full waveform	Nice to have	Nice to have	Not required	
Bathymetric Attributed Grid (BAG)		Nice to have	Not required	
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Not required	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Not required	
Ground control/ground truthing	Highly desirable	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Not required	
Subbottom characteristics			Not required	
Geologic and seismic data	Nice to have	Not required	Not required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Not required	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Required	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates	Nice to have	Required	Required	
Land use/land cover	Required	Required	Required	
Wetlands	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Highly desirable	Required		
Landmark features	Nice to have	Nice to have	Not required	
Cultural resources	Highly desirable	Nice to have	Not required	
Coastal and riverine structures	Nice to have	Required	Not required	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	I don't know	
Cost savings/cost reduction	Major	Major	I don't know	
Cost avoidance	Major	Major	I don't know	
Increased revenues	Minor	Moderate	I don't know	
Mission-driven performance improvements	Major	Major	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	I don't know	

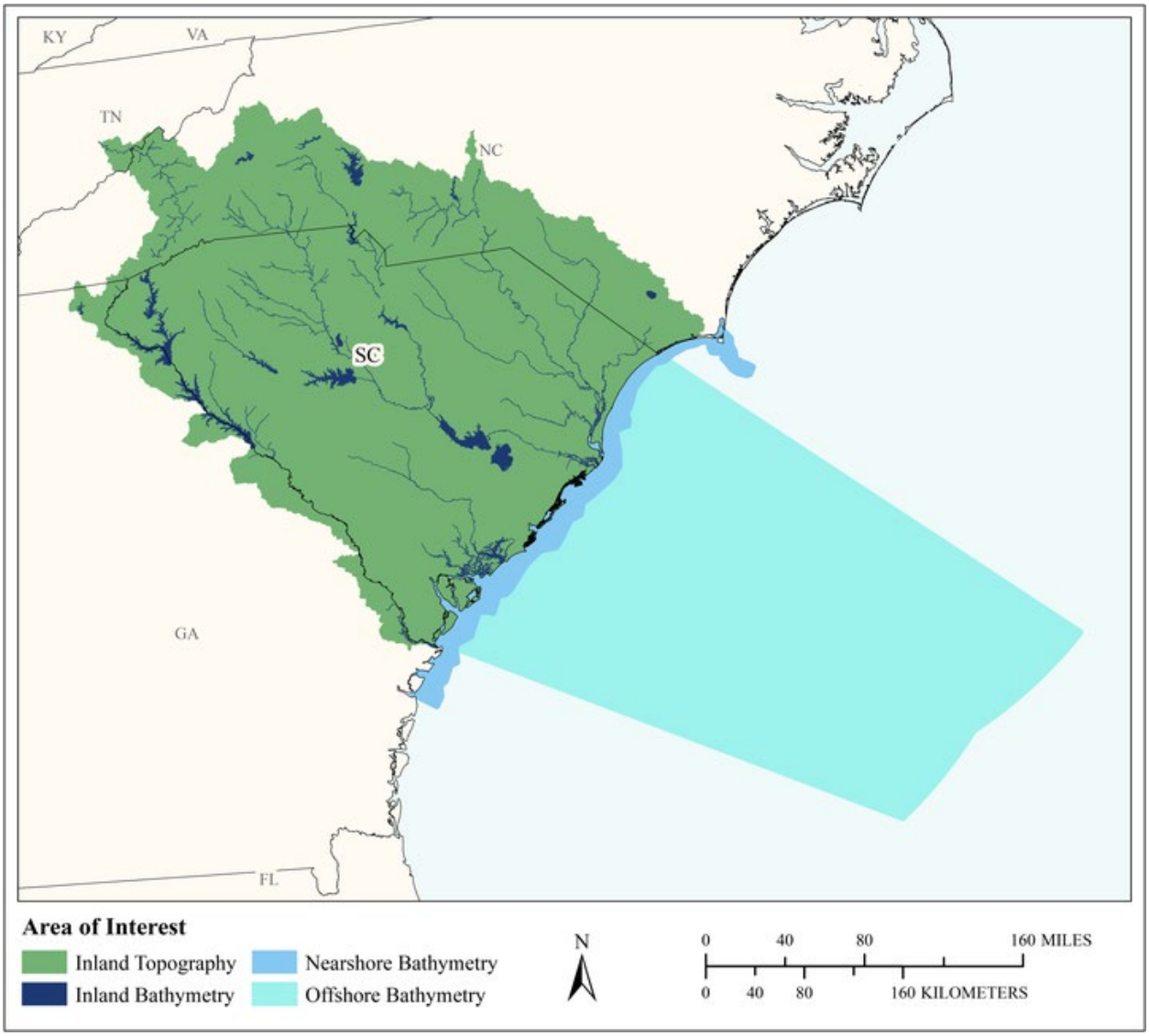
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	Major	I don't know	
Improved customer experience	Moderate	Major	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Major	Major	
Environmental	Major	Major	Major	
Public safety, including life and property	Moderate	Major	I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$250,000									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$177,410									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major					
Environmental	Major			Major			Major					
Public safety, including life and property	Major			Major			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes	Yes	
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes		Yes	
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Management of Land and Water Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Area split by varying quality level or update frequency	One or more Hydrologic Units (HUC8s)	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Custom description
Sub Area Requirements	HUC8s that cover South Carolina		South Carolina and the adjoining counties in Georgia and North Carolina	South Carolina out to the EEZ

MCA Description	Response
Mission Critical Activity	Holistic management of land and water resources to support the state's economy and environment. Wildlife conservation, geological and hydrological management, law enforcement and marine resources. Fisheries management, flood mapping, and geology are included. BU 09 - Fisheries Management and Aquaculture and BU 20 - Marine and Riverine Navigation and Safety are additional Business Uses.
MCA Title	Management of Land and Water Resources
MCA ID	21485
Organization Type	State or U.S. Territorial government
Organization Name	SCDNR Land, Water, and Conservation Division
Sub-Agency or Division	
Organization Mission	Provide reliable scientific information to decision makers about natural resources. Our mission is to serve as the principal advocate for and steward of South Carolina's natural resources.
Program Name	Wildlife and Freshwater Fisheries, Marine Resources Division and Land, Water and Conservation
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	BU 01 - Water Supply and Quality
Tertiary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Cultural resources and archaeology remnants such as cannon balls, brick works, posts, etc. Also, small hydrographic features, e.g. very small channels. Trees, docks, and dams.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required

Inland Bathy Feature Size Requirements	Response
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	(a) QL1 (b) QL2	QL0B	QL1B	Cross sections and/or transects meet needs
Update Frequency	6-10 years	6-10 years	6-10 years	I don't know, my work is not offshore
Event type(s)				
Quality Level and/or update frequency variability across AOI	Coastal counties need QL1, QL2 for the rest of the State		Areas of frequent change, sensitive environmental areas, and areas of urban interface would require higher quality and more frequency	EEZ nice to have, most important to go out to 8nm offshore
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	I don't know
Acceptable Vertical Error	Up to 10 cm	Up to 40 cm	Up to 50 cm	I don't know
How far onshore needed			To cover the beach slope	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			I don't know	I don't know
Cross sections and/or transects meet needs		Partial		Yes
Cross section/transect requirement		Not sure about longitudinal sampling density. But it should be greater in areas where there is more boat traffic or sensitive environmental areas.		

Hydrologic Processing Required	Response
Hydro-flattening	Required

Hydrologic Processing Required	Response
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Required	Nice to have	Highly desirable	Required	Highly desirable
Entire AOI under same environmental conditions	Required	Required	Required	Required	Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Highly desirable	Highly desirable	Required	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable	Highly desirable	Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	I don't know	I don't know	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Nice to have	Highly desirable
DTM	Required	Required	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Required	Required	Required	Required
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Highly desirable	Nice to have	Nice to have
Full waveform	Highly desirable	Highly desirable	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Required	Nice to have	Highly desirable

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Highly desirable
Tide Predictions			Nice to have	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Highly desirable
Intensity imagery/sidescan imagery	Required	Required	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Required	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Required
Nautical and/or navigation charts			Nice to have	Nice to have
Acoustic imagery of the seafloor			Highly desirable	Required
Aerial and/or satellite imagery	Highly desirable	Required	Highly desirable	Not required
Underwater videography			Not required	Nice to have
Bottom texture			Nice to have	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Highly desirable	Required	Nice to have	Highly desirable
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Not required	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Not required	Not required
Offshore cadastral			Not required	Not required
Lease areas			Not required	Not required
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Required	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Not required
Wetlands	Highly desirable	Required	Nice to have	Not required
Estuaries			Nice to have	Not required
Inland surface water features	Required	Required	Nice to have	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Required	Nice to have	
Cultural resources	Highly desirable	Highly desirable	Nice to have	
Coastal and riverine structures	Highly desirable	Required	Highly desirable	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	All of South Carolina has LiDAR, flown by the county, that was collected between 2008 and 2014. New 2017 LiDAR datasets are in Quality Control. SCDNR LWCD GIS users use DEMs, Point Cloud data, and Terrain models for geologic mapping, H&H modeling, cultural resources, and ecological research.	Old topo or site specific cross sections	Anything available from individual sources, such as universities. Limited in spatial and temporal extent. Drone based data acquisition by University	Digital Coast, university geophysical data
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	Yes
NCEI				
Open Topography				
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts				

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	South Carolina DNR			
Other		Yes	Yes	Yes
Other description		University provided data.	Universities	University
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	None	I don't know
Cost savings/cost reduction	Major	Minor	None	I don't know
Cost avoidance	Major	Minor	None	I don't know
Increased revenues	Minor	Minor	None	I don't know
Mission-driven performance improvements	Major	Minor	None	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	None	I don't know
Improved response or timeliness	Major	Minor	None	I don't know
Improved customer experience	Major	Minor	None	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor	None	I don't know
Environmental	Major	Minor	Minor	I don't know
Public safety, including life and property	Major	Minor	None	I don't know

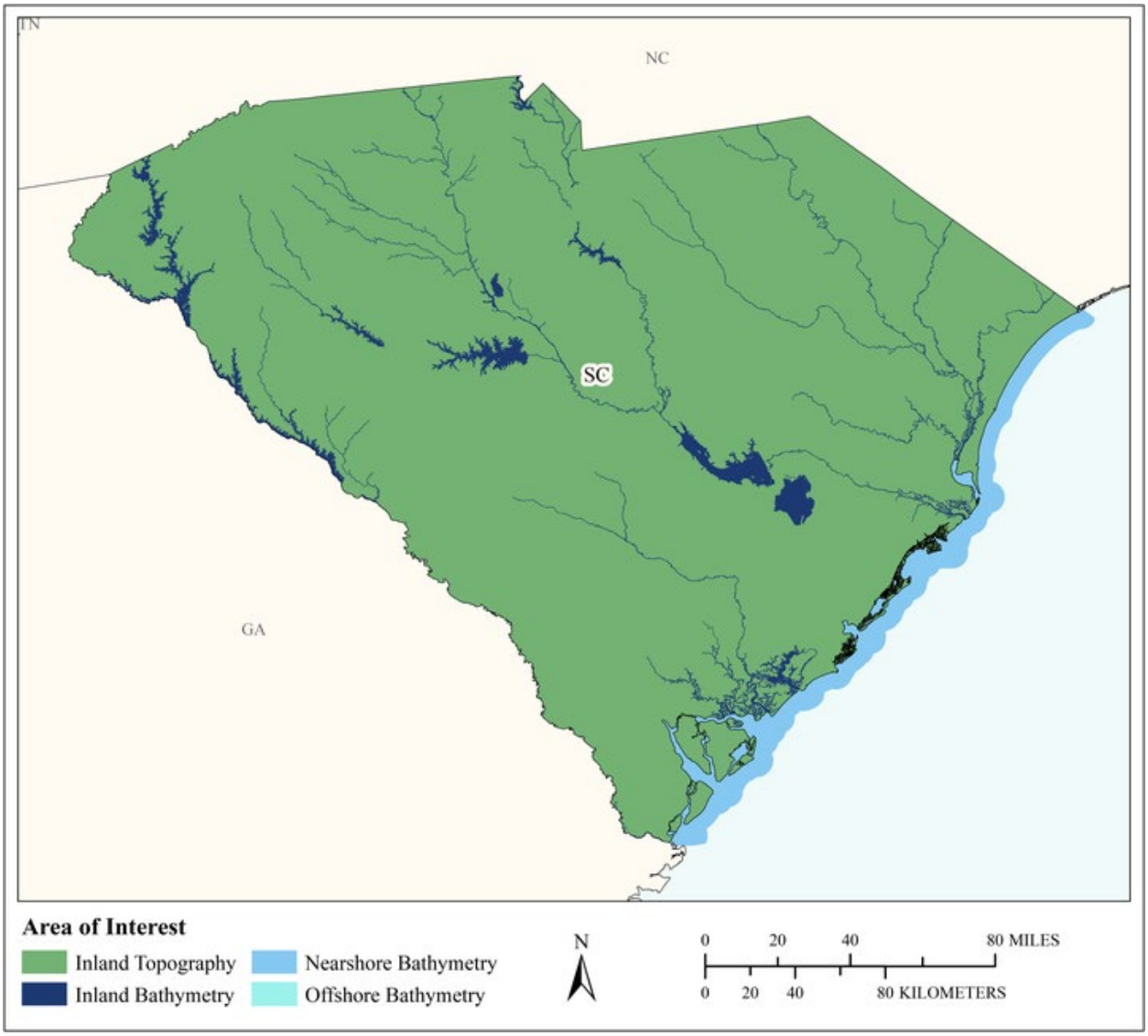
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Time savings description	Significant hours could be saved by inspecting 3D data in the office before planning field work in almost all sections for which I work, especially geology and hydrology. Significant hours saved from mapping some geology from 3D topographic data. Significant hours saved for project planning before field work.			Plan hydrologic and geologic investigations. Possibly reveal geology under waterbodies via topographic features. This would be the major benefit, because right now data are sparse and must be pieced together from many sources. Don't do permitting or delineation.			More targeted field work. Modeling and mapping coastal processes would become possible. No longer piecing together disparate data sources would be great.					
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction description				Would reduce field work or data processing required to find and manipulate data in waterways.			Not having to complete focused and expensive surveys by boat.					
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Cost avoidance description	Already processed data lets us get right to the products we need to use for our operations. Flood mitigation program contracts FEMA flood mapping. Would benefit greatly in this category.			All data in once plus is huge benefit. Possibly benefit to flood modeling?. Navigation in lakes and rivers improved possibly.			Modeling of storm surge, coastal change, etc.					
Increased revenues	Minor	Unable to provide		None			None			I don't know	Unable to provide	
Increased revenues description	Could increase competitiveness in getting grants in which topographic data are key components.											
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements description	Mission is to provide best possible data and information to decisions makers, so the better data, the better we achieve our mission. More effective geologic mapping, hydrologic modeling, and natural and cultural resources monitoring.			Expand investigations into water bodies where that hasn't really been done. Could improve effectiveness in long term. See above. Expand investigations into water bodies or using data from water bodies where that hasn't really been done.			Don't even have these data, so this would be a huge improvement. Improve coastal mapping and operations for all groups, from geology to flood mitigation to cultural resources.					
Future annual operational benefits added during validation		Annual dollars saved/ realized	$416,700		Annual dollars saved/ realized	$95,100						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Value added to products or services description	Geologic mapping products, educational and recreational resources, better hydrologic models. Accuracy matters for a number of our efforts.			Improved navigation in water bodies is a huge plus. Navigation charts or apps for lakes and rivers.								
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness description	Especially in response to major flooding events, hurricanes, etc. Improved educational information. Consultants and other agencies use our geologic and hydrologic information for permitting. Especially for our flood and geologic hazard modeling.			Possibly for navigating waterways during rescues. Would be very helpful for river and lake users. See above.								
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Improved customer experience description	This seems more like a benefit to be addressed by our own IT group and infrastructure. Not sure the data itself will improve our current situation. Not sure our customers always understand the quality of the data enough for this to be a major benefit.											
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$70,000		Annual dollars saved/ realized	$23,771						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate			Moderate			I don't know		
Education or outreach description	Showing products made from the data to engage customers and public is always good for our program.			Better education about how rivers and waterbodies work, build up sediment, etc.			Better outreach materials					
Environmental	Major			Moderate			Major			I don't know		
Environmental description	Improved data quality is improved decision making, which improves the environment.			Better data means better decisions, which means better for environment								
Public safety, including life and property	Major			Moderate			Moderate			Major		
Public safety, including life and property description	Especially in regards to geologic, climatic, and flood hazards.			Protecting property and life, especially with navigation related incidents and possibly flood modeling.								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes		Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes	Yes	Yes	Yes
Curvature maps				
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Wildlife and Habitat Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation planning for wildlife refuges and marine sanctuaries. Conservation of critical habitats. Management of diverse migratory bird habitats, coral reef and coral communities, marine mammals, protected fish species, and trust resources.
MCA Title	Wildlife and Habitat Management
MCA ID	60400
Organization Type	State or U.S. Territorial government
Organization Name	State of South Carolina
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL1B	Special Order
Update Frequency	6-10 years	6-10 years	6-10 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 2 meters	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DTM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Nice to have	Nice to have	Highly desirable
Classified point cloud	Highly desirable	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Highly desirable
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Highly desirable	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Not required	Nice to have
Lease areas			Not required	Nice to have
Fixed obstructions			Nice to have	Highly desirable
Floating observation/navigation systems			Nice to have	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Nice to have
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Highly desirable	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Nice to have	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Minor	Moderate
Cost savings/cost reduction	Major	Minor	Minor	Minor
Cost avoidance	Major	Minor	Moderate	Major
Increased revenues	None	Minor	None	None
Mission-driven performance improvements	Moderate	Moderate	Moderate	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate	Minor	Minor

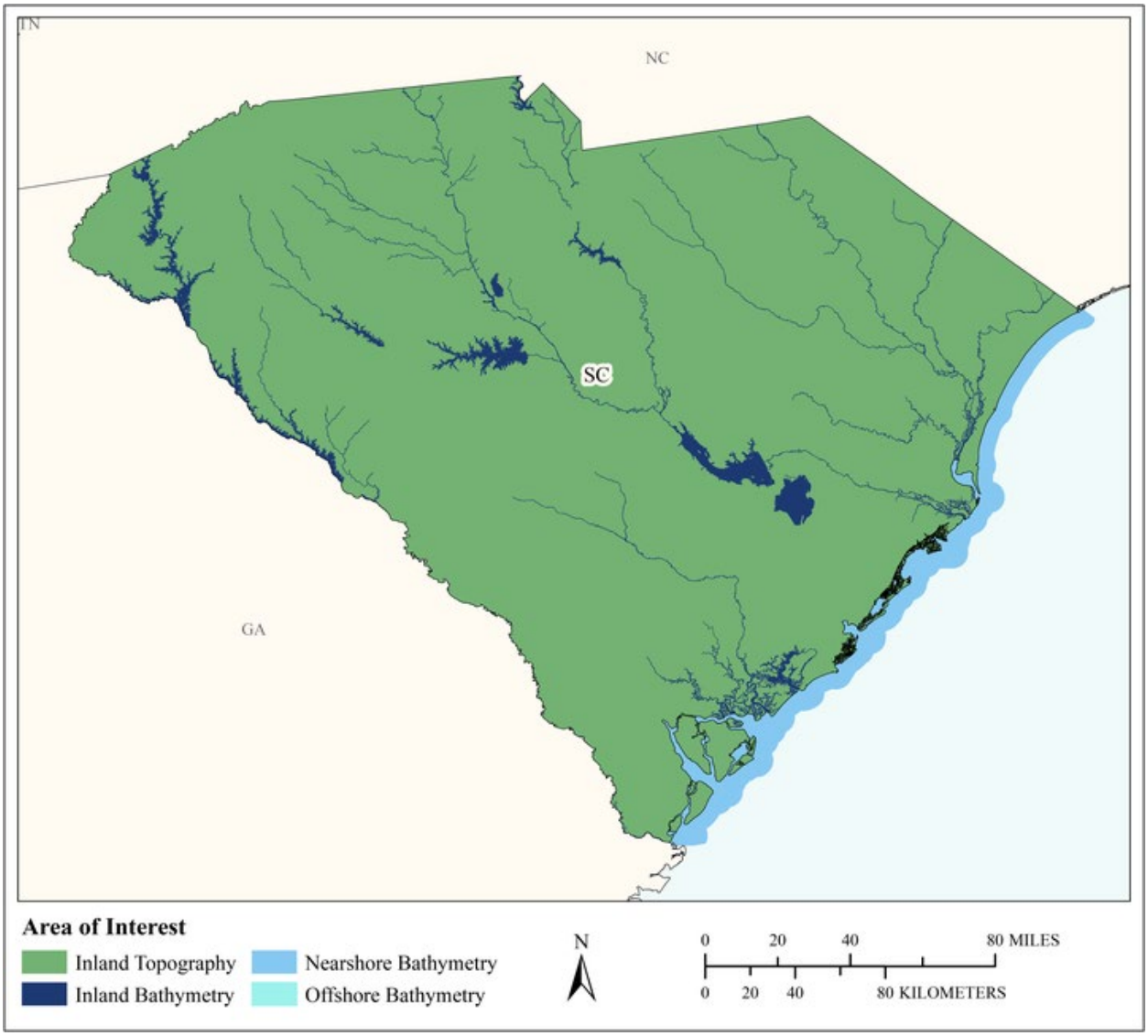
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Minor	Minor	Minor	Minor
Improved customer experience	Minor	Moderate	Minor	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Moderate	Minor	Minor
Environmental	Moderate	Moderate	Moderate	Major
Public safety, including life and property	Minor	Minor	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$416,700		Annual dollars saved/ realized	$95,100		Annual dollars saved/ realized	$1,199		Annual dollars saved/ realized	$0
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$700,000		Annual dollars saved/ realized	$23,771		Annual dollars saved/ realized	$70		Annual dollars saved/ realized	$0
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate			Moderate		
Environmental	Major			Moderate			Major			Major		
Public safety, including life and property	Moderate			Moderate			Moderate			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes			Yes
Curvature maps				
Cross sections	Yes			Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Fisheries Management and Aquaculture



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Management of fisheries. Sustainable aquaculture.
MCA Title	Fisheries Management and Aquaculture
MCA ID	60401
Organization Type	State or U.S. Territorial government
Organization Name	State of South Carolina
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL1B	Special Order
Update Frequency	2-3 years	6-10 years	6-10 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Nice to have	Nice to have	Required	Nice to have
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Required	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Required
DTM	Required	Highly desirable	Highly desirable	Nice to have
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Nice to have	Highly desirable	Nice to have
Classified point cloud	Highly desirable	Nice to have	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Nice to have
Tide Predictions			Not required	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Highly desirable	Required
Ground control/ground truthing	Required	Highly desirable	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Nice to have	Required
Acoustic imagery of the seafloor			Highly desirable	Required
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Required
Underwater videography			Nice to have	Highly desirable
Bottom texture			Nice to have	Required
Bottom type			Highly desirable	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Highly desirable	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Required
Floating observation/navigation systems			Nice to have	Required
Shorelines – current, historic, change rates	Required	Highly desirable	Highly desirable	
Land use/land cover	Required	Highly desirable	Nice to have	Nice to have
Wetlands	Required	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Highly desirable
Inland surface water features	Required	Required	Nice to have	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Not required	
Coastal and riverine structures	Required	Highly desirable	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	Moderate
Cost savings/cost reduction	Major	Moderate	Major	Minor
Cost avoidance	Moderate	Moderate	Minor	Minor
Increased revenues	Moderate	Moderate	Minor	None
Mission-driven performance improvements	Major	Major	Moderate	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Minor	Moderate

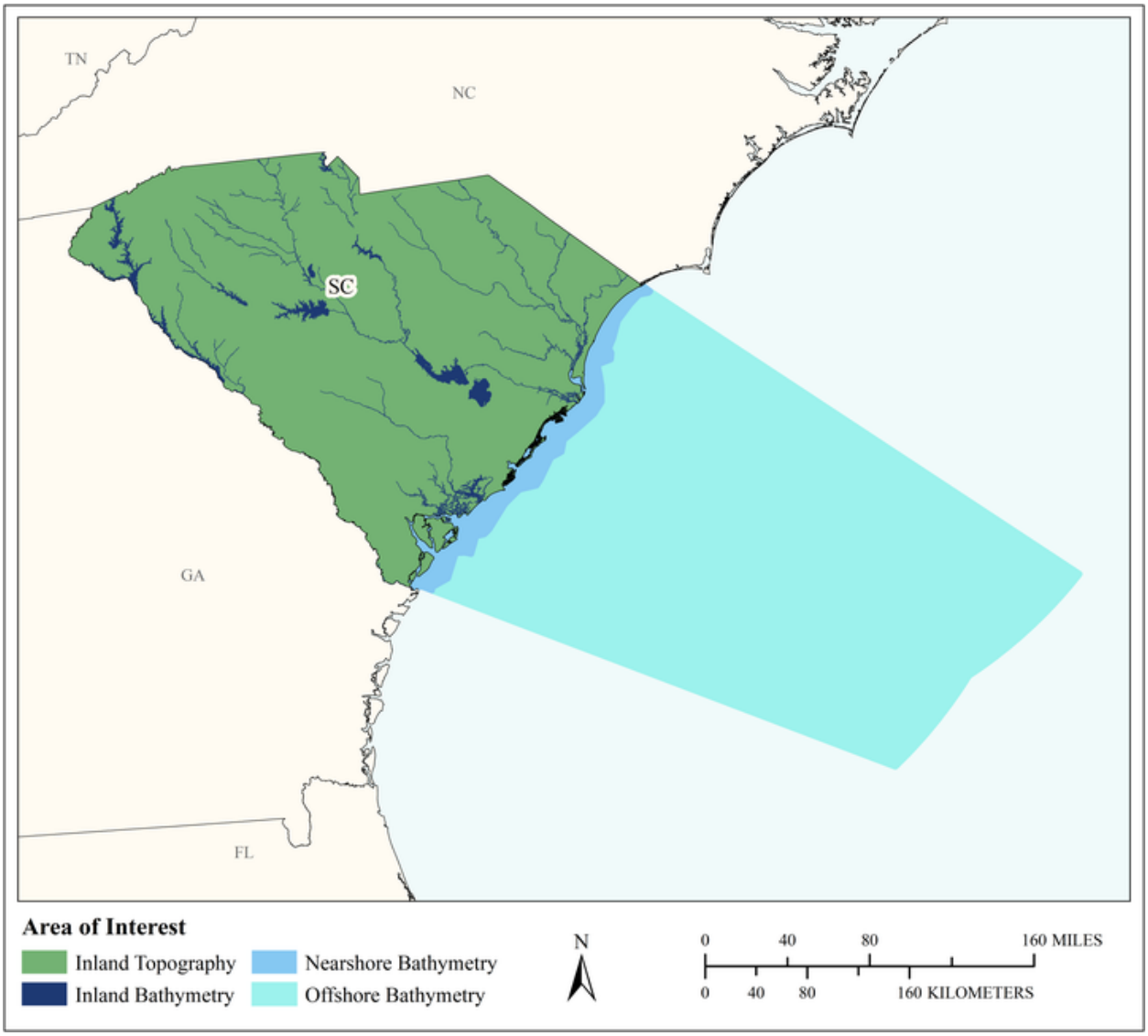
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major	Moderate	Minor
Improved customer experience	Moderate	Major	Minor	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Moderate	Moderate
Environmental	Major	Moderate	Moderate	Minor
Public safety, including life and property	Moderate	Minor	Minor	None

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		None		
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		None		
Increased revenues	Minor	Unable to provide		None			Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$416,700		Annual dollars saved/ realized	$95,100		Annual dollars saved/ realized	$190,267			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$70,000		Annual dollars saved/ realized	$23,771		Annual dollars saved/ realized	$13,973			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Moderate			Moderate		
Environmental	Moderate			Major			Major			Moderate		
Public safety, including life and property	Moderate			Moderate			Minor			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes		Yes	Yes
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic Mapping and Analysis



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Nice to have	Nice to have	Nice to have
Geographic Area Requirements	Area split by varying quality level or update frequency	One or more states, territories, or counties	Custom description	Custom description
Sub Area Requirements	South Carolina		All nearshore off South Carolina	South Carolina out to the EEZ

MCA Description	Response
Mission Critical Activity	Geologic mapping and analysis. Onshore or offshore mineral extraction. Modeling and mapping the effects of sea level rise or subsidence. Evaluation of sand and mineral resources. Coastal hazards mitigation. BU 03 – Coastal Zone Management is also a Business Use.
MCA Title	Geologic Mapping and Analysis
MCA ID	21484
Organization Type	State or U.S. Territorial government
Organization Name	South Carolina Dept Natural Resources-Geological Survey
Sub-Agency or Division	
Organization Mission	Provide reliable geologic information to decision makers. The mission of the Land, Water, and Conservation Division of the South Carolina Department of Natural Resources (of whom we are a part) is to provide scientific and reliable information to policy and decision makers and to the public in order to understand, sustain, and protect the State's natural resources for the benefit of all generations. The mission of the Geological Survey is to provide reliable, unbiased scientific information to public and private decision-makers involved with land-use planning, environment, and economic development.
Program Name	Geological Survey
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 11 - Geologic Resource Mining and Extraction
Tertiary Business Use	BU 16 - Sea Level Rise and Subsidence

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Docks, piers, bulkheads, boat landings, seawalls, groins, and living shorelines. Bottom surface underwater.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	(a) QL1 (b) QL2	QL2B	QL3B	I don't know
Update Frequency	4-5 years	Event driven only – Data need to coincide with a specific event.	2-3 years	4-5 years
Event type(s)		Flood		
Quality Level and/or update frequency variability across AOI	Coastal counties need QL1, QL2 for the rest of the State			We are most concerned with offshore areas inside of 8 nautical miles
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	Up to 1 meter	The best horizontal accuracy achievable for the vertical accuracy I need
Acceptable Vertical Error	Up to 10 cm	Up to 40 cm	Less than 10 cm	Less than 1 meter
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MHW	MHW
Cross sections and/or transects meet needs		Partial		Partial
Cross section/transect requirement		Transects located at stream gage locations, highest accuracy possible.		

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Nice to have	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Other				Highly desirable		
Other description				When data are collected following a specific event (i.e. hurricane), concurrent is ideal		
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Nice to have	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Highly desirable	Highly desirable
DTM	Highly desirable	Highly desirable	Highly desirable	Highly desirable

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DEM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Raw point cloud data	Required	Highly desirable	Highly desirable	Highly desirable
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Highly desirable	Highly desirable
Full waveform	Not required	Highly desirable	Highly desirable	Highly desirable
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Nice to have	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Underwater videography			Nice to have	Highly desirable
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Nice to have	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Highly desirable
Fixed obstructions			Nice to have	Highly desirable
Floating observation/navigation systems			Nice to have	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Highly desirable	Highly desirable	Highly desirable	
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Nice to have	Highly desirable	Highly desirable	
Cultural resources	Not required	Highly desirable	Highly desirable	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Lidar 2008-2014 for entire state. QL3	NOAA, USACE, USGS	NOAA, USACE, USGS, BOEM	NOAA, USACE, USGS, BOEM, NOAA Coastal Relief Model
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	Yes
NCEI	Yes	Yes	Yes	Yes
Open Topography				
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts		Yes	Yes	Yes
USGS Inland Waters server		Yes		
USGS data series		Yes		
Marine Minerals Program GIS			Yes	Yes
State Repositories	Yes	Yes	Yes	

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
State repositories used	SCDNR GIS Data Clearinghouse	South Carolina	South Carolina	
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Moderate	Moderate
Cost savings/cost reduction	Moderate	Minor	Moderate	Moderate
Cost avoidance	Moderate	Minor	Moderate	Moderate
Increased revenues	Minor	Moderate	Minor	Moderate
Mission-driven performance improvements	Major	Moderate	Moderate	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Moderate	Moderate
Improved response or timeliness	Major	Moderate	Moderate	Moderate
Improved customer experience	Major	Moderate	Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Moderate	Moderate
Environmental	Major	Moderate	Moderate	Moderate
Public safety, including life and property	Major	Moderate	Moderate	Moderate

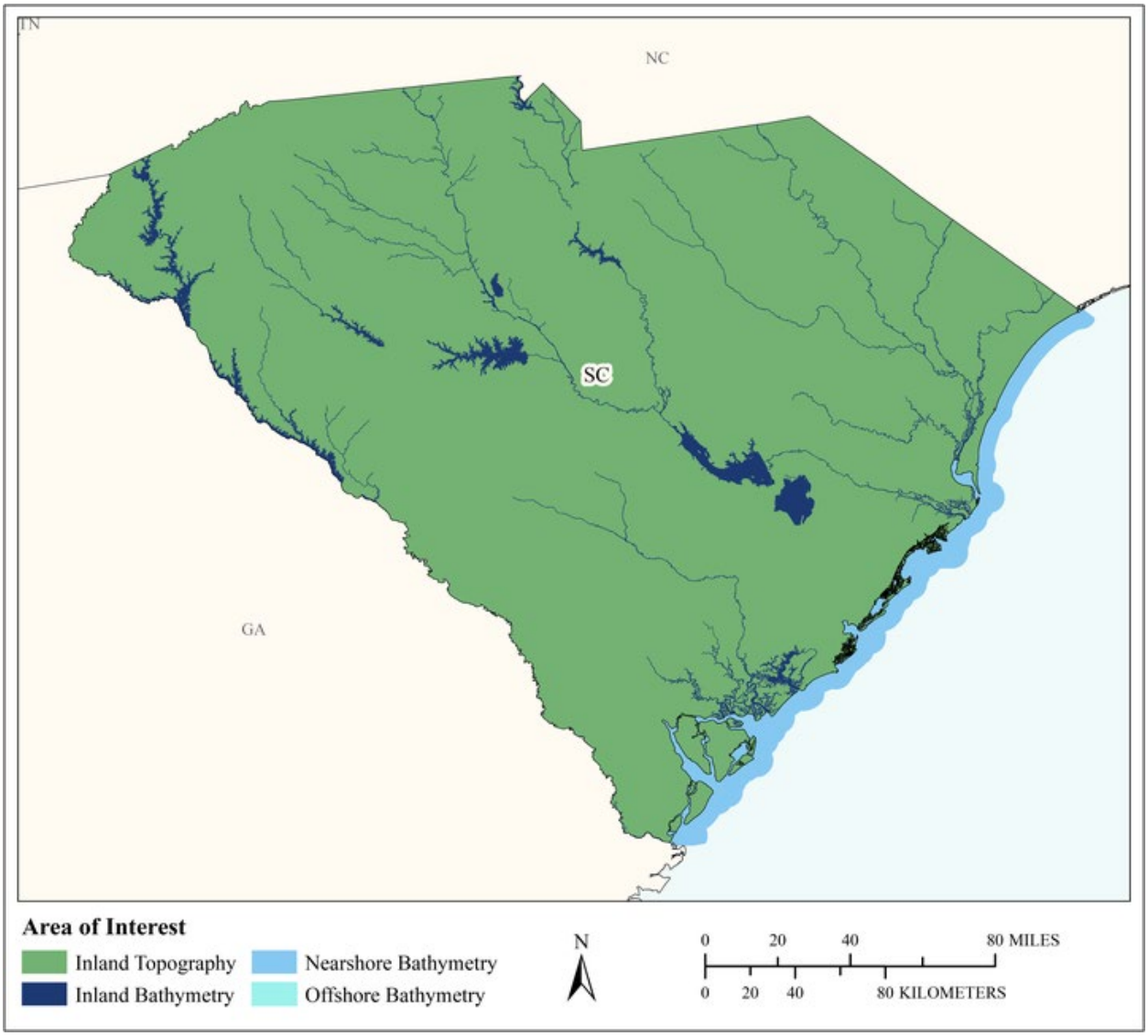
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Annual dollars saved/realized	$1,206	Major	Annual dollars saved/realized	$1,357
Time savings description							Improved bathymetry improves the quality of our final products and interpretations. Having improved bathymetric contours, or the ability to contour improved bathymetric data, helps us with questions about the nature and extent of the Outer Continental Shelf. Having access to high-resolution, continuous bathymetry data save on the front end of project planning. Currently, bathymetric data layers for some areas are pieced together, with some data requiring interpolation and modeling. More than anything, improved nearshore bathymetric data would improve our mapping outputs and interpretations of processes (related to currents and surficial geology) impacting the Outer Continental Shelf.			Using offshore 3D data can involve manipulating and merging large datasets, this would eliminate the need to do so. Being able to identify high-resolution, concurrently collected, large-scale datasets at the onset of a project is valuable. Having better data equates with less time needed to describe more complex efforts to acquire appropriate data. Using data that is already QA/QC'ed would help us save time making sure that all compiled datasets are appropriately combined.		
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction description							3D nearshore bathymetric data isn't something that we would collect on our own.					
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide		Moderate	Annual dollars saved/realized	$302	Major	Unable to provide	
Cost avoidance description							Reducing the need to interpolate raw bathymetric data would save us time.					
Increased revenues	Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Mission-driven performance improvements description							Having access to better bathymetry data would improve our maps, outputs, and interpretations.					
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Value added to products or services description							Maps and deliverables for projects dealing with nearshore and Outer Continental Shelf waters would be improved with better data.					
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Moderate	Annual dollars saved/realized	$302	Moderate	Unable to provide	
Improved response or timeliness description							Advice given to SCDNR Office of Environmental Programs on offshore energy citing activities or sand and gravel extraction would be improved.					
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Annual dollars saved/realized	$302	Moderate	Unable to provide	
Improved customer experience description							Outputs and products delivered to federal agencies would be improved. Data would not be served to the public by SCDNR. Data would likely not be used for creating applications associated with DNR.					
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate			Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Education or outreach description			It's always helpful to be able to point people to the most up-to-date, high resolution data available when they ask, and to be able to use it in our own project deliverables	
Environmental	Moderate	Major	Moderate	Moderate
Public safety, including life and property	Moderate	Major	Moderate	I don't know

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	Yes
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness		Yes	Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Underwater Archaeological Investigations



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conduct or cause to conduct underwater archaeological field/or laboratory investigations at prehistoric and historic sites in the best interest of the State.
MCA Title	Underwater Archaeological Investigations
MCA ID	22156
Organization Type	State or U.S. Territorial government
Organization Name	South Carolina Institute of Archaeology and Anthropology Maritime Research Division
Sub-Agency or Division	
Organization Mission	The mission statement of the Maritime Research Division (MRD) is to preserve and protect South Carolina's maritime archaeological heritage through research, management, and public education and outreach.
Program Name	The MRD oversees compliance of the State Underwater Antiquities Act
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	BU 27 - Recreation
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	A ceramic bead.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	
Rivers and Streams	
Less than 10 ft	
10 - 50 ft	
51 - 100 ft	
101 - 500 ft	
501 - 2,500 ft	
Greater than 2,500 ft	
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	
½ - 1 acre	
1.1 – 2 acres	

Inland Bathy Feature Size Requirements	Response
2.1 – 5 acres	
5.1 – 10 acres	
Greater than 10 acres	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL1B	Order 1a
Update Frequency	6-10 years and certain events.	6-10 years	4-5 years	6-10 years
Event type(s)	Event driven only			
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	I don't know	I don't know	I don't know	I don't know
Acceptable Vertical Error	I don't know	I don't know	I don't know	I don't know
How far onshore needed			I don't know	
How far down the beach profile needed	Below MLLW		I don't know	
Tide correction requirement				
Cross sections and/or transects meet needs	Partial			
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Not required	Not required	Not required	Not required	Not required	Not required
DEM for entire AOI needs to be seamless	Not required	Not required	Not required	Not required	Not required	Not required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM				
DTM				
DEM				
Raw point cloud data				
Classified point cloud				
Edited/cube XYZ				
Full waveform				
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening				
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery				
Ground control/ground truthing				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery				
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data				
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates				
Land use/land cover				
Wetlands				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features				
Bridges/culverts				
Landmark features				
Cultural resources				
Coastal and riverine structures				
Overhead structures				
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Best available	Best available	Best available	Best available
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	Yes
NCEI	Yes	Yes	Yes	Yes
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know	I don't know	I don't know	I don't know
Cost savings/cost reduction	I don't know	I don't know	I don't know	I don't know
Cost avoidance	I don't know	I don't know	I don't know	I don't know
Increased revenues	I don't know	I don't know	I don't know	I don't know
Mission-driven performance improvements	I don't know	I don't know	I don't know	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know	I don't know	I don't know	I don't know

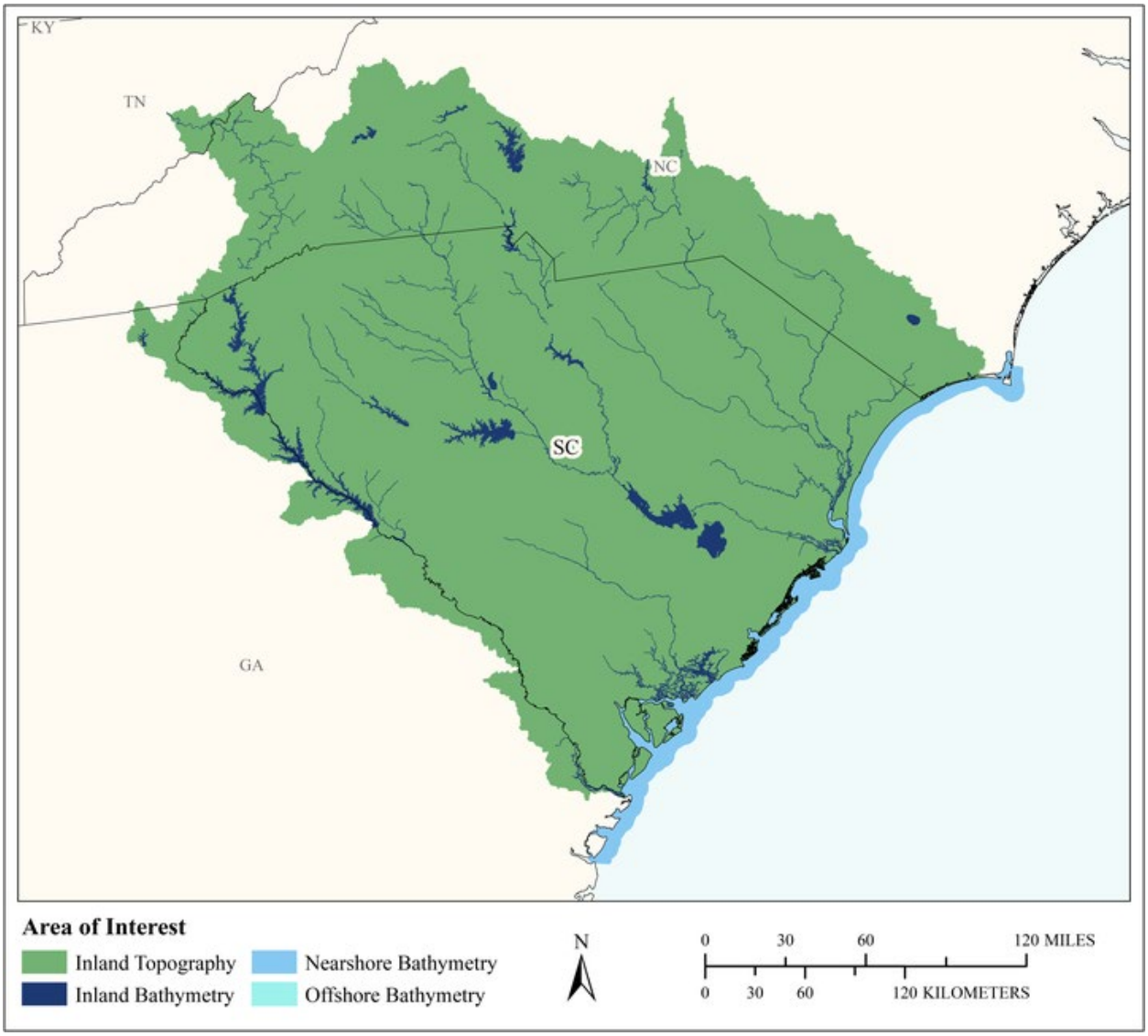
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	I don't know	I don't know	I don't know	I don't know
Improved customer experience	I don't know	I don't know	I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	I don't know	I don't know	I don't know
Environmental	I don't know	I don't know	I don't know	I don't know
Public safety, including life and property	I don't know	I don't know	I don't know	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$60,000		Annual dollars saved/ realized	$20,000		Annual dollars saved/ realized	$20,000			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$30,000									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Minor			Minor		
Environmental	Minor			Minor			Moderate			Moderate		
Public safety, including life and property	Minor			Minor			Minor			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Flood Response



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Highly desirable	Highly desirable	Required
Geographic Area Requirements	One or more Hydrologic Units (HUC8s)	One or more Hydrologic Units (HUC8s)	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements			South Carolina and the adjoining counties in Georgia and North Carolina	

MCA Description	Response
Mission Critical Activity	South Carolina Emergency Management Division (SCEMD) models and maps potential flood risk from the effects of rainfall, riverine and coastal areas, storm surge, sea level rise, and dam failures. Life safety, population dynamics, resource movements, and infrastructure protection are important aspects to emergency management.
MCA Title	Flood Response
MCA ID	1164
Organization Type	State or U.S. Territorial government
Organization Name	SC Emergency Management Division
Sub-Agency or Division	
Organization Mission	The South Carolina Emergency Management Division leads the state emergency management program by supporting local authorities to minimize the loss of life and property from all-hazard events.
Program Name	Emergency Management
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 16 - Sea Level Rise and Subsidence
Tertiary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Standard single family house.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Highly desirable
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have

Inland Bathy Feature Size Requirements	Response
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL1B	Special Order
Update Frequency	6-10 years	6-10 years	4-5 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	I don't know	I don't know	I don't know	Up to 2 meters
Acceptable Vertical Error	I don't know	I don't know	I don't know	Less than 1 meter
How far onshore needed			To cover the beach slope	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MLLW	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Nice to have
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable	Highly desirable	Required	Nice to have	Highly desirable
Entire AOI under same environmental conditions	Required	Required	Required	Required	Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Required	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Nice to have	Nice to have	Highly desirable
DTM	Nice to have	Nice to have	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Nice to have	Highly desirable	Highly desirable	Nice to have
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Not required	Not required	Nice to have
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Not required	Not required	Nice to have
Breaklines required for standard hydro-flattening	Nice to have	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Not required	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Highly desirable
Ground control/ground truthing	Not required	Not required	Nice to have	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	Highly desirable
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Nice to have	Not required
Bottom texture			Not required	Nice to have
Bottom type			Not required	Highly desirable
Submerged features			Not required	Highly desirable
Subbottom characteristics			Not required	Nice to have
Geologic and seismic data	Required	Highly desirable	Nice to have	Nice to have
Water column properties - Physical			Not required	Nice to have
Water column properties - Chemical			Not required	Nice to have
Water column properties - Biological			Not required	Nice to have
Currents			Not required	Highly desirable
Tide/wave heights			Highly desirable	Required
Sea ice conditions			Not required	Nice to have
Habitat distribution and classification			Nice to have	Required
Boundaries			Not required	Nice to have
Routes				Nice to have
Offshore cadastral			Highly desirable	Nice to have
Lease areas			Not required	Nice to have
Fixed obstructions			Highly desirable	Nice to have
Floating observation/navigation systems			Highly desirable	Nice to have
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Highly desirable	Highly desirable	Required	Nice to have
Wetlands	Highly desirable	Highly desirable	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Highly desirable		Required	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Not required	Highly desirable	
Cultural resources	Not required	Not required	Nice to have	
Coastal and riverine structures	Nice to have	Nice to have	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Currently using USGS 30m DEM, available for download from website.	University data where available, some data from flood studies	University data, NOAA	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast			Yes	
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server		Yes		
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other		Yes	Yes	
Other description		Local university	University, NOAA	
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available	None	Minor
Cost savings/cost reduction	Major	Inland bathy data not available	None	Minor

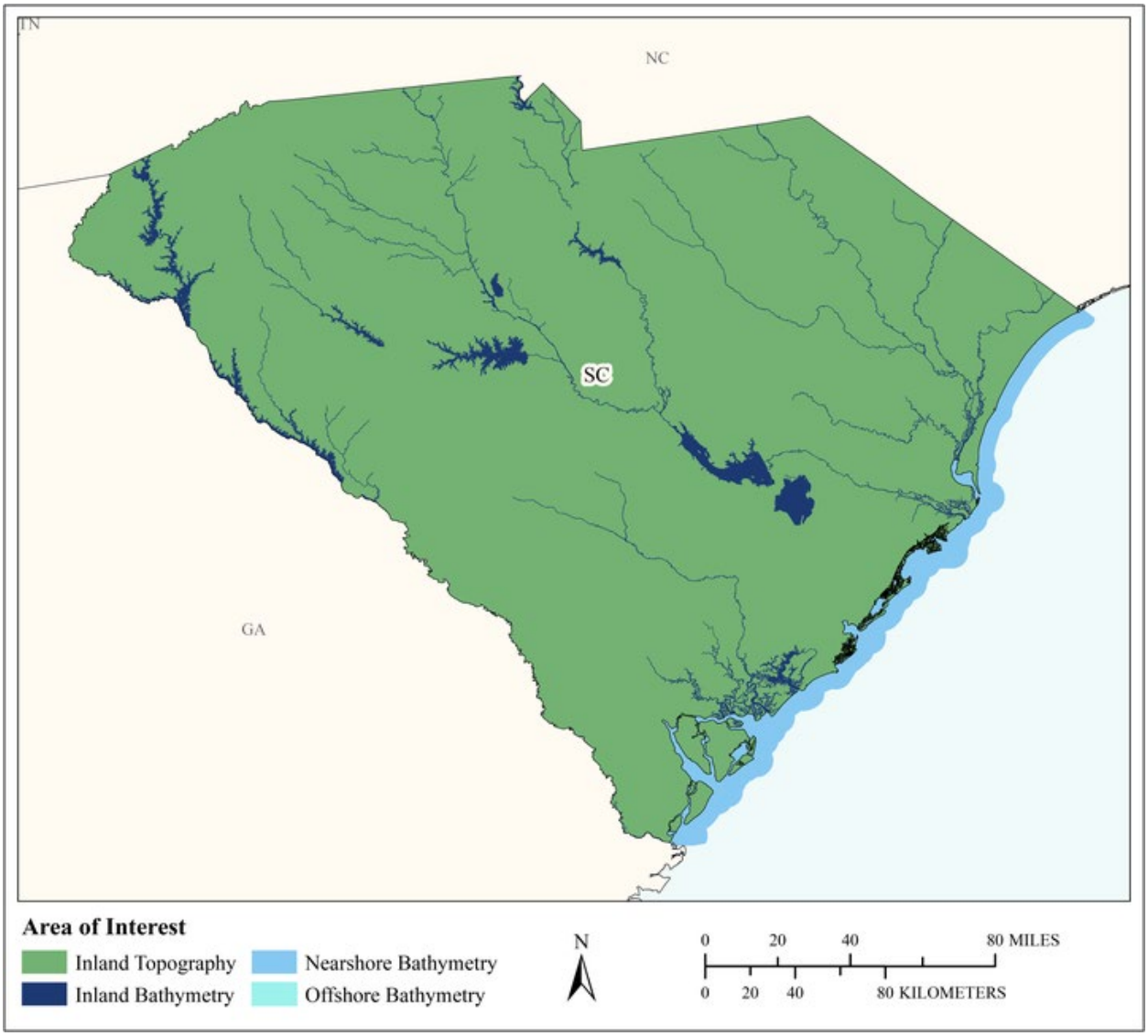
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost avoidance	Major	Inland bathy data not available	None	Moderate
Increased revenues	None	Inland bathy data not available	None	Minor
Mission-driven performance improvements	None	Inland bathy data not available	None	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None	Inland bathy data not available	None	Moderate
Improved response or timeliness	None	Inland bathy data not available	None	Major
Improved customer experience	None	Inland bathy data not available	None	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	Inland bathy data not available	None	Minor
Environmental	None	Inland bathy data not available	None	Moderate
Public safety, including life and property	None	Inland bathy data not available	None	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	None			Minor	Unable to provide		None			Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Cost avoidance description	Better quality flood mapping leads to better mitigation projects in the future.											
Increased revenues	Major	Unable to provide		None			Moderate	Unable to provide		Moderate	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$4,346,055		Annual dollars saved/ realized	$301,907		Annual dollars saved/ realized	$229,311			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Value added to products or services description	Enhanced mitigation projects.											
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Improved response or timeliness description	Better flood mapping.											
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$760,423		Annual dollars saved/ realized	$338,964		Annual dollars saved/ realized	$169,952			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major			Major		
Environmental	Moderate			Moderate			Moderate			Major		
Public safety, including life and property	Major			Major			Major			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				Yes
Contours				Yes
Hillshades				Yes
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	Yes
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes	Yes	Yes	
Other (please specify)	Yes	Yes	Yes	
Other description	Flood models			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Coordinated Data Acquisition and Dissemination



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Coordinated data acquisition and dissemination
MCA Title	Coordinated Data Acquisition and Dissemination
MCA ID	21883
Organization Type	State or U.S. Territorial government
Organization Name	SC Geographic Information Council
Sub-Agency or Division	
Organization Mission	Mission Statement: Lead the nation in collaboration and utilization of geospatial resources which achieve statewide goals to positively impact the lives of South Carolinians.
Program Name	I represent the state's GIS council for state agencies. On my council are, at present, 15 state agencies including public safety, law enforcement, emergency response, natural resources, transportation, economic development, environmental compliance, permitting, etc.
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	BU 22 - Infrastructure and Construction Management
Tertiary Business Use	BU 04 - Forest Resources Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Building footprints, impervious surfaces such as roads and driveways, etc.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable

Inland Bathy Feature Size Requirements	Response
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL1B	Order 2
Update Frequency	6-10 years	6-10 years	6-10 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI	Areas closer to the coast will require higher quality level, while mountain areas will not.			
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	Up to 20 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	I don't know	Up to 2 meters
How far onshore needed			To MHW	
How far down the beach profile needed	To MLLW		To MHW	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have	Highly desirable	Required
DTM	Required	Not required	Highly desirable	Highly desirable
DEM	Required	Highly desirable	Highly desirable	Required
Raw point cloud data	Not required	Highly desirable	Highly desirable	Required
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Highly desirable	Highly desirable
Full waveform	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Highly desirable	Required
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Nice to have	Highly desirable	Required
Underwater videography			Highly desirable	Highly desirable
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Required	Nice to have	Highly desirable	Highly desirable
Water column properties - Physical			Highly desirable	Highly desirable
Water column properties - Chemical			Highly desirable	Highly desirable
Water column properties - Biological			Highly desirable	Highly desirable
Currents			Highly desirable	Required
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Highly desirable	Nice to have
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Highly desirable	Highly desirable
Routes			Highly desirable	Highly desirable
Offshore cadastral			Highly desirable	Highly desirable
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required	Nice to have	Highly desirable	
Land use/land cover	Nice to have	Nice to have	Highly desirable	Highly desirable
Wetlands	Highly desirable	Nice to have	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Required
Inland surface water features		Nice to have	Highly desirable	
Bridges/culverts	Required	Nice to have		
Landmark features		Nice to have	Highly desirable	
Cultural resources		Nice to have	Highly desirable	
Coastal and riverine structures	Required	Nice to have	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Classified LAS data that supports development of hydro. Needs to take into account culverts, ditches, etc. for hydro and flood modeling	Best available	Best available	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know	I don't know	I don't know	Major
Cost savings/cost reduction	I don't know	I don't know	I don't know	Major
Cost avoidance	I don't know	I don't know	I don't know	Major

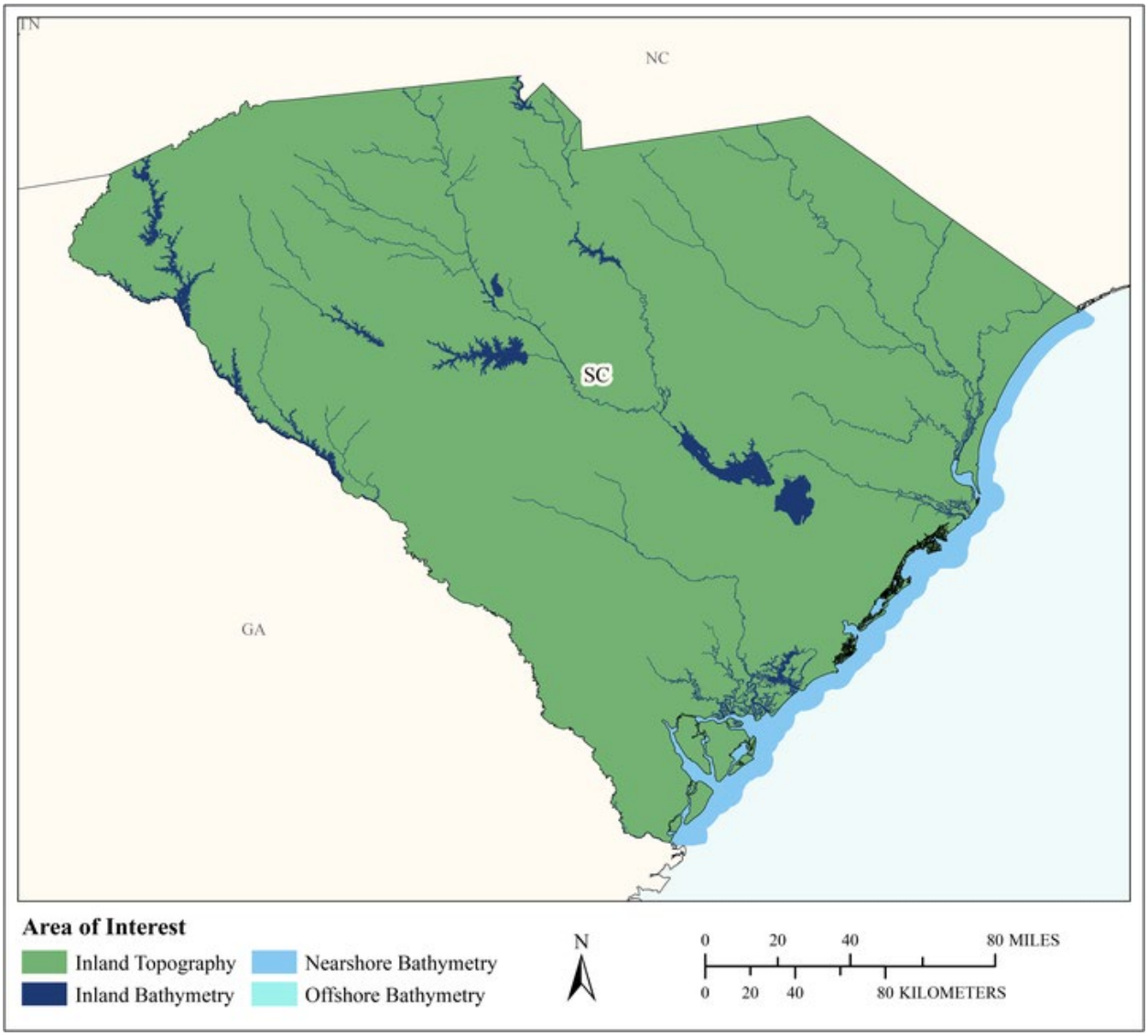
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Increased revenues	None	I don't know	I don't know	Major
Mission-driven performance improvements	Major	I don't know	I don't know	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	I don't know	I don't know	Major
Improved response or timeliness	Major	I don't know	I don't know	Major
Improved customer experience	I don't know	I don't know	I don't know	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	I don't know	I don't know	Major
Environmental	I don't know	I don't know	I don't know	Major
Public safety, including life and property	Major	I don't know	I don't know	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		Major	Unable to provide	
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		Major	Unable to provide	
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		Major	Unable to provide	
Other operational benefits	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$913,133		Annual dollars saved/ realized	$257,161		Annual dollars saved/ realized	$11,157		Annual dollars saved/ realized	$11,157
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		Major	Unable to provide	
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$16,139		Annual dollars saved/ realized	$16,407		Annual dollars saved/ realized	$320		Annual dollars saved/ realized	$320
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			Major			Moderate			Major		
Environmental	Moderate			Moderate			Moderate			Major		
Public safety, including life and property	Major			Major			Major			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				Yes
Contours				Yes
Hillshades				Yes
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Marine and Riverine Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Nautical charting. Bathymetric measurements of nearshore submerged coastal topography. Identification of hazards to navigation. Sediment management at coastal navigation projects. Precision marine navigation. Movement of goods and fishing vessels.
MCA Title	Marine and Riverine Navigation and Safety
MCA ID	60402
Organization Type	State or U.S. Territorial government
Organization Name	State of South Carolina
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Nice to have
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	keep as QL0B	I don't know
Update Frequency	2-3 years	2-3 years	2-3 years	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	Up to 2 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have	Nice to have	I don't know	Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Nice to have	Nice to have	I don't know	Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required	I don't know	Required	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required	I don't know	Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Required	I don't know
DTM	Required	Highly desirable	Required	I don't know
DEM	Required	Required	Required	I don't know
Raw point cloud data	Required	Nice to have	Required	I don't know
Classified point cloud	Required	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Highly desirable	I don't know
Full waveform	Not required	Not required	Not required	I don't know
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	I don't know
Breaklines required for standard hydro-flattening	Highly desirable	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	I don't know
Tide Predictions			Required	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	I don't know
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Highly desirable	I don't know
Ground control/ground truthing	Required	Nice to have	Highly desirable	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	I don't know
Nautical and/or navigation charts			Highly desirable	I don't know
Acoustic imagery of the seafloor			Highly desirable	I don't know
Aerial and/or satellite imagery	Required	Required	Highly desirable	I don't know
Underwater videography			Nice to have	I don't know
Bottom texture			Highly desirable	I don't know
Bottom type			Highly desirable	I don't know
Submerged features			Highly desirable	I don't know
Subbottom characteristics			Nice to have	I don't know
Geologic and seismic data	Not required	Not required	Nice to have	I don't know
Water column properties - Physical			Nice to have	I don't know
Water column properties - Chemical			Nice to have	I don't know
Water column properties - Biological			Nice to have	I don't know
Currents			Highly desirable	I don't know
Tide/wave heights			Highly desirable	I don't know
Sea ice conditions			Nice to have	I don't know
Habitat distribution and classification			Highly desirable	I don't know
Boundaries			Nice to have	I don't know
Routes			Required	I don't know
Offshore cadastral			Nice to have	I don't know
Lease areas			Nice to have	I don't know
Fixed obstructions			Required	I don't know
Floating observation/navigation systems			Required	I don't know
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Nice to have	Nice to have	Nice to have	I don't know
Wetlands	Highly desirable	Required	Highly desirable	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	I don't know
Inland surface water features	Highly desirable	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Required	Nice to have	Nice to have	
Cultural resources	Highly desirable	Highly desirable	Nice to have	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts		Yes	Yes	
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	I don't know
Cost savings/cost reduction	Major	I don't know	Minor	I don't know
Cost avoidance	Moderate	Major	Minor	I don't know
Increased revenues	Moderate	None	Minor	I don't know
Mission-driven performance improvements	Moderate	Minor	Minor	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	None	Minor	I don't know

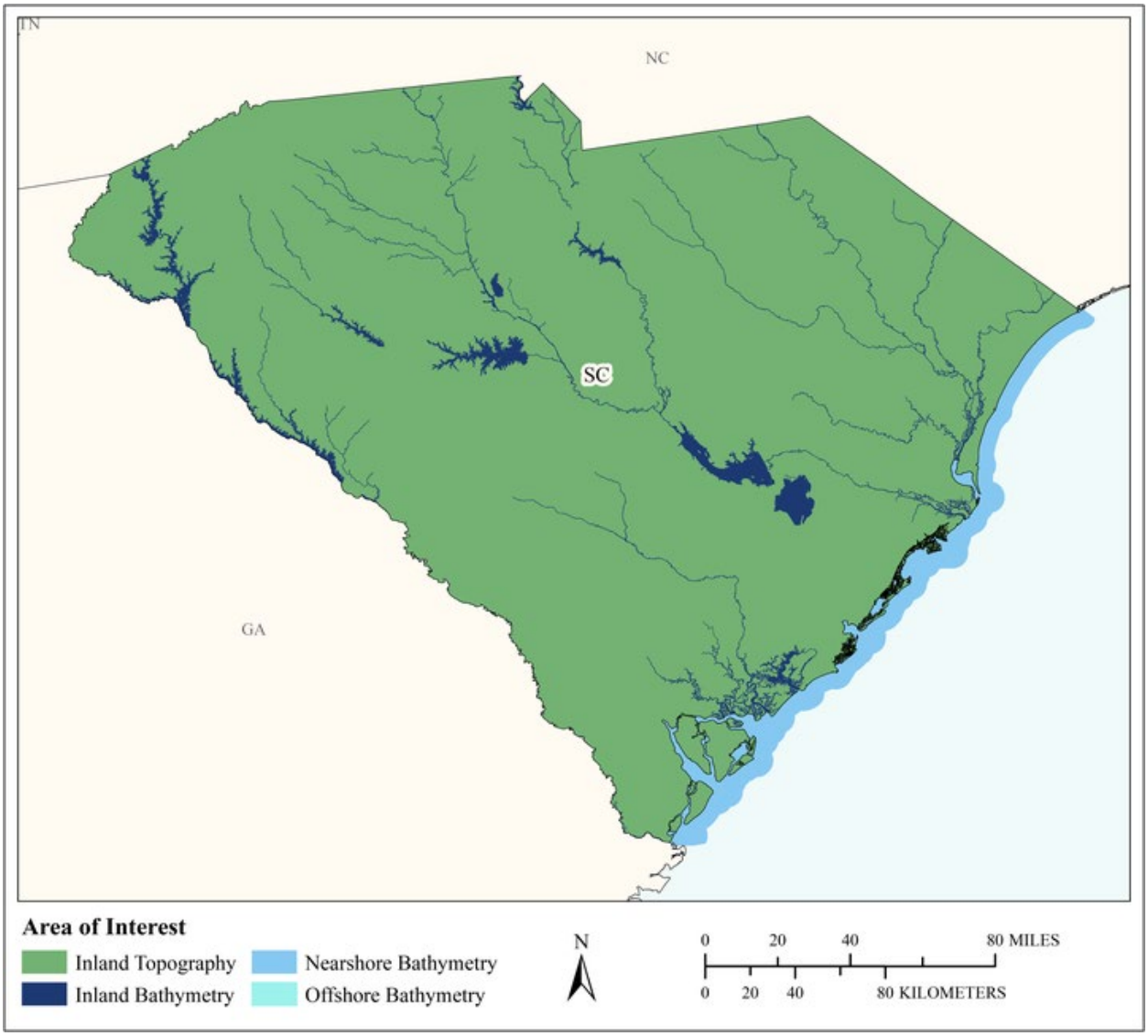
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor	None	Minor	I don't know
Improved customer experience	Moderate	None	Minor	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	None	Minor	I don't know
Environmental	Moderate	None	Minor	I don't know
Public safety, including life and property	Major	None	Major	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Increased revenues	None			Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,185,776		Annual dollars saved/ realized	$564,617		Annual dollars saved/ realized	$928,416			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Future annual customer service benefits added during validation					Annual dollars saved/ realized	$74,310		Annual dollars saved/ realized	$31,433			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			Moderate			Minor			I don't know		
Environmental	None			Moderate			Major			I don't know		
Public safety, including life and property	Minor			Moderate			Major			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			
Slope maps				
Aspect maps				
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps				Yes
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				Yes

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Aviation Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of in-flight hazards and path obstructions. Aeronautical charting. Runway construction and repair.
MCA Title	Aviation Navigation and Safety
MCA ID	60403
Organization Type	State or U.S. Territorial government
Organization Name	State of South Carolina
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 21 - Aviation Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Nice to have
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B	I don't know	I don't know
Update Frequency	Annually	Annually	Annually	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	I don't know	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	I don't know	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Nice to have	I don't know	Highly desirable	Nice to have
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable	I don't know	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	I don't know	Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	I don't know	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Highly desirable	I don't know
DTM	Required	Required	Highly desirable	I don't know
DEM	Required	Required	Highly desirable	I don't know
Raw point cloud data	Highly desirable	Highly desirable	Nice to have	I don't know
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Nice to have	I don't know
Full waveform	Highly desirable	Nice to have	Nice to have	I don't know
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	I don't know
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	I don't know
Tide Predictions			Nice to have	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	I don't know
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Nice to have	I don't know
Ground control/ground truthing	Required	Required	Required	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	I don't know
Nautical and/or navigation charts			Highly desirable	I don't know
Acoustic imagery of the seafloor			Highly desirable	I don't know
Aerial and/or satellite imagery	Required	Required	Required	I don't know
Underwater videography			Not required	I don't know
Bottom texture			Not required	I don't know
Bottom type			Nice to have	I don't know
Submerged features			Not required	I don't know
Subbottom characteristics			Not required	I don't know
Geologic and seismic data	Nice to have	Nice to have	Not required	I don't know
Water column properties - Physical			Not required	I don't know
Water column properties - Chemical			Not required	I don't know
Water column properties - Biological			Not required	I don't know
Currents			Not required	I don't know
Tide/wave heights			Not required	I don't know
Sea ice conditions			Not required	I don't know
Habitat distribution and classification			Nice to have	I don't know
Boundaries			Highly desirable	I don't know
Routes			Nice to have	I don't know
Offshore cadastral			Nice to have	I don't know
Lease areas			Not required	I don't know
Fixed obstructions			Nice to have	I don't know
Floating observation/navigation systems			Nice to have	I don't know
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Required	Required	Required	I don't know
Wetlands	Required	Required	Required	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	I don't know
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Required	Highly desirable	Not required	
Cultural resources	Required	Highly desirable	Nice to have	
Coastal and riverine structures	Highly desirable	Nice to have	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	I don't know
Cost savings/cost reduction	Major	Major	Moderate	I don't know
Cost avoidance	Major	Major	Moderate	I don't know
Increased revenues	Major	None	None	I don't know
Mission-driven performance improvements	Major	Major	Minor	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Moderate	I don't know

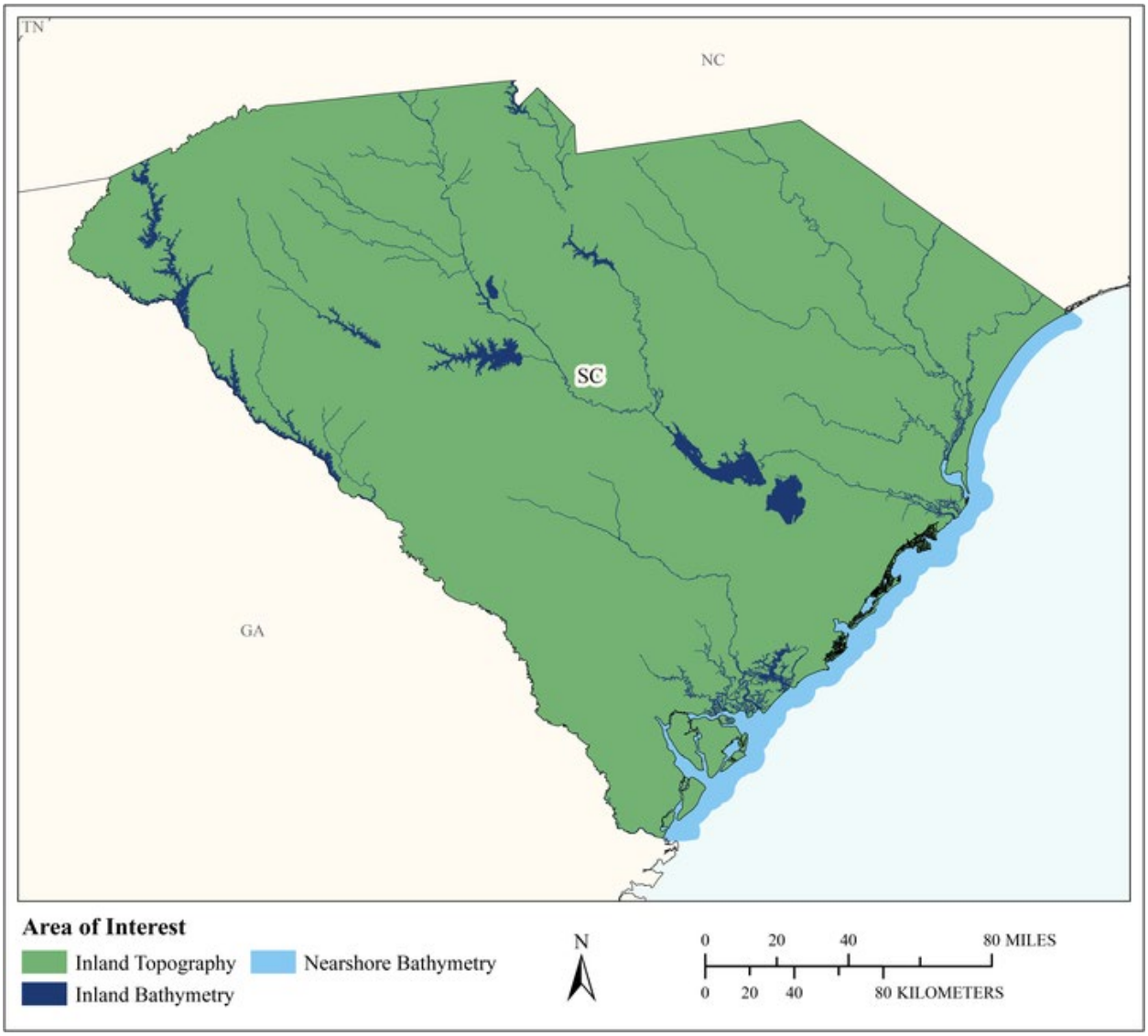
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major	Minor	I don't know
Improved customer experience	Major	Major	Minor	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	Minor	None	I don't know
Environmental	Major	Moderate	None	I don't know
Public safety, including life and property	Major	Moderate	None	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$104,639		Annual dollars saved/ realized	$20,836						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$130,325									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Moderate			I don't know			I don't know		
Environmental	Moderate			Major			I don't know			I don't know		
Public safety, including life and property	Moderate			Major			I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes	Yes	Yes	
Curvature maps	Yes			
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Infrastructure and Construction Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Marine construction. Bridge design and construction. Engineering and construction of dams, levees, dikes, reservoirs, and coastal structures. Shipyard and port construction. Water, sewer, or power line planning and vegetation analysis. Pump, drain, and well placement. Stormwater modeling. Cut and fill analysis for earth-moving. Building site analysis. Road infrastructure. Infrastructure hardening or mitigation for climate change effects, e.g. sea level change.
MCA Title	Infrastructure and Construction Management
MCA ID	60404
Organization Type	State or U.S. Territorial government
Organization Name	State of South Carolina
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL1B	
Update Frequency	6-10 years	6-10 years	6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Highly desirable	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Nice to have	Nice to have	
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	
Ground control/ground truthing	Required	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Highly desirable	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Nice to have	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Highly desirable	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Required	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	
Cost savings/cost reduction	Major	Major	Minor	
Cost avoidance	Major	Moderate	Minor	
Increased revenues	Minor	None	None	
Mission-driven performance improvements	Moderate	Moderate	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate	Minor	

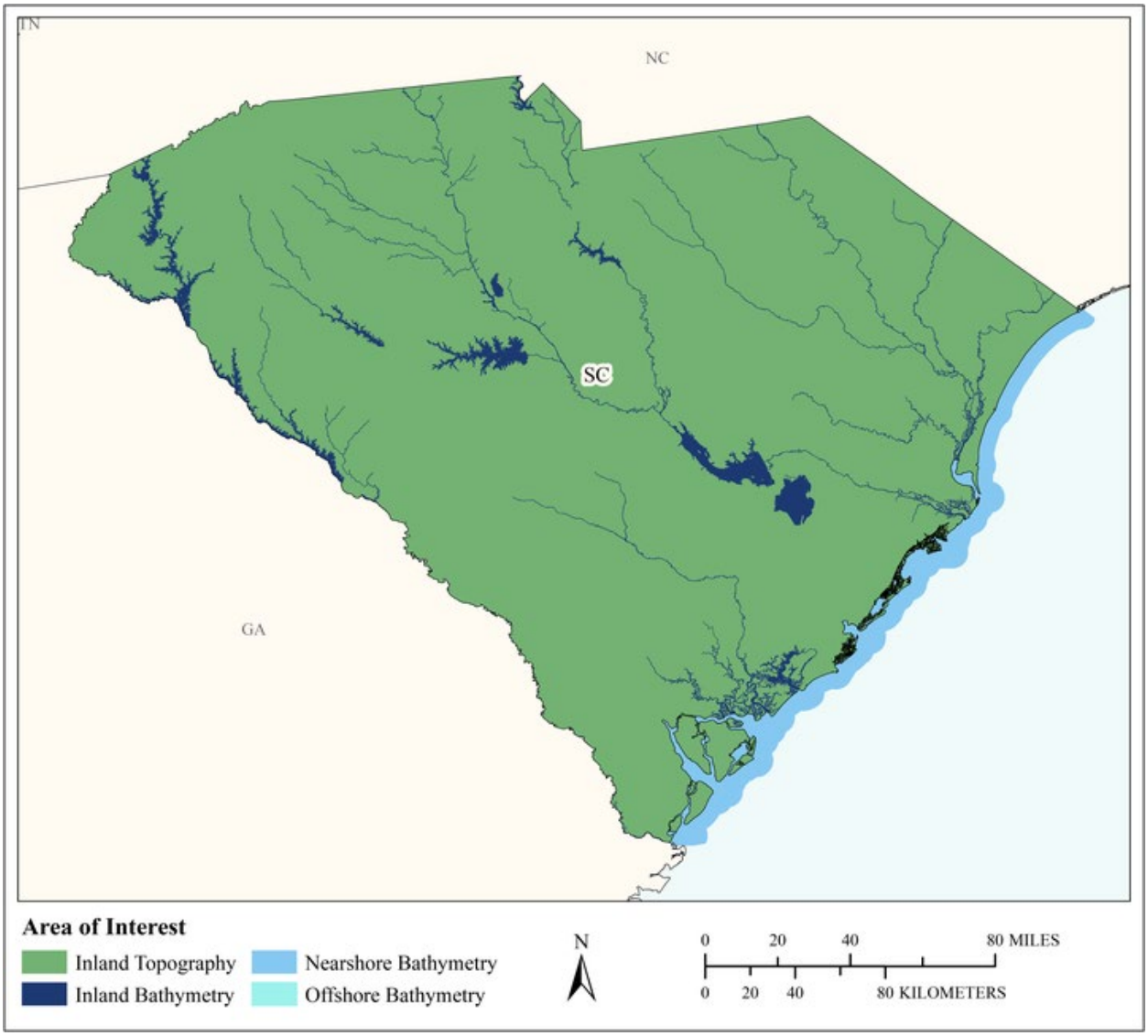
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major	Minor	
Improved customer experience	Moderate	Minor	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	Minor	
Environmental	Moderate	Minor	Minor	
Public safety, including life and property	Moderate	Moderate	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Increased revenues	None			None			Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,391,043		Annual dollars saved/ realized	$468,664		Annual dollars saved/ realized	$25,309			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$4,093,559		Annual dollars saved/ realized	$48,665		Annual dollars saved/ realized	$3,480			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			Minor					
Environmental	Moderate			Moderate			Moderate					
Public safety, including life and property	Major			Moderate			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Urban and Regional Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Land development and zoning. Municipal mapping of building footprints and elevations. Port resilience planning. Parks and transportation planning. Virtual city creation. Urban ecology planning.
MCA Title	Urban and Regional Planning
MCA ID	60405
Organization Type	State or U.S. Territorial government
Organization Name	State of South Carolina
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL1B	Cross sections and/or transects meet needs
Update Frequency	4-5 years	6-10 years	6-10 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				Yes
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Required	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Required	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Required	Required
DTM	Required	Required	Required	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Required	Nice to have	Highly desirable	Highly desirable
Classified point cloud	Required	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Highly desirable
Full waveform	Nice to have	Nice to have	Nice to have	Required
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Highly desirable
Tide Predictions			Nice to have	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Highly desirable
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Highly desirable
Ground control/ground truthing	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	Required
Nautical and/or navigation charts			Highly desirable	Required
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Highly desirable
Underwater videography			Not required	Nice to have
Bottom texture			Nice to have	Highly desirable
Bottom type			Nice to have	Highly desirable
Submerged features			Nice to have	Highly desirable
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Not required	Highly desirable
Water column properties - Chemical			Not required	Highly desirable
Water column properties - Biological			Not required	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Nice to have	Required
Routes			Nice to have	Highly desirable
Offshore cadastral			Nice to have	Highly desirable
Lease areas			Nice to have	Highly desirable
Fixed obstructions			Nice to have	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Required	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Nice to have	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Minor	Major
Cost savings/cost reduction	Major	Minor	Minor	Major
Cost avoidance	Major	Minor	Minor	Major
Increased revenues	Minor	Minor	None	Moderate
Mission-driven performance improvements	Major	Minor	Minor	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Minor	Major

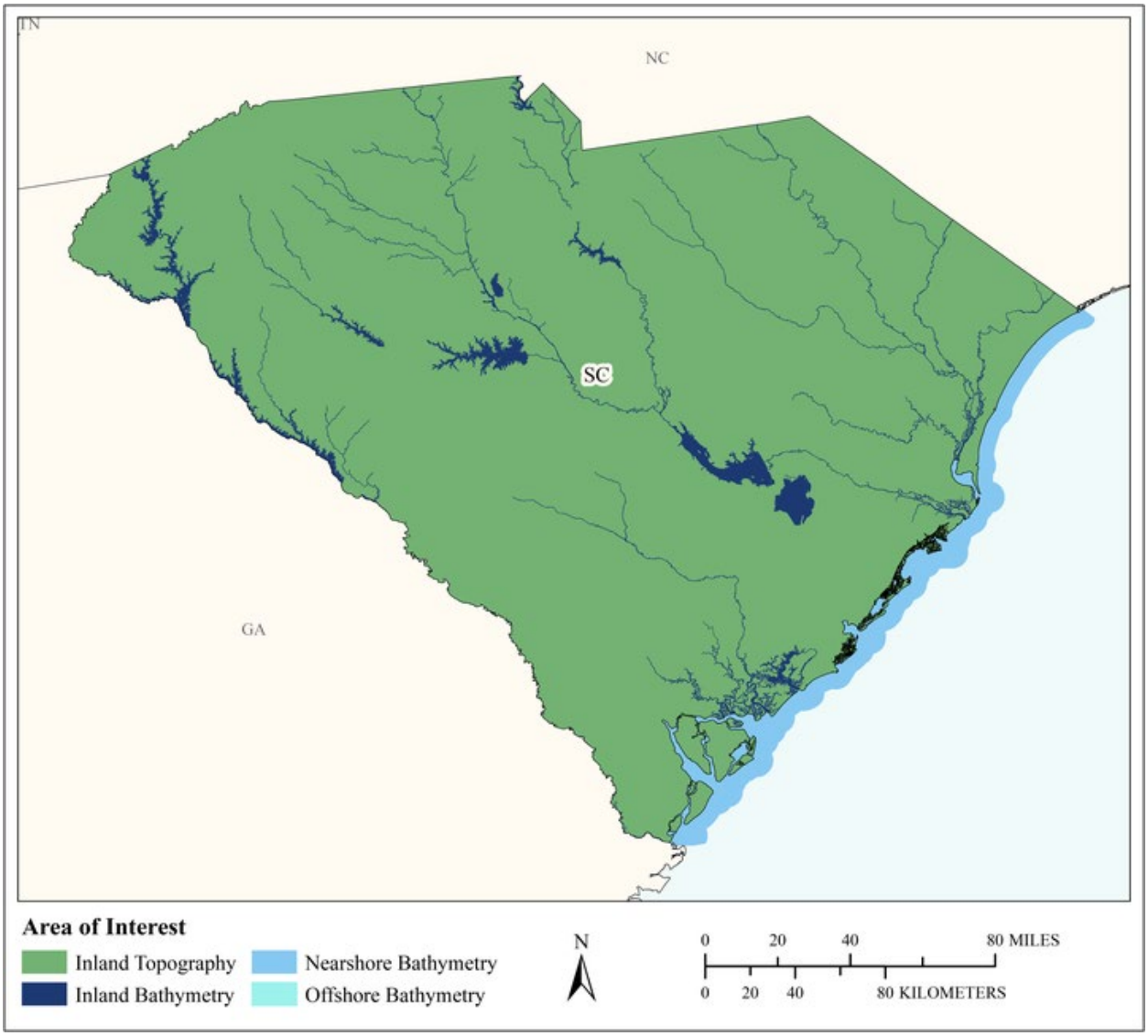
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	Minor	Major
Improved customer experience	Major	Moderate	Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	Major
Environmental	Major	Minor	Minor	Major
Public safety, including life and property	Major	Minor	Minor	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide		Major	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Major	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$8,328,386		Annual dollars saved/ realized	$339,200		Annual dollars saved/ realized	$221,668			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$961,516		Annual dollars saved/ realized	$429,118		Annual dollars saved/ realized	$233,851			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate			Moderate			Major		
Environmental	Major			Moderate			Moderate			Major		
Public safety, including life and property	Major			Major			Moderate			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes		Yes	
Aspect maps	Yes			Yes
Curvature maps				Yes
Cross sections		Yes	Yes	Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Inland and Coastal Hazards Wetlands Mitigation Education Through GIScience Courses



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Inland and Coastal Hazards Wetlands Mitigation Education through GIScience courses
MCA Title	Inland and Coastal Hazards Wetlands Mitigation Education Through GIScience Courses
MCA ID	21942
Organization Type	Academic or Not-for-Profit
Organization Name	University of South Carolina
Sub-Agency or Division	
Organization Mission	Education and Research with a supplemental Public Service component
Program Name	Department of Homeland Security Department of Transportation
Total Annual Program Budget	
Primary Business Use	BU 26 - Education K12 and Beyond, Basic Research
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Varies by application. Positional accuracy for bare surface for some applications needs to be within 10cm (x-y-z)

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B	QL1B	Order 1a
Update Frequency	6-10 years and certain events.	6-10 years	6-10 years	6-10 years
Event type(s)	Event driven only			
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Up to 2 meters	Up to 5 meters	Up to 5 meters
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 40 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed	To MHW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Nice to have	Not required	Highly desirable	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Required	Nice to have	Not required	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Required	Required	Highly desirable	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Required	Required
DTM	Required	Highly desirable	Required	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Required	Required	Required	Required
Classified point cloud	Required	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Not required	Highly desirable	Nice to have	Nice to have
Ground control/ground truthing	Highly desirable	Highly desirable	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Highly desirable	Required	Required	Highly desirable
Underwater videography			Nice to have	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Nice to have
Geologic and seismic data	Not required	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Highly desirable	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Highly desirable
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Nice to have
Wetlands	Required	Highly desirable	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Various LiDAR data collections by counties, many collected under the State-USGS-FEMA program.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes			
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Moderate	Major	Minor
Cost savings/cost reduction	Minor	Minor	Moderate	Minor
Cost avoidance	I don't know	Minor	Major	Moderate
Increased revenues	Minor	None	Minor	None

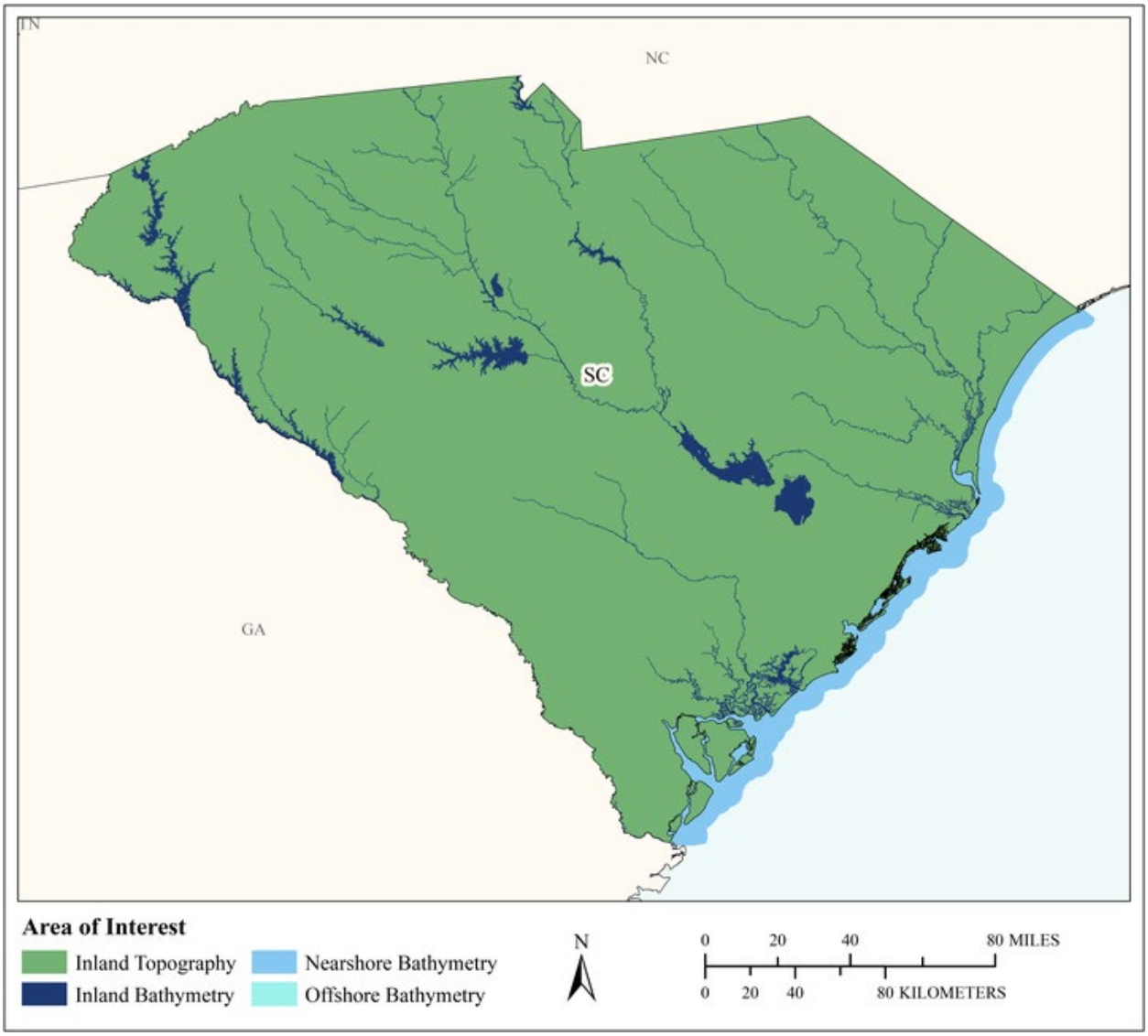
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Mission-driven performance improvements	Moderate	Moderate	Major	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know	Minor	Major	Moderate
Improved response or timeliness	Moderate	Minor	Minor	Minor
Improved customer experience	Moderate	Minor	Moderate	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major	Major	Major
Environmental	Major	Minor	Minor	Minor
Public safety, including life and property	Moderate	Moderate	Minor	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	I don't know	Unable to provide		Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide	
Cost avoidance	I don't know	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	I don't know	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$162,664		Annual dollars saved/ realized	$42,538		Annual dollars saved/ realized	$7,943			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved customer experience	I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$388,815					Annual dollars saved/ realized	$313			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major			Major		
Environmental	Major			Major			Major			Major		
Public safety, including life and property	Major			Major			Major			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes	Yes	
Contours		Yes	Yes	Yes
Hillshades			Yes	Yes
Slope maps				Yes
Aspect maps				Yes
Curvature maps				
Cross sections			Yes	Yes
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Maritime and Land Boundary Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Delimitation of legal and other coastal boundaries, inland boundaries, and ordinary high water lines (OHWL).
MCA Title	Maritime and Land Boundary Management
MCA ID	60406
Organization Type	State or U.S. Territorial government
Organization Name	State of South Carolina
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 30 - Maritime and Land Boundary Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL1B	I don't know
Update Frequency	6-10 years	6-10 years	6-10 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Highly desirable	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Nice to have	Nice to have	Highly desirable	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable	Highly desirable	Required	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable	Highly desirable	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	Required
DTM	Required	Required	Required	Required
DEM	Highly desirable	Required	Required	Required
Raw point cloud data	Nice to have	Highly desirable	Required	Required
Classified point cloud	Highly desirable	Highly desirable	Required	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Not required	Nice to have
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Not required
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Nice to have	Required	Not required	Not required
Ground control/ground truthing	Highly desirable	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Required	Highly desirable	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Nice to have
Water column properties - Biological			Not required	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Highly desirable	Nice to have
Routes			Nice to have	Highly desirable
Offshore cadastral			Highly desirable	Nice to have
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Required	Required
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Nice to have
Wetlands	Required	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Highly desirable	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Minor	None	I don't know
Cost savings/cost reduction	Moderate	None	Minor	Moderate
Cost avoidance	Moderate	None	Minor	Moderate
Increased revenues	Minor	None	None	I don't know
Mission-driven performance improvements	Major	None	Moderate	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None	None	I don't know

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	None	Minor	Moderate
Improved customer experience	Major	None	Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	Moderate
Environmental	Major	Minor	Minor	Moderate
Public safety, including life and property	Moderate	None	Minor	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	Minor	Unable to provide		None			None			I don't know	Unable to provide	
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$200,000		Annual dollars saved/ realized	$200,000		Annual dollars saved/ realized	$278,206			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$133,543									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Moderate			Moderate		
Environmental	Minor			Major			Major			Major		
Public safety, including life and property	None			Moderate			Moderate			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps		Yes		
Cross sections		Yes		
Height-Above-Ground maps		Yes		
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

South Dakota

South Dakota is an expansive, sparsely populated midwestern U.S. state containing a total land area of 77,116 square miles, making it the 17th largest in the U.S. As of July 2019, the U.S. Census Bureau estimates the population to be 884,659. As of the 2010 census, South Dakota ranked fifth lowest in the U.S. in both total population as well as population density. Over the last several decades, the population in many rural areas has declined in South Dakota. South Dakota also has a prominent Native American population making up approximately 9% of the total population. Most Native American reservations reside in the West River. Eastern South Dakota is home to most of the state's population, and the area's fertile soil is used to grow a variety of crops. West of the Missouri River, ranching is the predominant agricultural activity. The service industry is the largest economic contributor in South Dakota (including retail, finance, and health care industries). However, agricultural production is still very important to the state's economy, especially in rural areas. Tourism also makes up a large sector of South Dakota's economy.

The State of South Dakota is about 60% covered with 3DEP quality lidar (Figure 1).

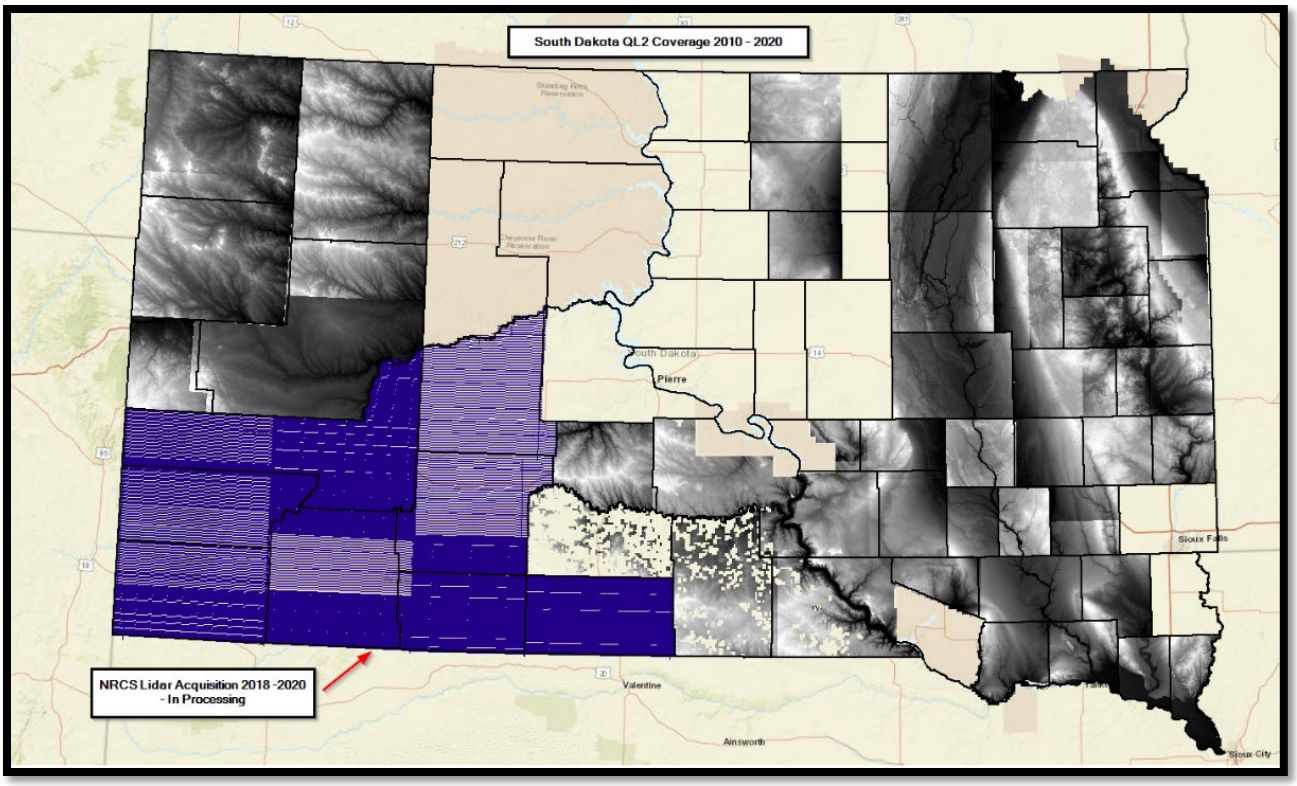


Figure 1. Gray shading shows 3DEP-compliant data; purple shows 3DEP-compliant data currently in progress. Other areas have no 3DEP-compliant data

Most of the lidar collected in the state was funded through the Natural Resources Conservation Service (Department of Agriculture) in partnership with the U.S. Geological Survey. Lidar acquisition commenced in 2005 and has been piecemeal driven by flood related issues, however, this early lidar does not meet 3DEP standards and is a patchwork of differing resolutions and coordinate units. The remainder of the state is covered with IfSAR data, which is at a resolution, age, and accessibility level that does not meet 3DEP compliance. The southwestern corner of the state is currently in the process of being

collected. Whereas, the easternmost edge of South Dakota is currently funded and under contract for collection.

Older collections (2012-2014) of state-funded lidar data along the easternmost counties can be accessed through the South Dakota Department of Environment and Natural Resources (http://www.sdgs.usd.edu/digitaldata/lidar.aspx).

South Dakota recognizes the need for high-quality elevation data and is in the early stages to develop and implement a strategic planning effort, and the attendant outreach and education needed to build funding required to complete the state with 3DEP-compliant elevation data. An in-depth outreach effort will be needed to ascertain the requirements for additional inland bathymetry that support mission-critical program work and future applications, especially in state agencies that were not able to provide input into this study, or agencies that have yet to realize the full potential of high-resolution elevation data.

Importance of elevation data to South Dakota

Nineteen Mission Critical Activities (MCAs) within 18 primary Business Uses (BUs) were noted in the survey. Examples include Recreational Use by the Public and Project Planning listed as an MCA under the primary BU of Wildlife and Habitat Management. Flood Risk Management was an MCA listed under the primary BU of Flood Risk Management. Municipal mapping of city/county transportation systems, impervious surface mapping, and city infrastructure planning is found under the primary BU of Urban and Regional Planning. More specifically, elevation data are used to:

- Provide sustainable outdoor recreational opportunities through responsible management of the state's parks, fisheries and wildlife;
- Assist local and state entities in identifying areas of flood risk, mitigating those risks, and recovering from flood events, as well as mapping flood plain environments and erosion and environmental management; and
- Map city/county transportation systems and impervious surfaces, plan city infrastructure (all water, sewer, and storm water systems).

High-level summary of elevation data requirements

As illustrated by the responses to this study, there is a pressing need for high-resolution elevation data in South Dakota.

- For the state's wildlife and habitat management and recreation purposes, Quality Level 2 (QL2) inland topography and QL2B inland bathymetry is needed and should be updated every 6-10 years.
- Flood risk management also requires QL2 inland topography and QL2B inland bathymetry but needs an update frequency every 4-5 years. Flood risk management activities would benefit from higher resolution elevation data in the form of improved/reduced field visits and more efficient modeling and mapping. Major costs avoided include data processing errors and avoided property loss due to natural hazards due to improved projections and faster warnings to at-risk areas.
- For urban and regional planning, QL1 inland topography is needed with an update frequency of every 4-5 years for Pennington County.
- In general, respondents indicated a need for QL1 inland topography and QL1B inland bathymetry updated every 4-5 years.

Additional Comments

Recommendations for a future elevation effort for a South Dakota elevation program will revisit the areas covered with QL3 older data and/or ifSAR with a goal to capture new 3DEP-compliant data as required in this survey and any further information that will be forthcoming. South Dakota seeks to get programming in place for continuity and consistency of lidar acquisition across the state into the future.

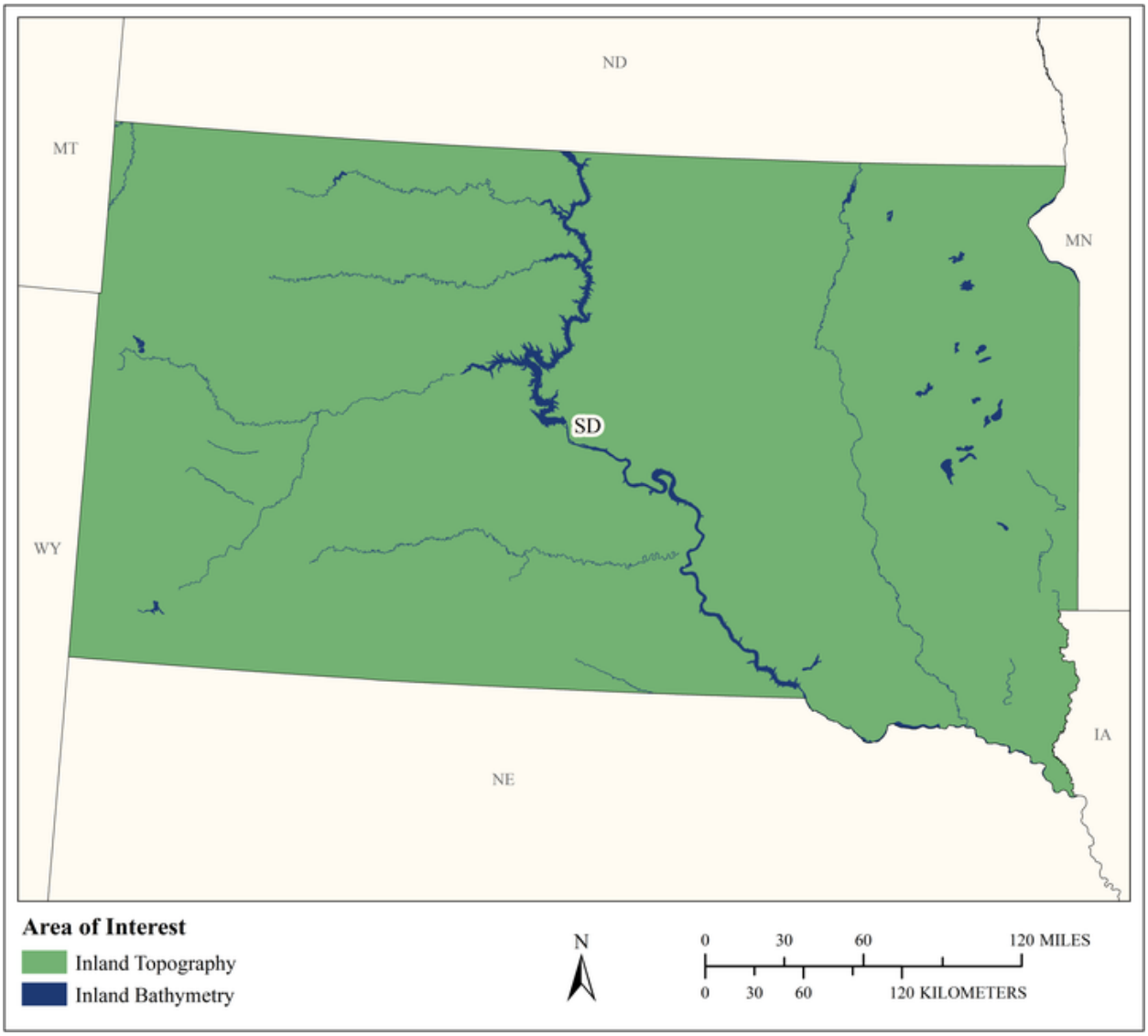
The State of South Dakota has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	State of South Dakota	60407	Water Supply and Quality	Inland Topo	QL2	4-5 years	$427,573	$114,527	Moderate	Major	Moderate
				Inland Bathy	QL1B	6-10 years	$1,849,718	$193,303	Moderate	Major	Moderate
BU 02 – Riverine Ecosystem Management	State of South Dakota	60408	Riverine Ecosystem Management	Inland Topo	QL1 HD	6-10 years	$118,034	$11,789	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$62,833	$4,430	Major	Major	Major
BU 04 – Forest Resource Management	State of South Dakota	60409	Forest Resources Management	Inland Topo	QL1	2-3 years	$304,897	$441,985	Major	Major	Major
BU 05 – Rangeland Management	State of South Dakota	60410	Rangeland Management	Inland Topo	QL2	Annually	Unable to quantify	Unable to quantify	Minor	Major	I don't know
BU 06 – Natural Resource Management	State of South Dakota	60411	Natural Resources Conservation	Inland Topo	QL1 HD	4-5 years	$3,024,676	$11,107,536	Major	Major	Major
BU 07 – Wildlife and Habitat Management	South Dakota Game, Fish and Parks	21604	Recreational Use by the Public and Project Planning	Inland Topo	QL2	6-10 years	$151	$436	I don't know	I don't know	I don't know
				Inland Bathy	QL2B	6-10 years	$147,214	$88,982	I don't know	I don't know	I don't know
BU 08 – Agriculture	State of South Dakota	60412	Agriculture and Precision Farming	Inland Topo	QL2	2-3 years	$89,282	$70,780	Major	Major	Minor
BU 10 – Geologic Assessment	State of South Dakota	60413	Geologic Assessment and Hazard Mitigation	Inland Topo	QL1	4-5 years	$16,278,211	$285,764	Major	Major	Major
BU 12 – Renewable Energy Resources	State of South Dakota	60414	Renewable Energy Resources	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	None
BU 13 – Oil and Gas Resources	State of South Dakota	60415	Oil and Gas Resources	Inland Topo	QL1	Annually	$33,847	Unable to quantify	Minor	Major	Major
BU 14 – Cultural Resource Management	State of South Dakota	60416	Cultural Resources Preservation and Management	Inland Topo	QL1	4-5 years	$14,134	$12,358	Minor	Minor	Minor

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 15 – Flood Risk Management	South Dakota Office of Emergency Management	21658	Flood Risk Management	Inland Topo	QL2	4-5 years	$15,525,326	$4,027,135	Major	Major	Major
				Inland Bathy	QL2B	4-5 years	$6,030	$1,000,000	Major	Major	Major
BU 17 – Wildfire Management	State of South Dakota	60417	Wildfire Management, Planning, and Response	Inland Topo	QL1	4-5 years	$414,327	Unable to quantify	Major	Major	Major
BU 19 – Land Navigation	State of South Dakota	60418	Land Navigation and Safety	Inland Topo	QL0	2-3 years	$998,977	$80,672	Minor	Major	Major
BU 22 – Infrastructure Management	State of South Dakota	60419	Infrastructure and Construction Management	Inland Topo	QL0 HD	4-5 years	$3,465,530	$10,198,358	Minor	Moderate	Major
				Inland Bathy	QL0B	4-5 years	$1,167,592	$121,240	Minor	Moderate	Moderate
BU 23 – Urban and Regional Planning	City of Rapid City	21704	Municipal Planning and Mapping	Inland Topo	QL1	4-5 years	Unable to quantify	Unable to quantify	Major	I don't know	Major
BU 23 – Urban and Regional Planning	State of South Dakota	60420	Urban and Regional Planning	Inland Topo	QL1	4-5 years	$20,748,661	$2,395,442	Moderate	Major	Major
				Inland Bathy	QL1B	6-10 years	$845,056	$1,069,069	Moderate	Moderate	Major
BU 26 – Education and Basic Research	State of South Dakota	60421	Education K12 and Beyond, Basic Research	Inland Topo	QL1 HD	2-3 years	$405,248	$968,662	Major	Major	Major
BU 27 – Recreation	State of South Dakota	60422	Recreation	Inland Topo	QL1	4-5 years	$17,694	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	4-5 years	$10,656	Unable to quantify	Major	Major	Moderate

MCA Title: Water Supply and Quality



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Fate and transport of contaminants. Pollution risk mitigation. Runoff and sedimentation analyses. Point- or non-point source pollution modeling. Management of contaminants and marine debris - point, non-point, vessel, and atmospheric pollution; spills; trash.
MCA Title	Water Supply and Quality
MCA ID	60407
Organization Type	State or U.S. Territorial government
Organization Name	State of South Dakota
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B		
Update Frequency	4-5 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Required			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Highly desirable	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	Major	Minor		
Increased revenues	Minor	None		
Mission-driven performance improvements	Major	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		

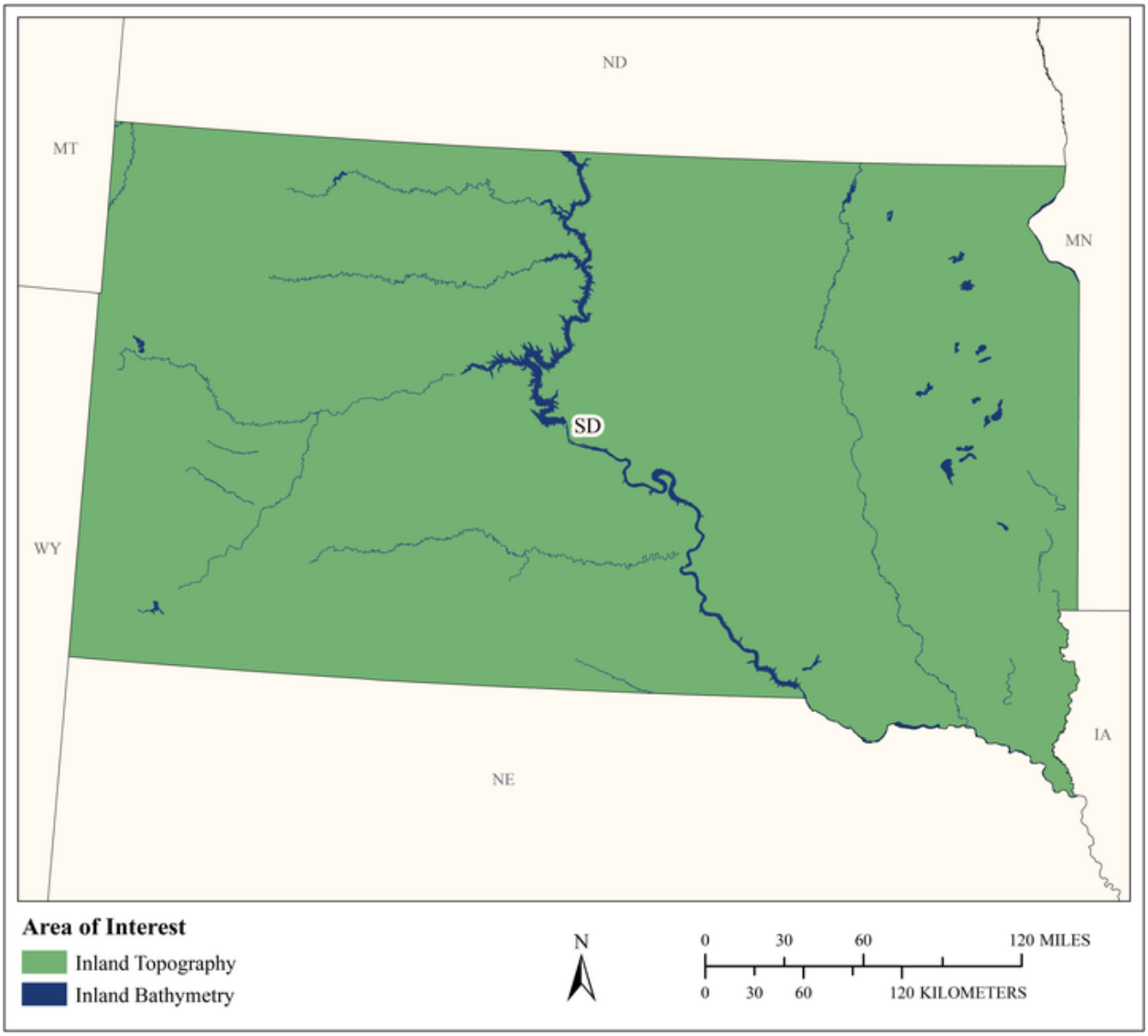
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor		
Improved customer experience	Major	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor		
Environmental	Major	Moderate		
Public safety, including life and property	Major	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$427,573		Annual dollars saved/ realized	$1,849,718						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide							
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$114,527		Annual dollars saved/ realized	$193,303						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate								
Environmental	Major			Major								
Public safety, including life and property	Moderate			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Riverine Ecosystem Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Stream channel analysis and mapping. Stream bank erosion analysis. Aquatic and terrestrial species habitat management. Environmental management.
MCA Title	Riverine Ecosystem Management
MCA ID	60408
Organization Type	State or U.S. Territorial government
Organization Name	State of South Dakota
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B		
Update Frequency	6-10 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Required			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Required	Highly desirable		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Highly desirable	Nice to have		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Moderate	Minor		
Cost avoidance	Moderate	None		
Increased revenues	None	None		
Mission-driven performance improvements	Major	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		

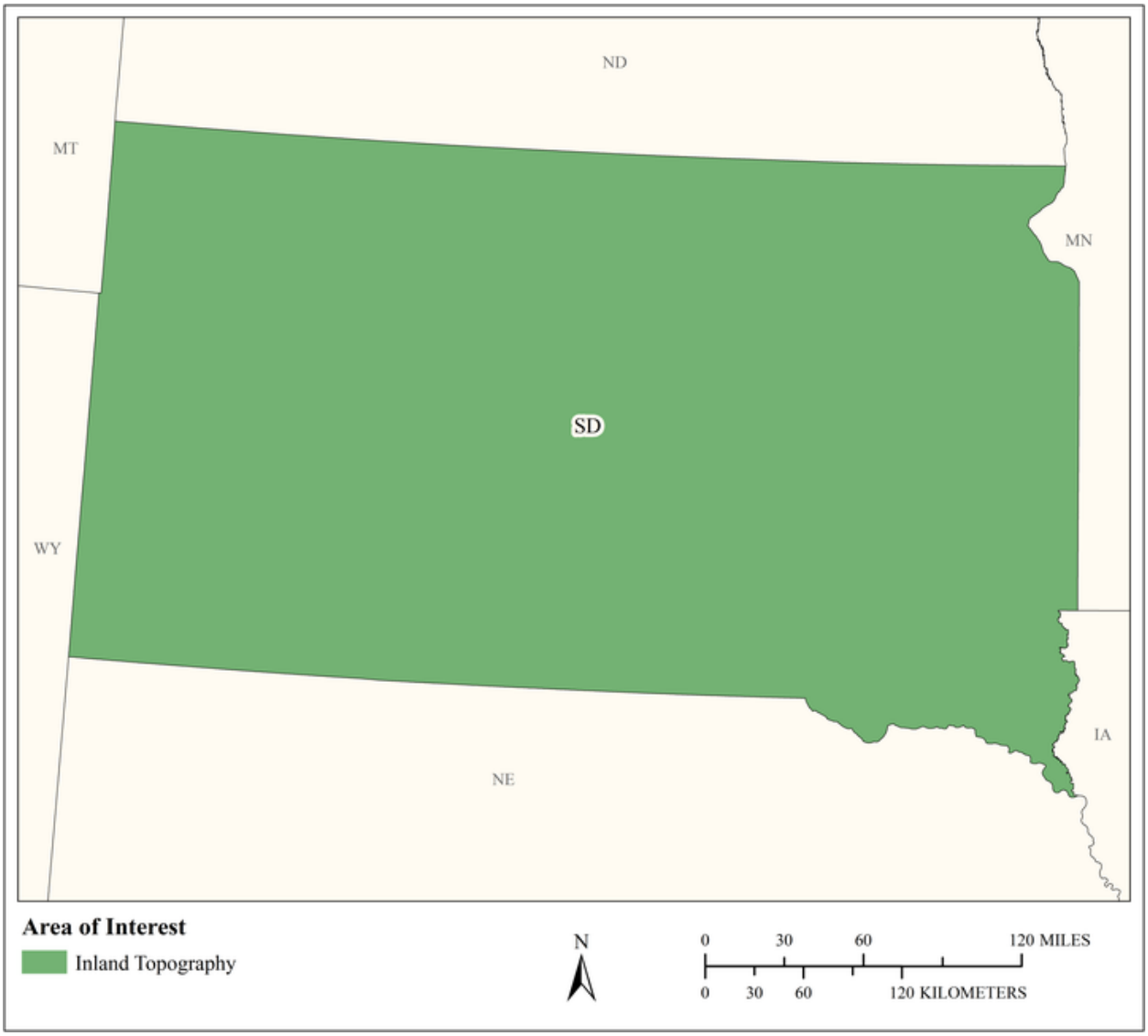
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Moderate		
Improved customer experience	Major	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate		
Environmental	Major	Major		
Public safety, including life and property	Major	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$118,034		Annual dollars saved/ realized	$62,833						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$11,789		Annual dollars saved/ realized	$4,430						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Major			Major								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Forest Resources Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Forest health assessment. Determination of standing inventory of forest resources. Prescribed burn planning. Analysis of carbon stocks for trade. Harvest systems planning.
MCA Title	Forest Resources Management
MCA ID	60409
Organization Type	State or U.S. Territorial government
Organization Name	State of South Dakota
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Highly desirable			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

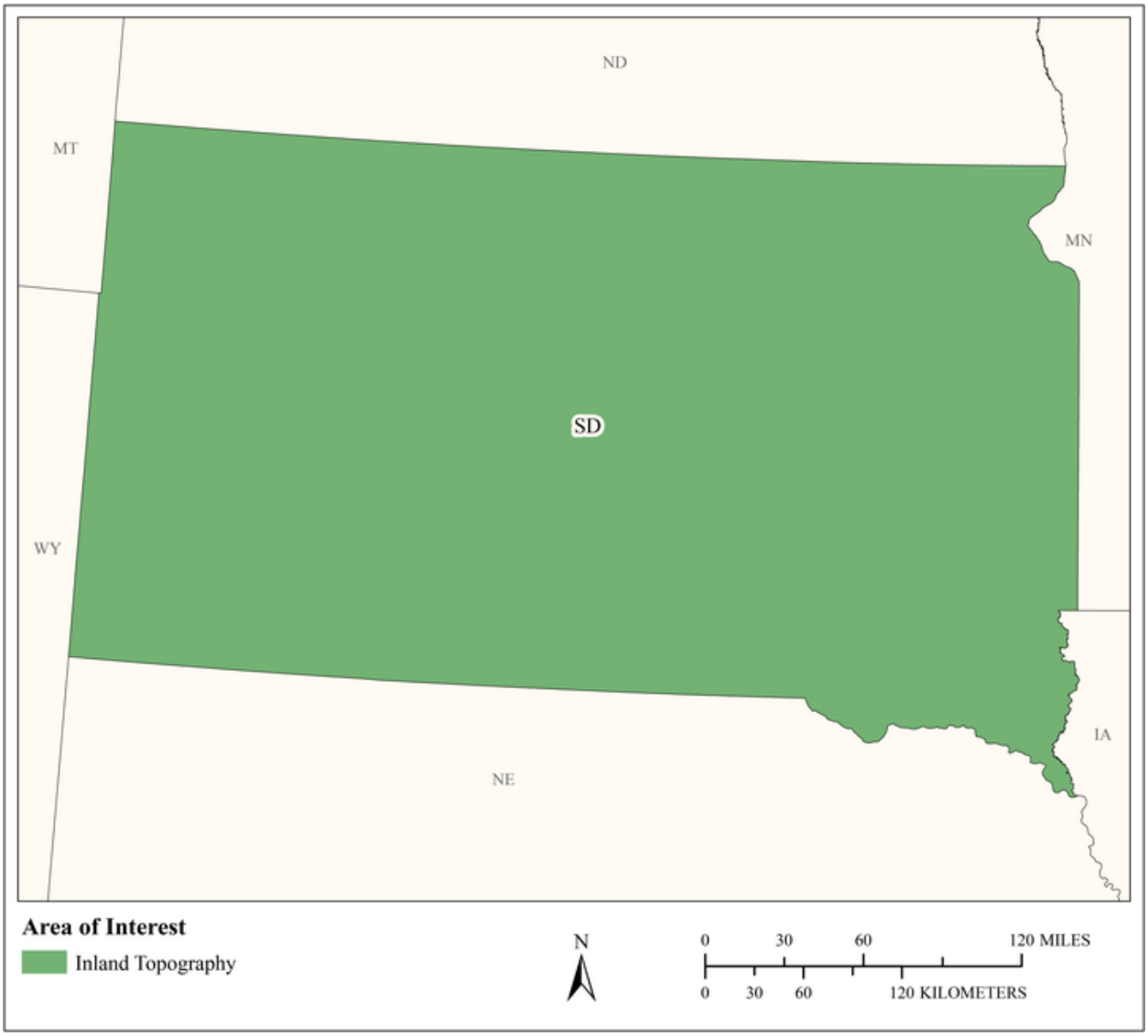
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$304,897									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$441,985									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Rangeland Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Assessment of rangeland health. Mapping for soil erosion potential due to grazing.
MCA Title	Rangeland Management
MCA ID	60410
Organization Type	State or U.S. Territorial government
Organization Name	State of South Dakota
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 05 - Rangeland Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Highly desirable			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Not required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None			
Cost savings/cost reduction	None			
Cost avoidance	None			
Increased revenues	None			
Mission-driven performance improvements	None			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None			

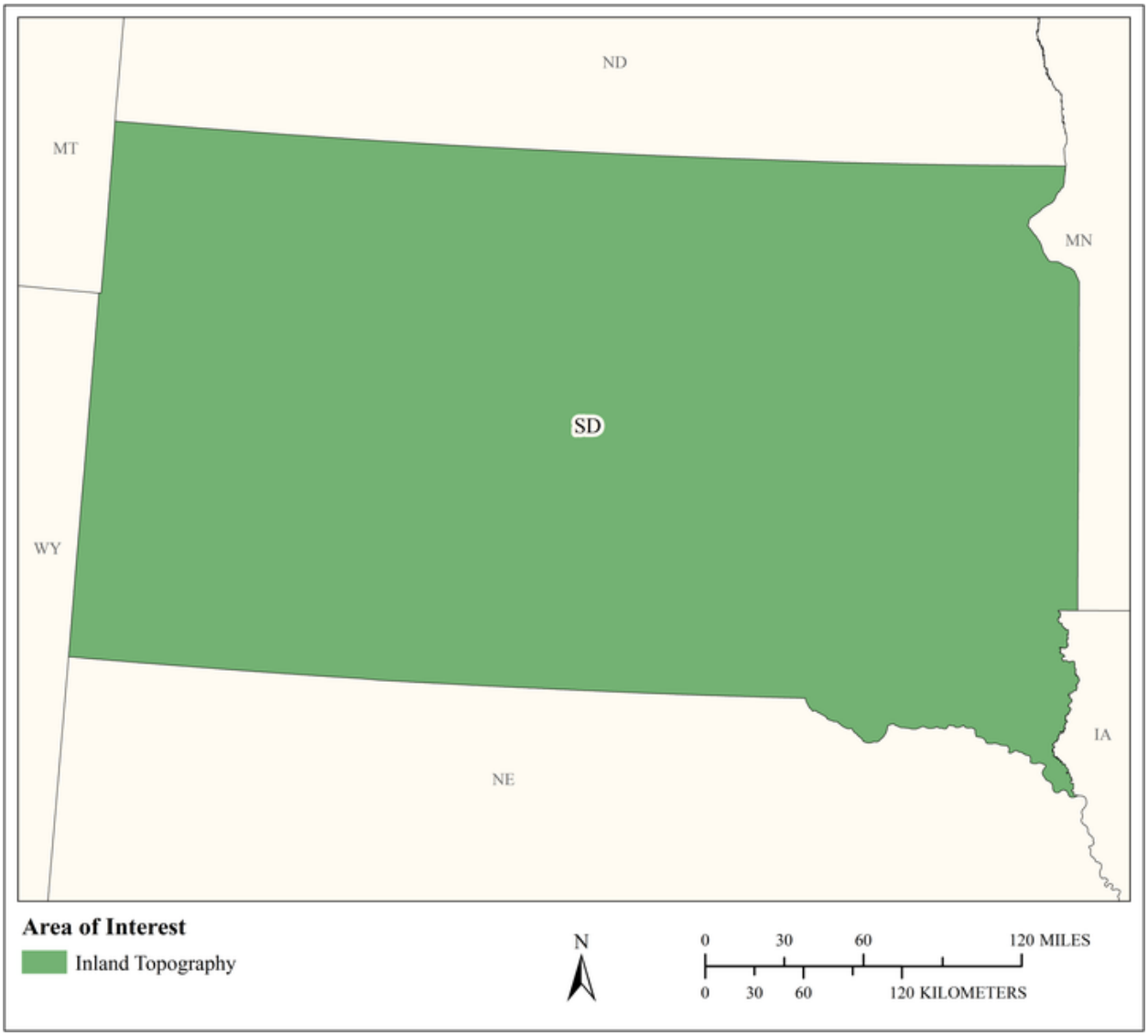
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	None			
Improved customer experience	None			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	None			
Public safety, including life and property	None			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	None											
Cost avoidance	Minor	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Natural Resources Conservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation engineering. Soils and wetlands mapping and characterization. Modeling of biological and ecological systems. Erosion control. Rainfall penetration studies, impervious surfaces. Assessment of blue carbon stocks.
MCA Title	Natural Resources Conservation
MCA ID	60411
Organization Type	State or U.S. Territorial government
Organization Name	State of South Dakota
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

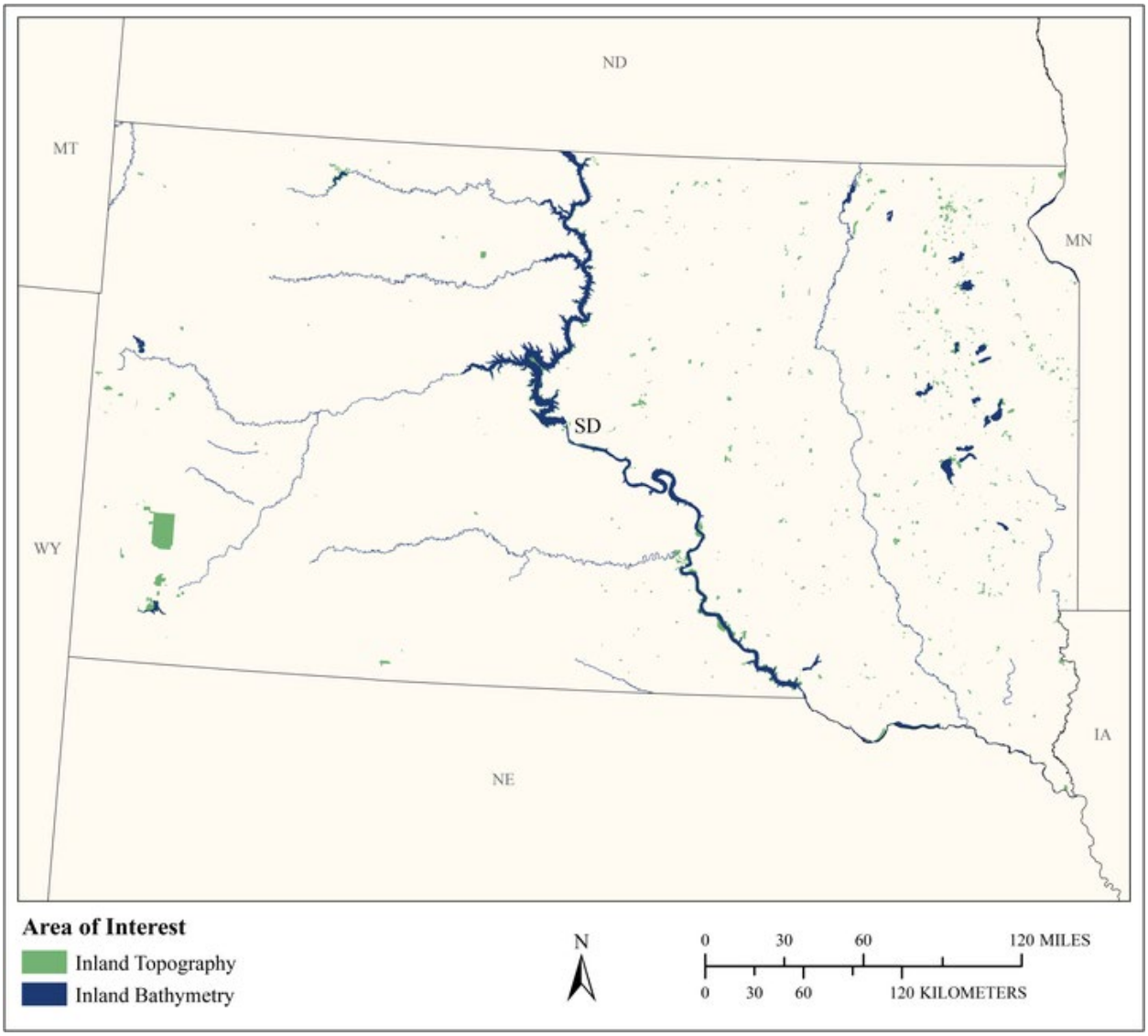
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$3,024,676									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$11,107,536									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Recreational Use by the Public and Project Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Respondent provided own shapefile, KML, or geodatabase	One or more states, territories, or counties		
Sub Area Requirements	State Game Production Areas and parks and rec areas.			

MCA Description	Response
Mission Critical Activity	Provide sustainable outdoor recreational opportunities through responsible management of our state's parks, fisheries and wildlife. Bathymetry is needed for fisheries research (random samples need to be taken at different depths), for use by the public for recreation (lake depth for boating and fishing, identification of underwater submerged objects for boating), and for habitat management. Topography is needed for planning for campgrounds and roadway development.
MCA Title	Recreational Use by the Public and Project Planning
MCA ID	21604
Organization Type	State or U.S. Territorial government
Organization Name	South Dakota Game, Fish and Parks
Sub-Agency or Division	
Organization Mission	Our mission is to provide sustainable outdoor recreational opportunities through responsible management of our state's parks, fisheries and wildlife by fostering partnerships, cultivating stewardship and safely connecting people with the outdoors.
Program Name	South Dakota Game, Fish and Parks
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	BU 27 - Recreation
Tertiary Business Use	BU 09 - Fisheries Management and Aquaculture

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Trees, submerged objects

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Not required
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B		
Update Frequency	6-10 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter		
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs		Partial		
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Not required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required			Not required	
Entire AOI under same environmental conditions	Not required	Not required			Not required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Not required	Not required			Not required	
DEM for entire AOI needs to be seamless	Not required	Not required			Not required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Not required		
DTM	Highly desirable	Not required		
DEM	Required	Required		
Raw point cloud data	Not required	Not required		
Classified point cloud	Not required	Not required		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Highly desirable	Not required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Nice to have	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Not required		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Highly desirable		
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Not required	Highly desirable		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Not required	Not required		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Statewide IfSAR flown by Sanborn 2005	None available		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	South Dakota			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know	Inland bathy data not available		
Cost savings/cost reduction	I don't know	Inland bathy data not available		
Cost avoidance	I don't know	Inland bathy data not available		

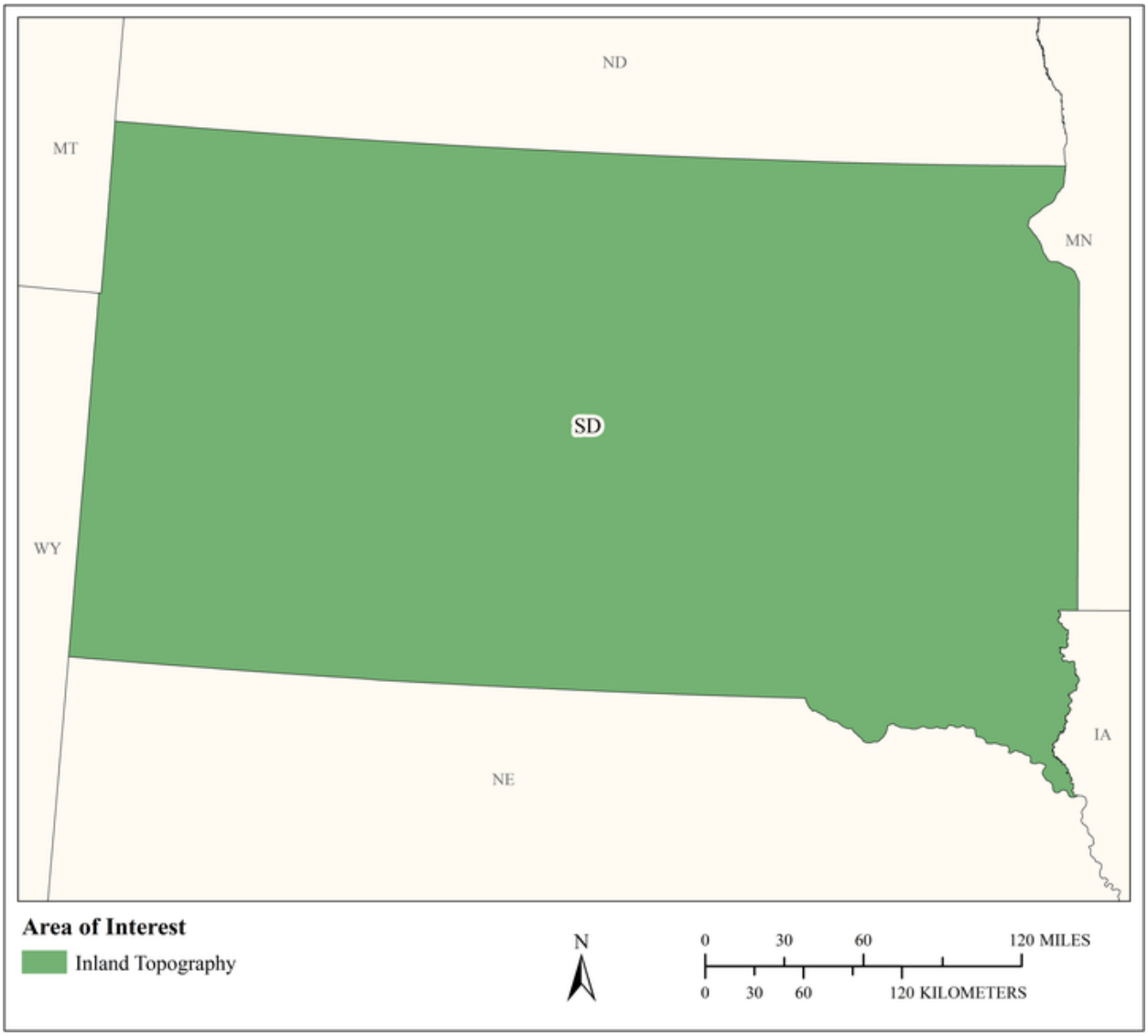
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	I don't know	Inland bathy data not available		
Mission-driven performance improvements	I don't know	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know	Inland bathy data not available		
Improved response or timeliness	I don't know	Inland bathy data not available		
Improved customer experience	I don't know	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	Inland bathy data not available		
Environmental	I don't know	Inland bathy data not available		
Public safety, including life and property	I don't know	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide							
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide							
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	I don't know	Unable to provide		I don't know	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$151		Annual dollars saved/ realized	$147,214						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	I don't know	Unable to provide		I don't know	Unable to provide							
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$436		Annual dollars saved/ realized	$88,982						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know								
Environmental	I don't know			I don't know								
Public safety, including life and property	I don't know			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	1
Update frequency	3

MCA Title: Agriculture and Precision Farming



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Farm pond design. Irrigation system design. Detailed site analysis to support precision farming. Analysis of farm sedimentation and runoff. Calibration of fertilizer application, fertilizer management, and irrigation planning. Optimized terraforming.
MCA Title	Agriculture and Precision Farming
MCA ID	60412
Organization Type	State or U.S. Territorial government
Organization Name	State of South Dakota
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 08 - Agriculture and Precision Farming
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

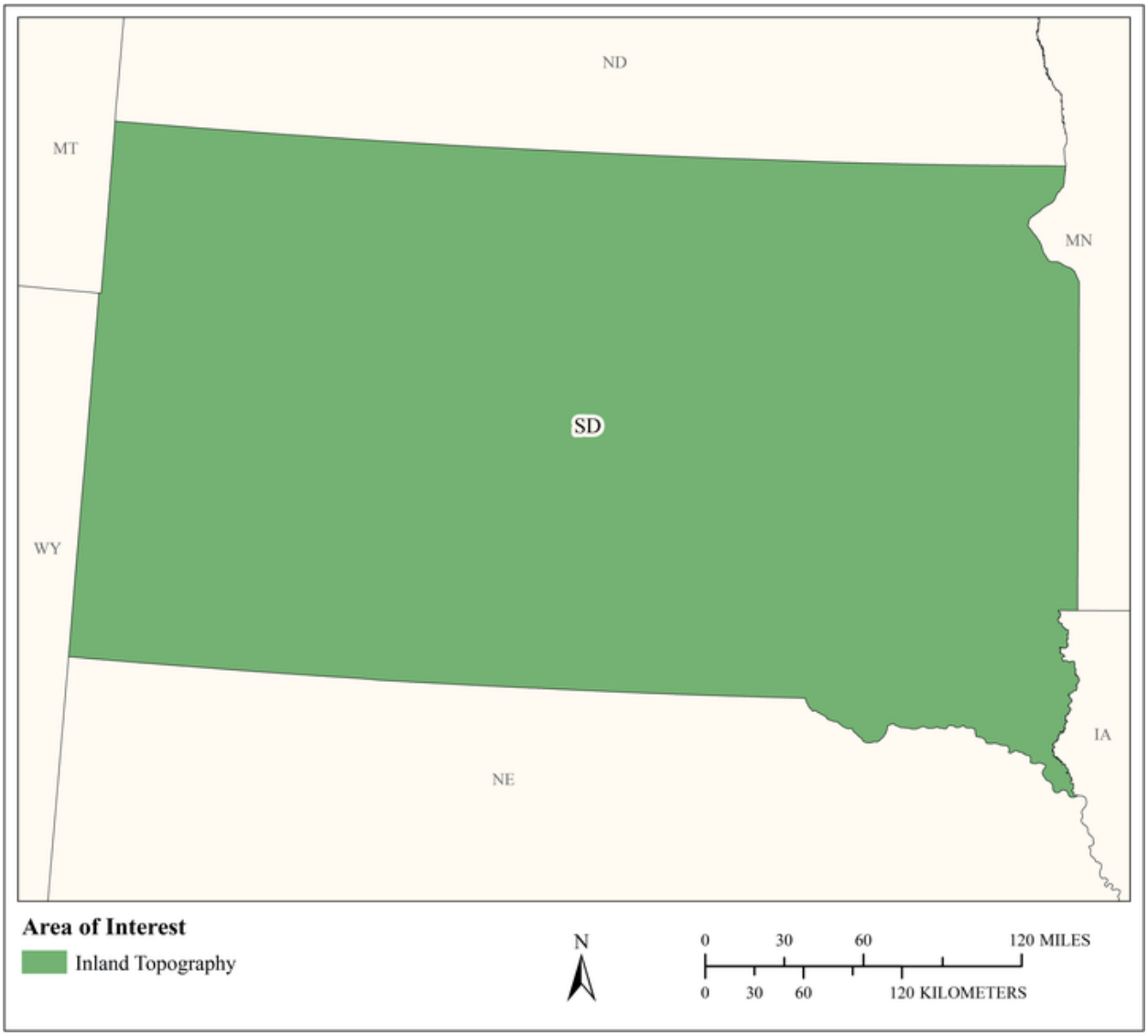
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$89,282									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$70,780									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Minor											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic Assessment and Hazard Mitigation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Geologic mapping and analysis. Sinkhole and steephead mapping, monitoring, and analysis. Identification of geomorphologic units. Landslide hazard mapping and assessment. Karst mapping, including springs and caves. Aquifer recharge.
MCA Title	Geologic Assessment and Hazard Mitigation
MCA ID	60413
Organization Type	State or U.S. Territorial government
Organization Name	State of South Dakota
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

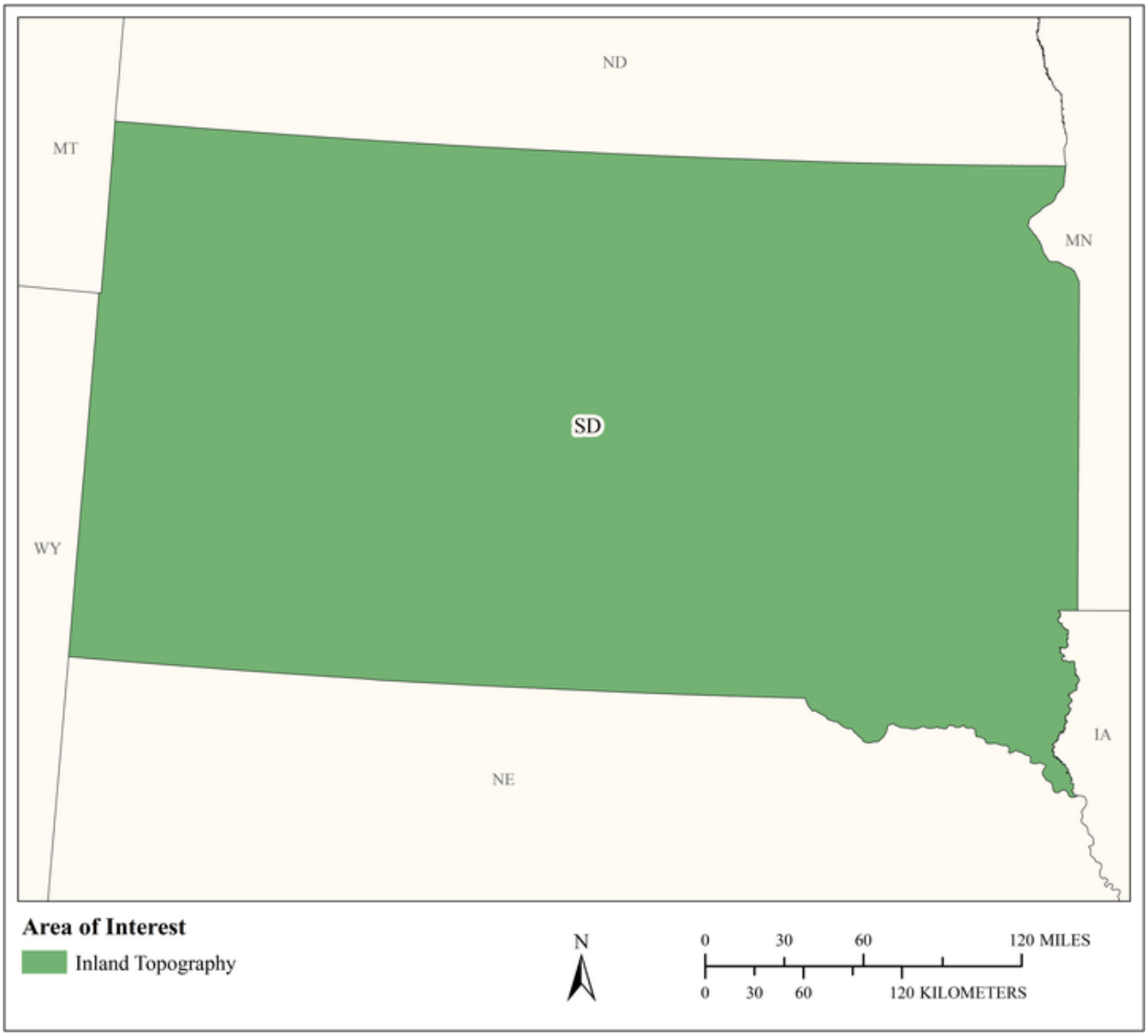
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$16,278,211									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$285,764									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Renewable Energy Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Alternate energy development – solar, tidal, wind, wave, and ocean current. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Low head power potential for hydropower.
MCA Title	Renewable Energy Resources
MCA ID	60414
Organization Type	State or U.S. Territorial government
Organization Name	State of South Dakota
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Not required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Minor			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor			

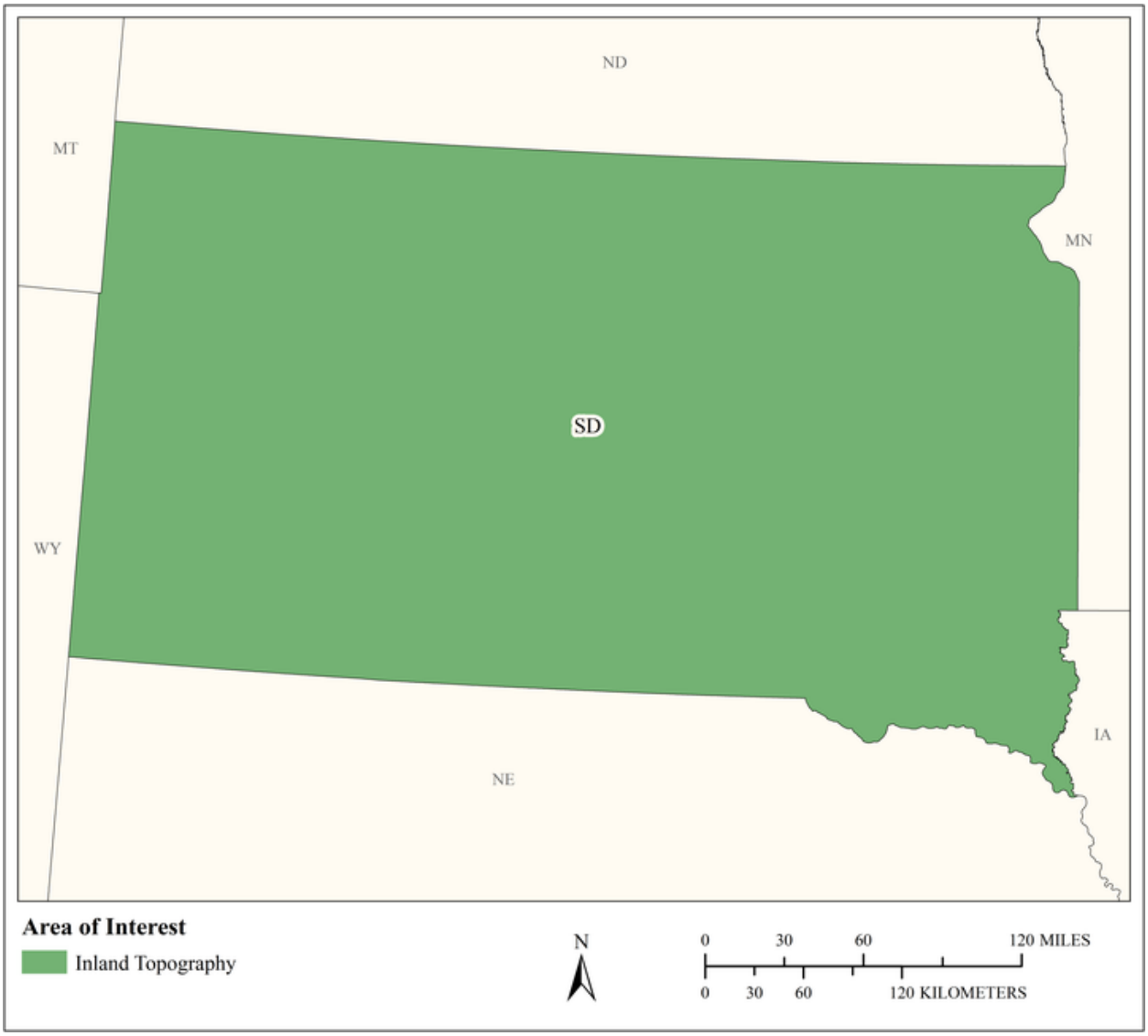
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Minor			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	None											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Oil and Gas Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Oil and gas exploration and production. Pipeline and route selection. Facility siting to mitigate geologic hazards. Construction planning. Environmental impact assessment and mitigation. Regulatory compliance.
MCA Title	Oil and Gas Resources
MCA ID	60415
Organization Type	State or U.S. Territorial government
Organization Name	State of South Dakota
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 13 - Oil and Gas Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to triple the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Nice to have			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Minor			
Cost avoidance	Minor			
Increased revenues	None			
Mission-driven performance improvements	Minor			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

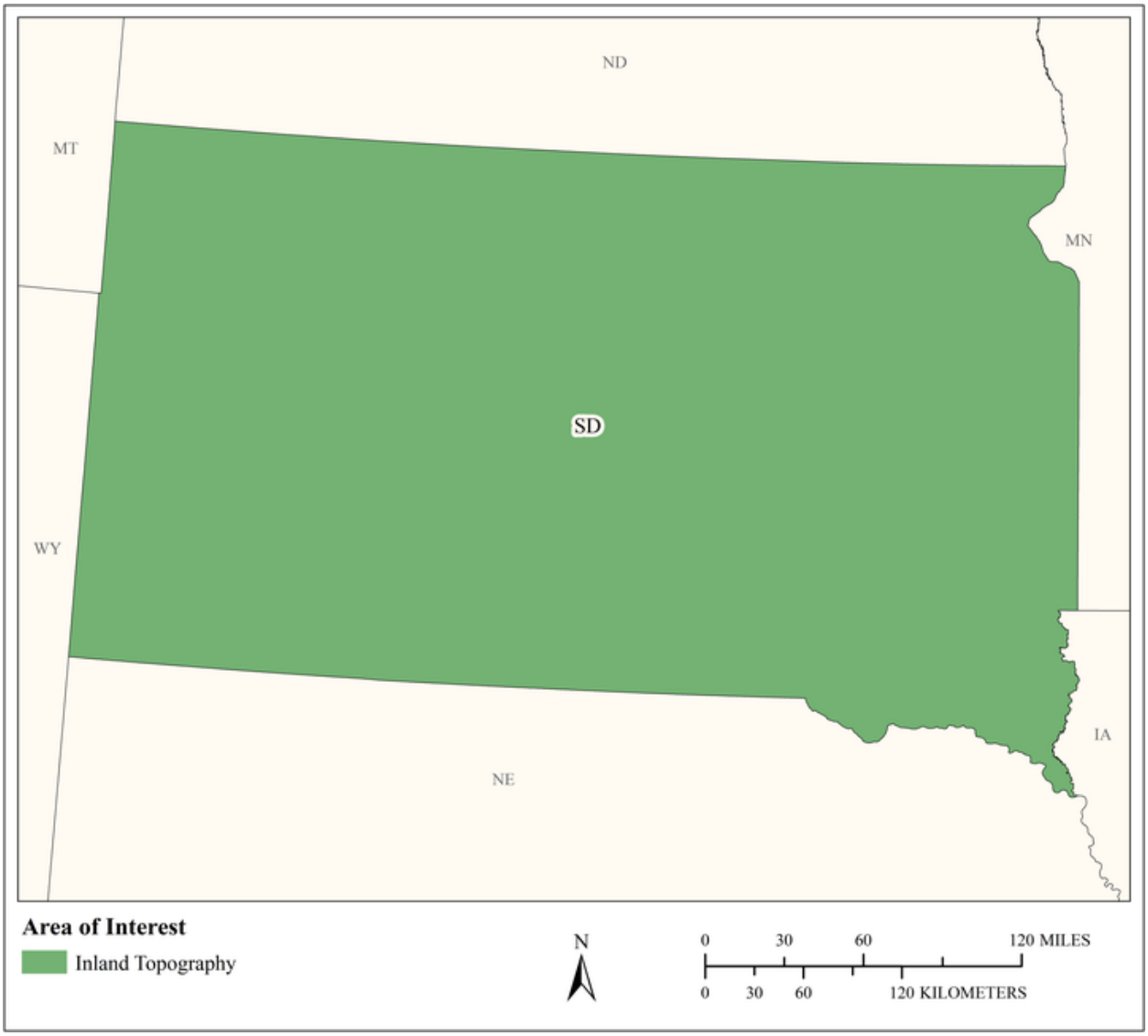
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$33,847									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Cultural Resources Preservation and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Discovery and analysis of underwater archaeological and historical cultural sites. Site protection and preservation planning. Discovery and analysis of Native American and other historical cultural sites and subsistence activities.
MCA Title	Cultural Resources Preservation and Management
MCA ID	60416
Organization Type	State or U.S. Territorial government
Organization Name	State of South Dakota
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Nice to have					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have					
DEM for entire AOI needs to be seamless	Nice to have					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Moderate			
Cost avoidance	Minor			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			

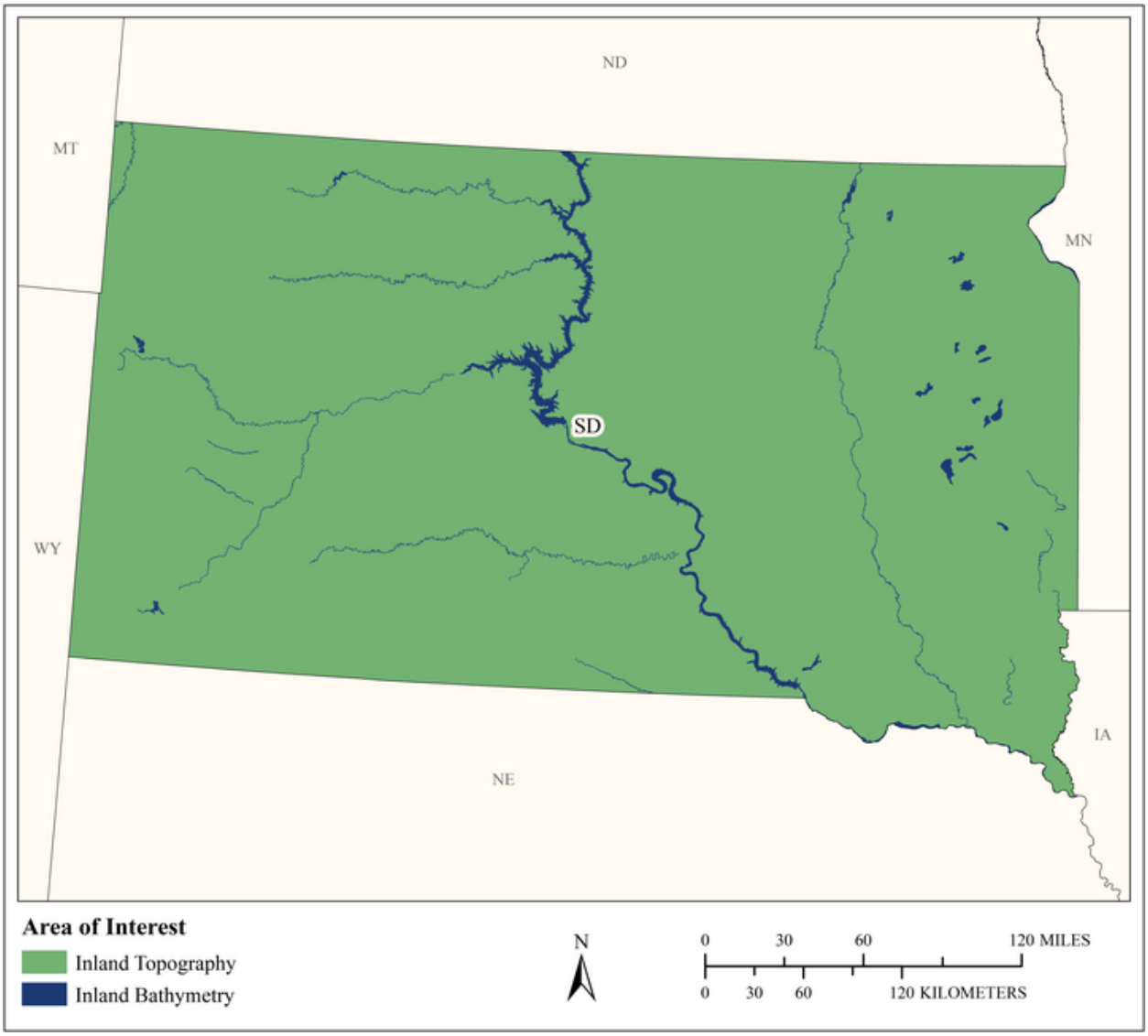
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Cost savings/cost reduction	Minor	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Moderate	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$14,134									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$12,358									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	Minor											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Flood Risk Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	As a state we are concerned with the mapping of flood plain environments for the health and welfare of our citizens, habitat management, erosion and environmental management. We manage the database for this data and provide access for emergency management personnel and citizens. Elevation data are needed for H&H modeling, water flow analysis, and flood risk management - assisting local and state entities in identifying areas of flood risk, mitigating those risks, and recovering from flood events.
MCA Title	Flood Risk Management
MCA ID	21658
Organization Type	State or U.S. Territorial government
Organization Name	South Dakota Office of Emergency Management
Sub-Agency or Division	National Flood Insurance Program, Mitigation Grant Program, Pre-Disaster Mitigation
Organization Mission	Together, each division is committed to providing quality customer services and partnerships with our clients to ensure the state's IT organization is responsive, reliable and well-aligned to support the business needs of the State of South Dakota. The purpose of the Emergency Management Division is to protect South Dakotans and their property from the effects of natural, manmade, and technological disasters. To fulfill our charge, we recognize the four phases of emergency management: Preparedness, Response, Recovery, and Mitigation.
Program Name	Within our Emergency Management Program we provide the data to map critical infrastructure, hydrological, and elevation information to provide rapid response for emergency personnel and citizens in affected areas.
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 01 - Water Supply and Quality
Tertiary Business Use	BU 02 - Riverine Ecosystem Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)

General Geographic Area and Size	
Description of smallest 3D features	In inland bathymetry we are looking for submerged rocks or blocks of cement/trees that have been moved by flood waters. Inland we are looking at trees and buildings, changes in elevation over flat areas.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Not required
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 60 cm	Up to 1 meter		
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Not required			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Required			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have			Nice to have	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Nice to have		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Highly desirable	Highly desirable		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Not required		
Bathymetric Attributed Grid (BAG)		Not required		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required	Highly desirable		
Ground control/ground truthing	Nice to have	Not required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Required		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		
Estuaries				
Inland surface water features	Required	Highly desirable		
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Required	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Currently using spotty QL3 and QL2 Lidar data flown over a 10 year period (2008, 2011, 2012, 2014, 2016, and some being acquired currently), of varying resolutions and time frames. Most of the Lidar acquired has been during flood events, so there have been no 'before' and 'after' comparisons.	We do not have current bathymetric data		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	South Dakota GIS Open Data and archived State Lidar data.			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Inland bathy data not available		
Cost savings/cost reduction	Minor	Inland bathy data not available		
Cost avoidance	None	Inland bathy data not available		
Increased revenues	Minor	Inland bathy data not available		
Mission-driven performance improvements	Moderate	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Inland bathy data not available		
Improved response or timeliness	Minor	Inland bathy data not available		
Improved customer experience	Minor	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Inland bathy data not available		
Environmental	Moderate	Inland bathy data not available		
Public safety, including life and property	Major	Inland bathy data not available		

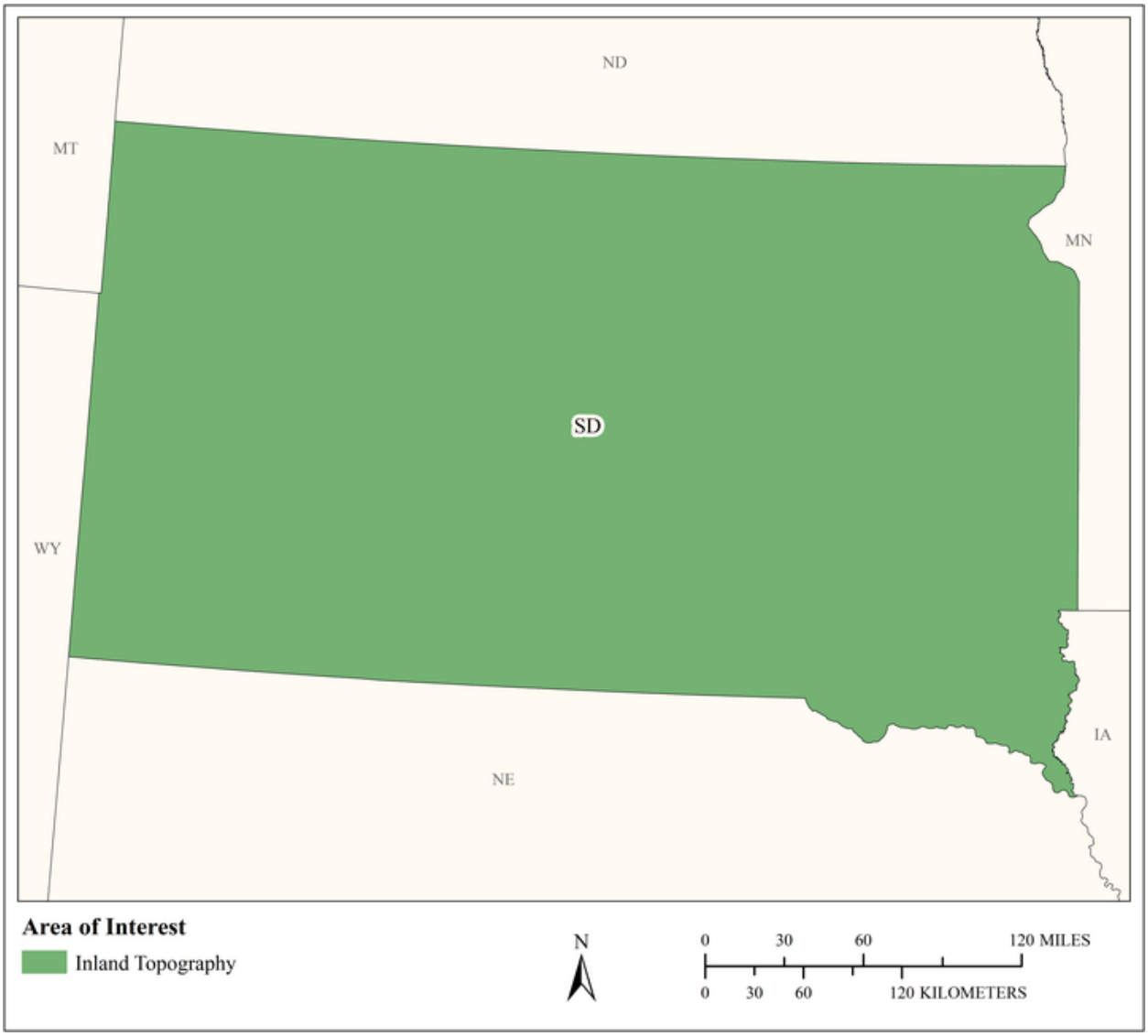
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$18,090	Moderate	Annual dollars saved/realized	$6,030						
Time savings description	Haven't been able to use effectively in past. We have not been able to avoid this. Being able to have the data on hand and readily downloadable will save immensely on time to pull data together. Having data readily accessible would allow for modeling and data dissemination instead of having to find it or process it for each individual request.			Although field visits cannot be excluded, it would speed up inspections greatly. Having the data readily available will be a great help.								
Cost savings/cost reduction	Major	Annual dollars saved/realized	$5,000,000	I don't know	Unable to provide							
Cost savings/cost reduction description	Being able to have the data acquired would free us up to actually use the data in other projects.											
Cost avoidance	Major	Annual dollars saved/realized	$10,500,000	I don't know	Unable to provide							
Cost avoidance description	Again the ability of being proactive, not reactive is a major benefit and cost avoidance. Wouldn't need to use consultants to prepare data to use. In emergency events would be able to plan ahead being proactive instead of always reactive.			There are numerous boating accidents due to hitting submerged trees or concrete that could be avoided.								
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Major	Annual percent improvement	100%	I don't know	Unable to provide							
Mission-driven performance improvements description	Having the data available and ready to access will be 100% better than current availability.											
Other operational benefits	Major	Annual dollars saved/realized	$7,236									
Other operational benefits description	Being able to provide data organizationally and publicly. Multiple times data is requested that we cannot deliver because we don't have it or it takes hours to find and process.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$7,236	Major	Annual dollars saved/realized	$1,000,000						
Value added to products or services description	Multiple times data is requested that we cannot deliver because we don't have it or it takes hours to find and process.			This has the potential for significant savings due to the accuracy of the data.								
Improved response or timeliness	Major	Annual dollars saved/realized	$2,010,854	Major	Unable to provide							

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Improved response or timeliness description	Having complete coverage that is readily available will help immensely. Having the data readily available and processed would increase our response time exponentially. Being able to prepare for worst case scenarios will help prepare for disaster events. Having the data readily available and processed would increase our recovery time exponentially. Customers have currently not been able to access data, so having it will help.			As river courses change with disaster events this will allow us to monitor and react to events faster. Being able to map changes in shorelines or buried objects will allow for improved products. Being able to map changes in shorelines or buried objects will allow for fast recovery. Being able to map changes in shorelines or buried objects will allow for fast customer assistance. Having the data readily available will allow for faster responses to save properties and personnel.								
Improved customer experience	Major	Annual dollars saved/realized	$2,009,045	Major	Unable to provide							
Improved customer experience description	Being able to provide new data and services will greatly enhance our products. Having the data available and in one place will allow for better, more accurate processes. Haven't had it in the past.			Having the data available and downloadable will greatly enhance public safety and service. With the new data, new services will be able to be delivered to other agencies and the public.								
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Education or outreach description	We receive many requests over the year to provide data that we do not have, this would greatly help our outreach			Being able to provide services and apps to the public will enhance outreach								
Environmental	Major			Major								
Environmental description	Having total coverage that is repeated every 5 or so years would be immensely helpful			Having immediate access to changes in rivers will allow major updates to wetlands and the environment								
Public safety, including life and property	Major			Major								
Public safety, including life and property description	Having the data available, ready access, processed would greatly help securing safety for our communities			Making this data available will allow for an increase in services to protect the public during a disaster event								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes	Yes		
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Wildfire Management, Planning, and Response



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of forest fuel and fire susceptibility. Fire behavior modeling to support wildfire suppression activities. Wildland/urban interface building identification. Post fire analysis to determine landslide prone areas.
MCA Title	Wildfire Management, Planning, and Response
MCA ID	60417
Organization Type	State or U.S. Territorial government
Organization Name	State of South Dakota
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 17 - Wildfire Management, Planning, and Response
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

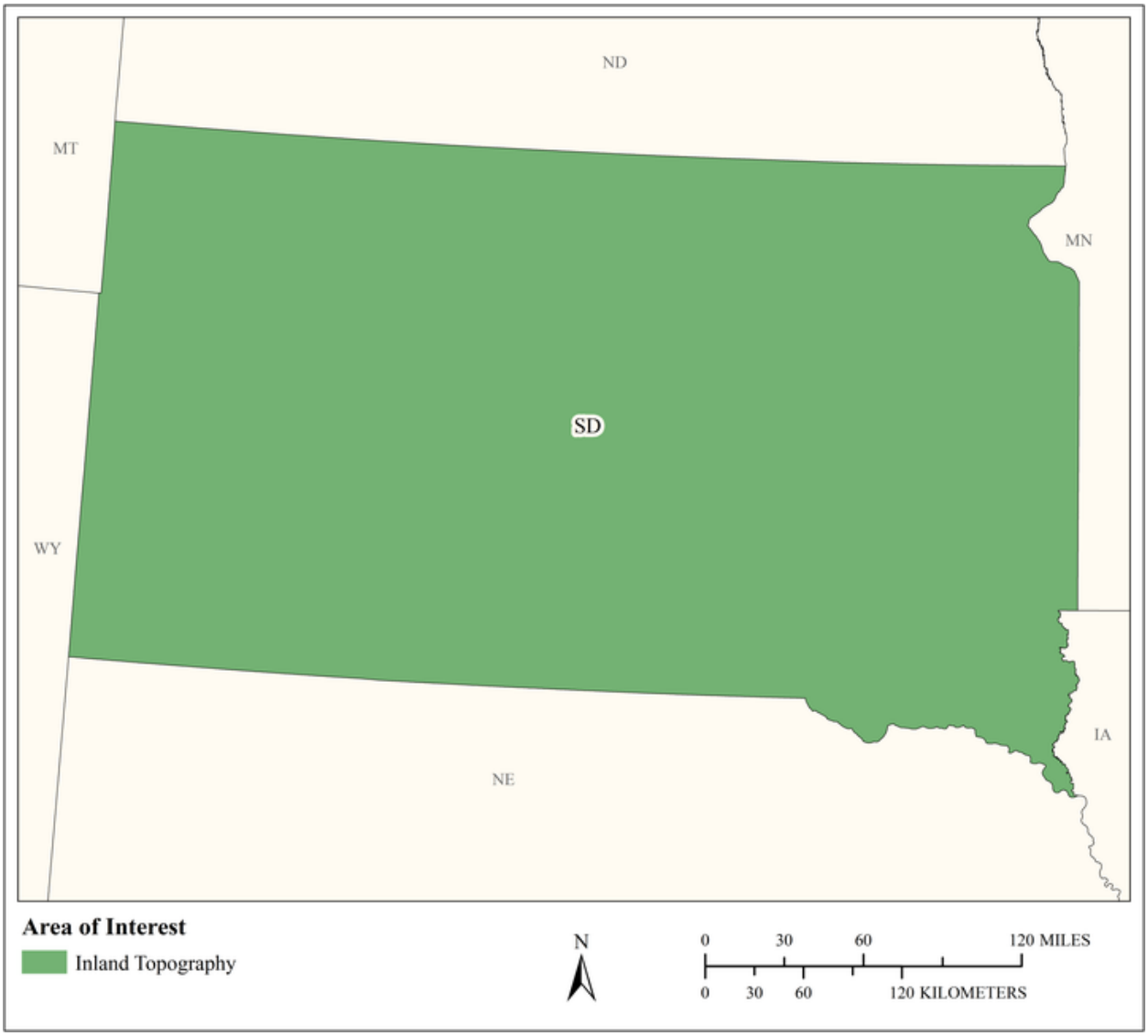
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$414,327									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Land Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Road and railroad route selection and maintenance. Slope analysis for autonomous cars. GPS navigation visualization.
MCA Title	Land Navigation and Safety
MCA ID	60418
Organization Type	State or U.S. Territorial government
Organization Name	State of South Dakota
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 19 - Land Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

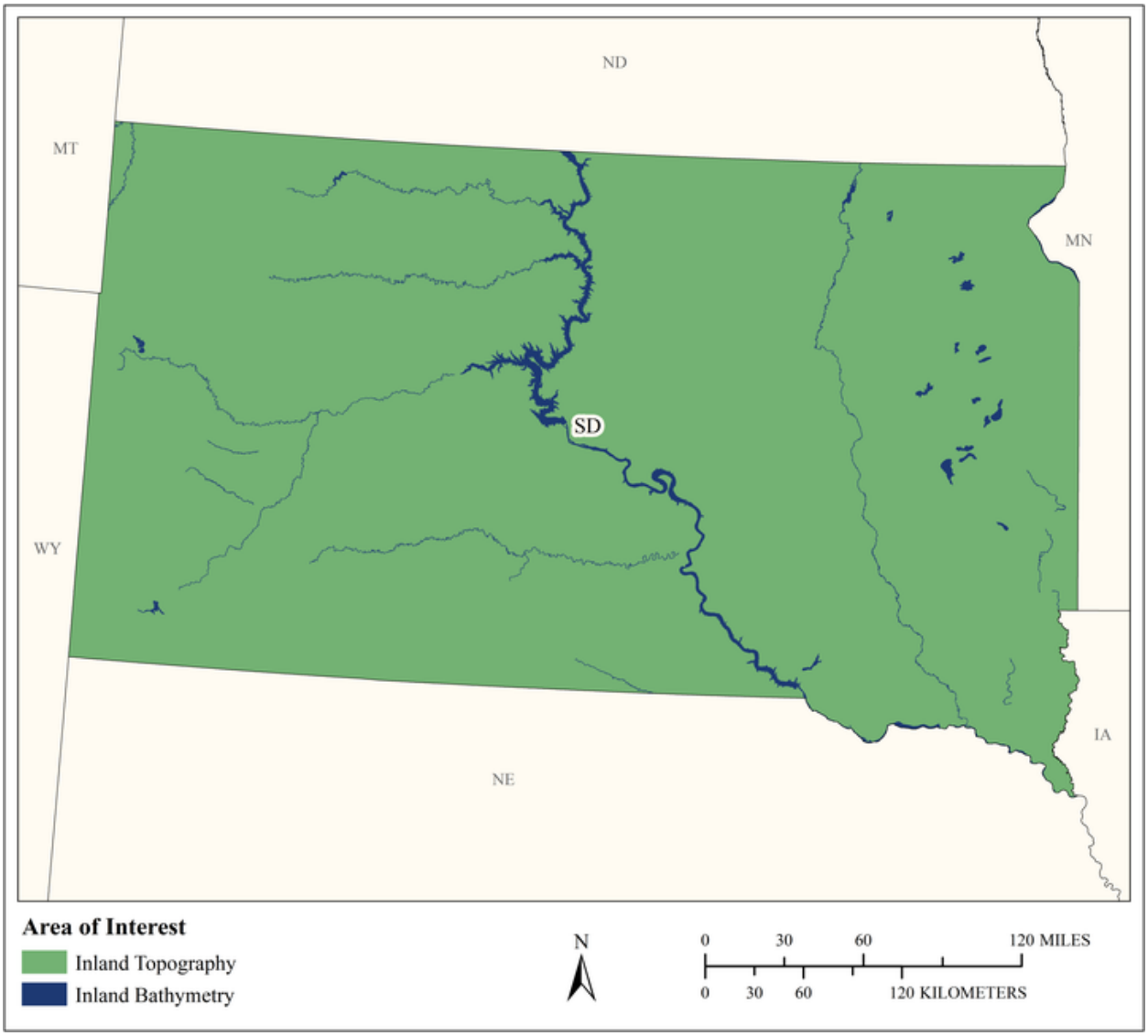
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Moderate			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Moderate	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$998,977									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$80,672									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Infrastructure and Construction Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Marine construction. Bridge design and construction. Engineering and construction of dams, levees, dikes, reservoirs, and coastal structures. Shipyard and port construction. Water, sewer, or power line planning and vegetation analysis. Pump, drain, and well placement. Stormwater modeling. Cut and fill analysis for earth-moving. Building site analysis. Road infrastructure. Infrastructure hardening or mitigation for climate change effects, e.g. sea level change.
MCA Title	Infrastructure and Construction Management
MCA ID	60419
Organization Type	State or U.S. Territorial government
Organization Name	State of South Dakota
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	Up to 2 meters		
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Nice to have		
Classified point cloud	Required	Highly desirable		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Nice to have		
Coastal and riverine structures	Highly desirable	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Moderate		
Increased revenues	Minor	None		
Mission-driven performance improvements	Moderate	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate		

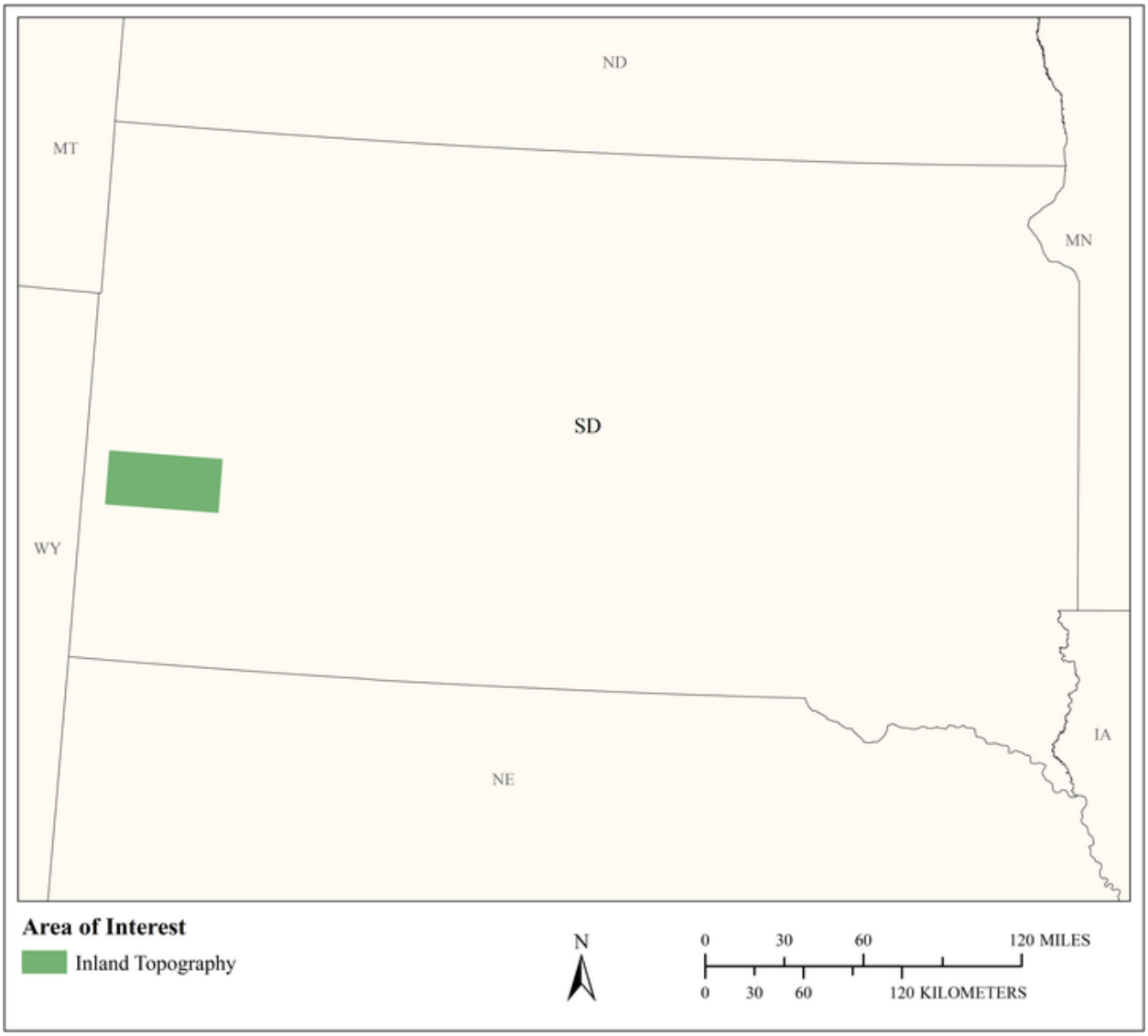
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major		
Improved customer experience	Moderate	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor		
Environmental	Moderate	Minor		
Public safety, including life and property	Moderate	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide							
Increased revenues	None			None								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$3,465,530		Annual dollars saved/ realized	$1,167,592						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Minor	Unable to provide							
Improved customer experience	Major	Unable to provide		Minor	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$10,198,358		Annual dollars saved/ realized	$121,240						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor								
Environmental	Moderate			Moderate								
Public safety, including life and property	Major			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Municipal Planning and Mapping



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Respondent provided own shapefile, KML, or geodatabase			
Sub Area Requirements	Rapid City Runoff			

MCA Description	Response
Mission Critical Activity	Municipal mapping of city/county transportation systems, impervious surface mapping, city infrastructure planning (all water, sewer and storm water systems), flood analysis for emergency management.
MCA Title	Municipal Planning and Mapping
MCA ID	21704
Organization Type	Regional, County, City, or other local government
Organization Name	City of Rapid City
Sub-Agency or Division	
Organization Mission	To provide mapping services and technical support to the staffs of the City of Rapid City and Pennington County, and to the general public.
Program Name	Storm Water Runoff
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Cars, trees, boats

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need			
Acceptable Vertical Error	Up to 20 cm			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Not required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Nice to have			
Wetlands	Nice to have			
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Not required			
Cultural resources	Not required			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	LiDAR, QL2, dated March 2015			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	Our own LiDAR data			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			

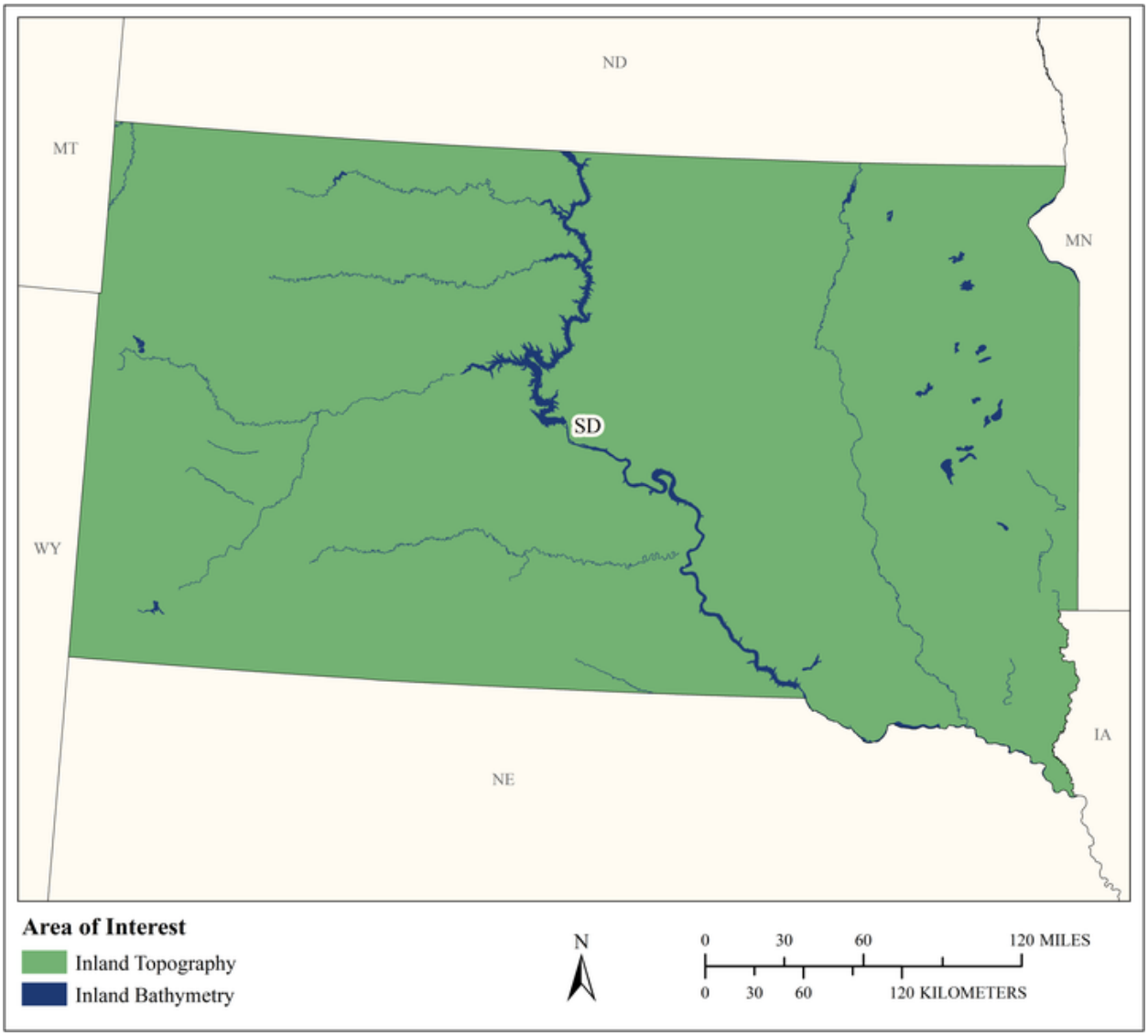
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Cost savings/cost reduction	None			
Cost avoidance	I don't know			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Minor			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	I don't know			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	I don't know	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	I don't know											
Public safety, including life and property	Major											
Public safety, including life and property description	People would have better knowledge of areas that tend to flood or have major runoff due to storm activity											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades				
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Urban and Regional Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Land development and zoning. Municipal mapping of building footprints and elevations. Port resilience planning. Parks and transportation planning. Virtual city creation. Urban ecology planning.
MCA Title	Urban and Regional Planning
MCA ID	60420
Organization Type	State or U.S. Territorial government
Organization Name	State of South Dakota
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B		
Update Frequency	4-5 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Required	Nice to have		
Classified point cloud	Required	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Highly desirable		
Land use/land cover	Required	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Nice to have		
Coastal and riverine structures	Highly desirable	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	Major	Minor		
Increased revenues	Minor	Minor		
Mission-driven performance improvements	Major	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		

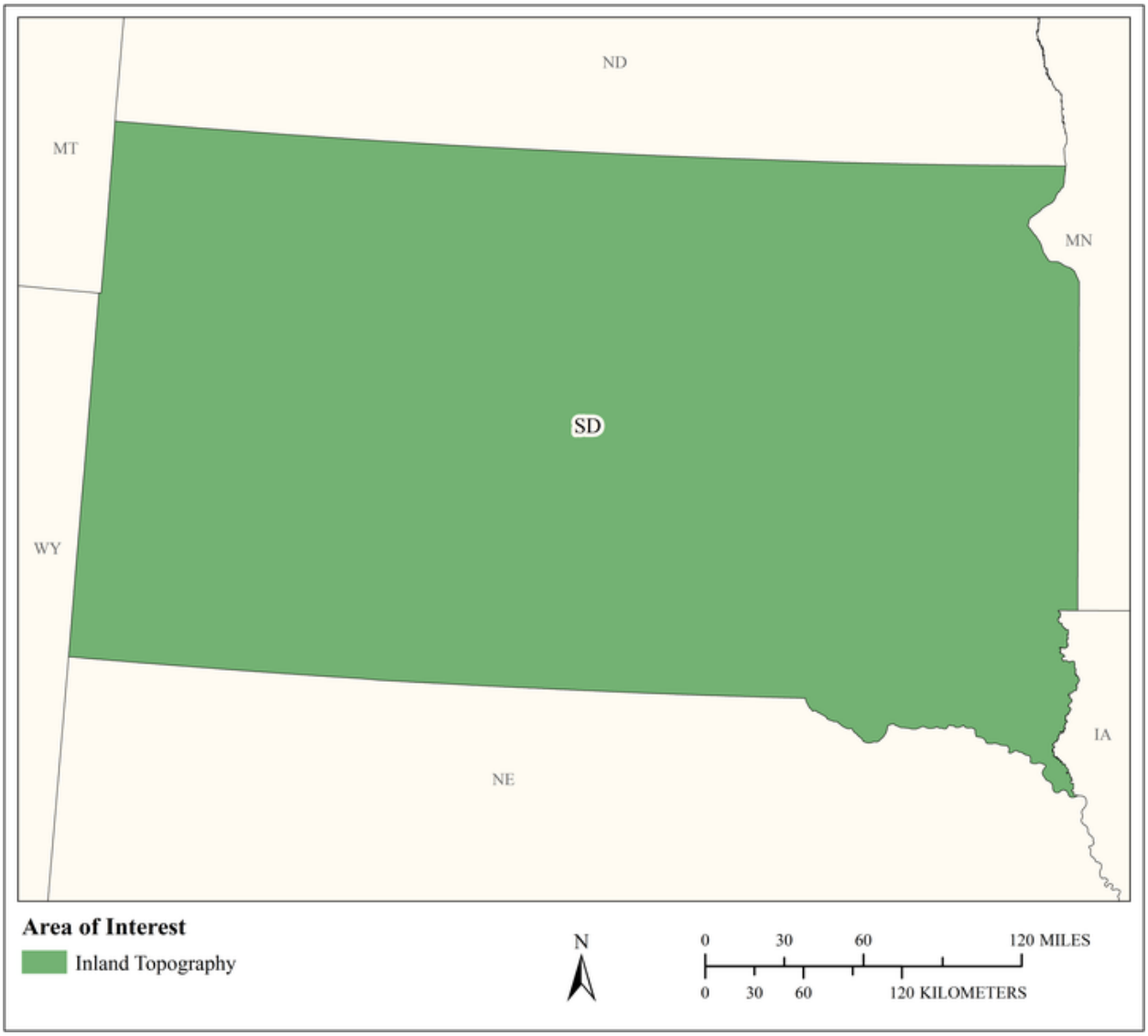
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor		
Improved customer experience	Major	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor		
Environmental	Major	Minor		
Public safety, including life and property	Major	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$20,748,661		Annual dollars saved/ realized	$845,056						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$2,395,442		Annual dollars saved/ realized	$1,069,069						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate								
Environmental	Major			Moderate								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Education K12 and Beyond, Basic Research



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Development of 3-D visualizations to help students understand the Earth they live on. Understanding of continental-scale climate change impacts. Ocean science. Ocean education. Scientific research. Data dissemination. Development of training simulators.
MCA Title	Education K12 and Beyond, Basic Research
MCA ID	60421
Organization Type	State or U.S. Territorial government
Organization Name	State of South Dakota
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 26 - Education K12 and Beyond, Basic Research
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

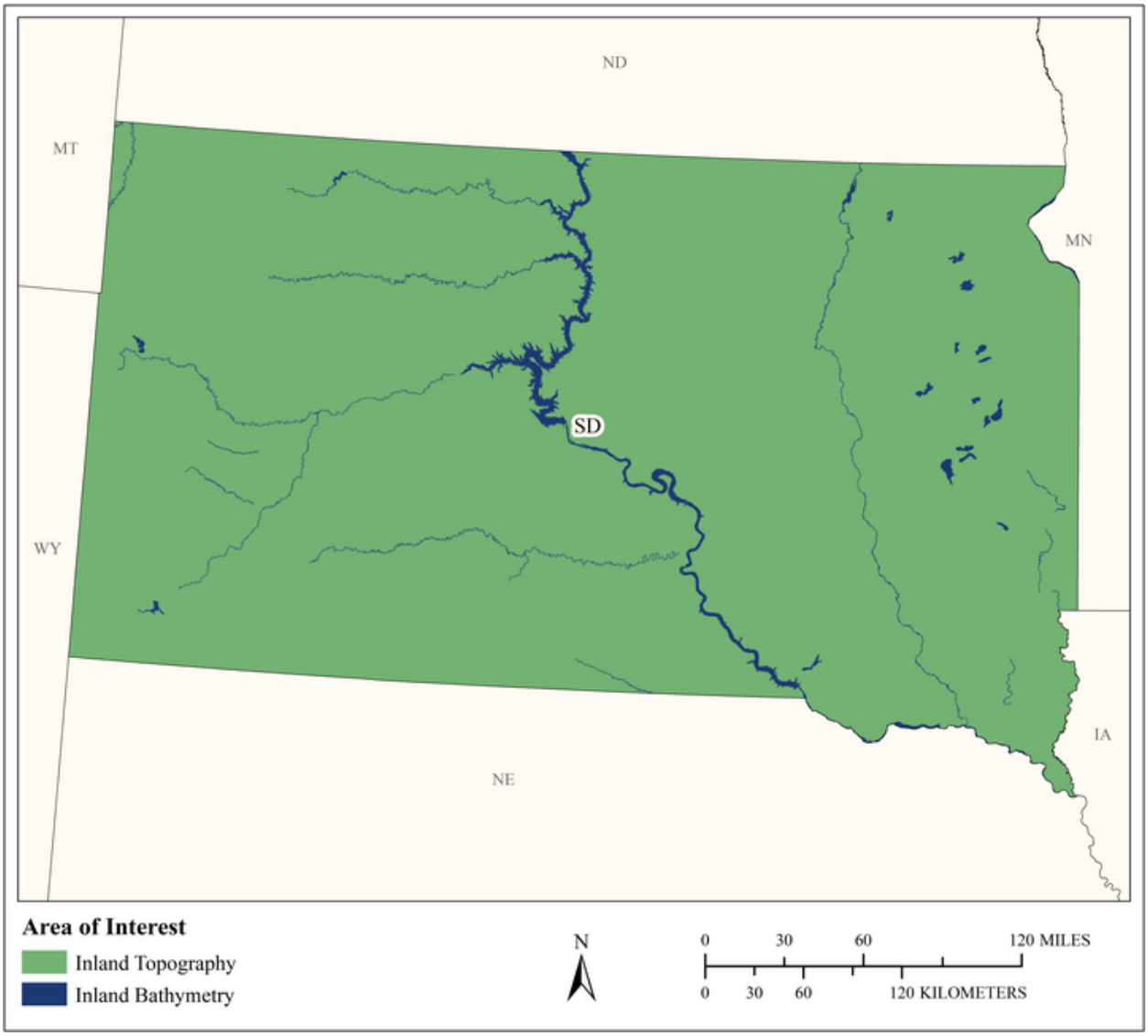
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$405,248									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$968,662									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Recreation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Planning and development of recreational facilities such as rafting, boating, swimming, diving, and fishing areas; ski slopes; and golf courses. Location- based products and services such as maps and guides. Tourism. Trail and vista site planning. Orienteering.
MCA Title	Recreation
MCA ID	60422
Organization Type	State or U.S. Territorial government
Organization Name	State of South Dakota
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 27 - Recreation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required			Not required	
Entire AOI under same environmental conditions	Required	Not required			Not required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have			Nice to have	
DEM for entire AOI needs to be seamless	Required	Nice to have			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required		
DTM	Nice to have	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Highly desirable	Highly desirable		
Edited/cube XYZ		Highly desirable		
Full waveform	Not required	Nice to have		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Nice to have		
Ground control/ground truthing	Nice to have	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Highly desirable		
Land use/land cover	Nice to have	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Not required	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor		
Cost savings/cost reduction	Moderate	Minor		
Cost avoidance	Major	Minor		
Increased revenues	None	Minor		
Mission-driven performance improvements	Major	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor		

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Minor		
Improved customer experience	Moderate	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor		
Environmental	Major	Minor		
Public safety, including life and property	Major	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	None			Moderate	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$17,694		Annual dollars saved/ realized	$10,656						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Minor	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major								
Environmental	Moderate			Major								
Public safety, including life and property	Moderate			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

Tennessee

As of March 2019, the State of Tennessee is approximately 75% complete with developing Quality Level 2 (QL2) lidar data through the USGS 3D Elevation Program (3DEP). All of Tennessee will be completed by May 2020. The success of this effort in Tennessee has been through strong coordination among federal, state, and local governments. Tennessee Valley Authority, U.S. Army Corps of Engineers, U.S. Department of Agriculture/ Natural Resources Conservation Service, U.S. Forest Service, as well as funding from USGS comprised the federal partners. Tennessee state agencies that contributed to the USGS 3DEP effort included: Transportation, Environment and Conservation, and Finance and Administration. At the local level, several counties, municipalities, utility districts, and electric co-operatives contributed additional funding.

The following table provides an overview of the applications needing better terrain data.

Vegetation Management	Code enforcement
Stormwater Management	Historic Preservation
Hazardous Material Management	Assessing
Agriculture	Unmanned Airborne Vehicle Navigation (R&D)
Transportation Planning	Solar Energy Potential (R&D)
Flood Risk Management	Environment and Conservation
Forestry Management	Emergency Response
Economic Development	Landslide Mitigation

These applications and others are highlighted in the state's business plan from 2013:

https://www.tn.gov/content/dam/tn/finance/documents/TN_OIR-GIS_EnhancedElevBusinessPlanFINAL_REV010612_v4.pdf

The vast majority of elevation requirements for Tennessee can be met with the USGS QL2 standard. However, there may be other applications that require QL1 (transmission line management, etc.) data and/or topo/bathy lidar data. Most respondents requiring inland bathymetry indicated a need for QL0B data. Elevation data should be updated every 4-5 years.

The State of Tennessee has found tremendous value in the 3DEP lidar datasets and would hope that additional funding will be provided to support future enhanced elevation data acquisition efforts.

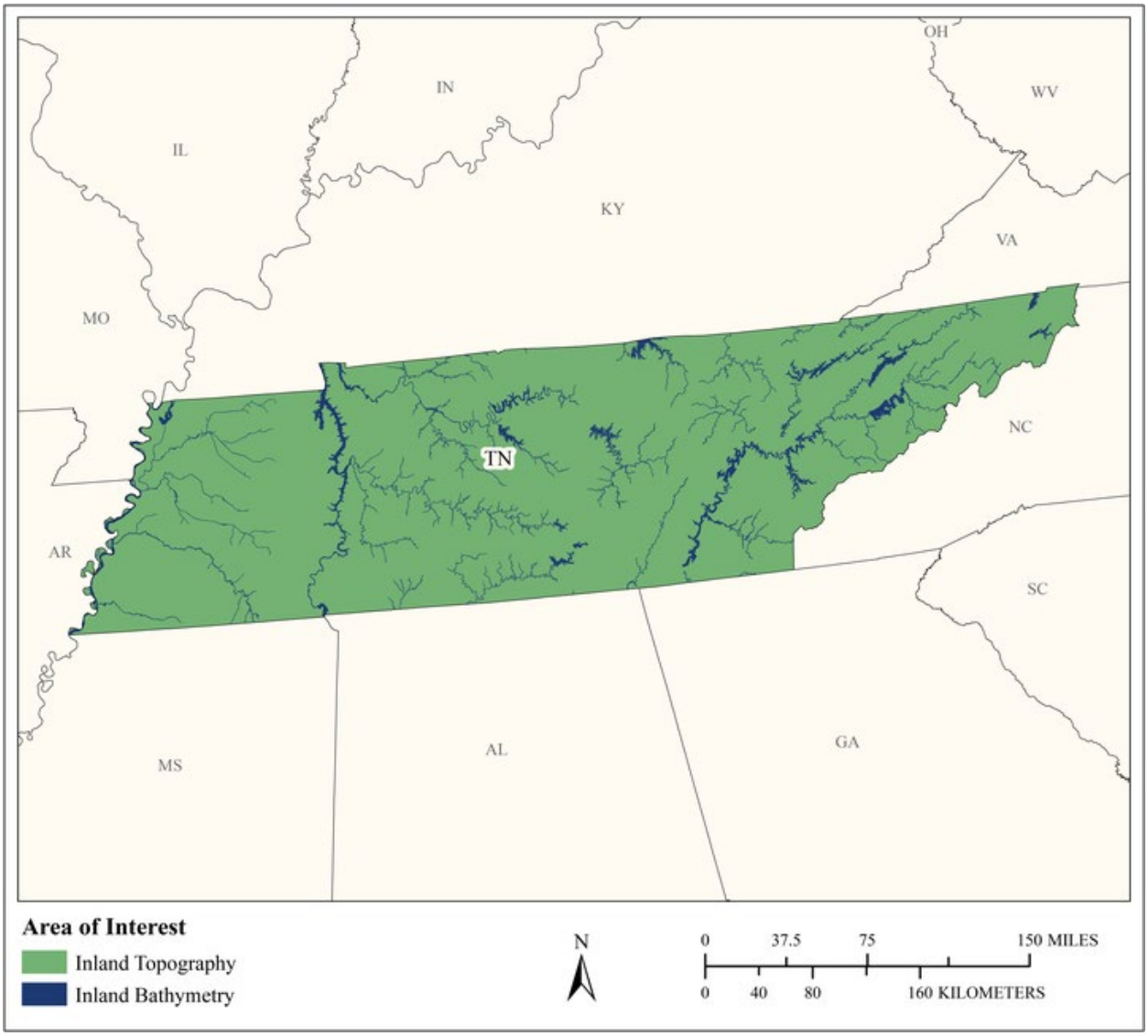
The State of Tennessee has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	State of Tennessee	60423	Water Supply and Quality	Inland Topo	QL2	4-5 years	$233,663	$62,587	Moderate	Major	Moderate
				Inland Bathy	QL1B	6-10 years	$1,010,847	$105,637	Moderate	Major	Moderate
BU 02 – Riverine Ecosystem Management	State of Tennessee	60424	Riverine Ecosystem Management	Inland Topo	QL1 HD	6-10 years	$64,504	$6,443	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$34,337	$2,421	Major	Major	Major
BU 04 – Forest Resource Management	State of Tennessee	60425	Forest Resources Management	Inland Topo	QL1	2-3 years	$166,622	$241,539	Major	Major	Major
BU 06 – Natural Resource Management	State of Tennessee	60426	Natural Resources Conservation	Inland Topo	QL1 HD	4-5 years	$1,652,947	$6,070,128	Major	Major	Major
BU 07 – Wildlife and Habitat Management	Tennessee Wildlife Resources Agency	21496	Protect, Conserve, and Manage the Fish and Wildlife of the State and Their Habitats	Inland Topo	QL2	4-5 years	$10,038	$28,994	None	I don't know	None
				Inland Bathy	Cross sections and/or transects meet needs	Event driven	$80,450	$48,628	I don't know	I don't know	I don't know
BU 08 – Agriculture	State of Tennessee	60427	Agriculture and Precision Farming	Inland Topo	QL2	2-3 years	$48,791	$38,680	Major	Major	Minor
BU 09 – Fisheries Management and Aquaculture	State of Tennessee	60428	Fisheries Management and Aquaculture	Inland Bathy	QL0B	6-10 years	$84,322	$38,378	Major	Major	Moderate
BU 12 – Renewable Energy Resources	State of Tennessee	60429	Renewable Energy Resources	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	None
BU 15 – Flood Risk Management	State of TN, F&A, GIS Services	1407	Statewide GIS Coordination	Inland Topo	QL2	6-10 years	$5,917,041	$1,035,296	Moderate	Major	I don't know
				Inland Bathy	QL1B	4-5 years	$411,038	$461,491	Moderate	Moderate	Major
BU 15 – Flood Risk Management	Shelby County, Tennessee Government	21951	Geospatial Support to County and Local Government Agencies	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	Moderate	Minor	Moderate

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 17 – Wildfire Management	State of Tennessee	60430	Wildfire Management, Planning, and Response	Inland Topo	QL1	4-5 years	$226,425	Unable to quantify	Major	Major	Major
BU 18 – Homeland Security	State of Tennessee	60431	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management	Inland Topo	QL2	4-5 years	$1,243,208	$21,973	Major	Moderate	Major
BU 20 – Marine and Riverine Navigation	State of Tennessee	60432	Marine and Riverine Navigation and Safety	Inland Bathy	QL0B	2-3 years	$768,712	$101,171	Moderate	Moderate	Moderate
BU 22 – Infrastructure Management	Tennessee Dept. of Transportation	21753	Management and Modification of the Multimodal Transportation Systems in Tennessee	Inland Topo	QL2	(a) 4-5 years (b) 6-10 years	$1,893,868	$5,573,274	I don't know	I don't know	Major
				Inland Bathy	Cross sections and/or transects meet needs	6-10 years	$638,074	$66,256	None	Major	I don't know
BU 25 – Real Estate, Banking, and Insurance	Hamilton County TN GIS	1461	Coordination and Support of Government Agencies and Utilities Within Hamilton County	Inland Topo	QL2	4-5 years	$20,000	Unable to quantify	None	Minor	Minor
BU 27 – Recreation	State of Tennessee	60433	Recreation	Inland Bathy	QL0B	4-5 years	$5,823	Unable to quantify	Major	Major	Moderate
BU 30 – Maritime and Land Boundary Management	Knoxville, Knox County, Knoxville Utilities Board, TN,	22180	Address and Cadastral Information Management	Inland Topo	QL2	6-10 years	$90,450	Unable to quantify	Moderate	None	None

MCA Title: Water Supply and Quality



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Fate and transport of contaminants. Pollution risk mitigation. Runoff and sedimentation analyses. Point- or non-point source pollution modeling. Management of contaminants and marine debris - point, non-point, vessel, and atmospheric pollution; spills; trash.
MCA Title	Water Supply and Quality
MCA ID	60423
Organization Type	State or U.S. Territorial government
Organization Name	State of Tennessee
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B		
Update Frequency	4-5 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Required			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Highly desirable	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	Major	Minor		
Increased revenues	Minor	None		
Mission-driven performance improvements	Major	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		

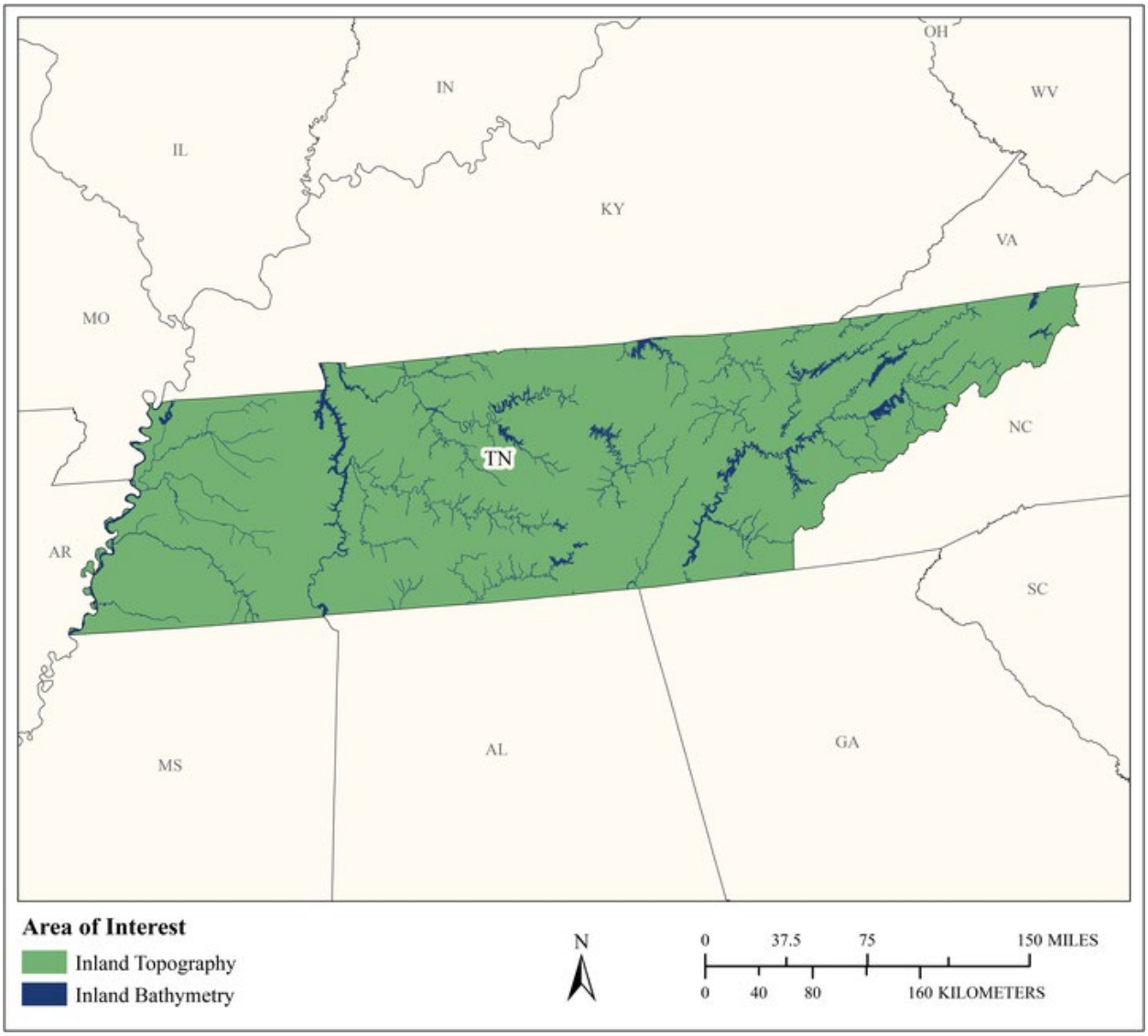
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor		
Improved customer experience	Major	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor		
Environmental	Major	Moderate		
Public safety, including life and property	Major	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$233,663		Annual dollars saved/ realized	$1,010,847						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide							
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$62,587		Annual dollars saved/ realized	$105,637						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate								
Environmental	Major			Major								
Public safety, including life and property	Moderate			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Riverine Ecosystem Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Stream channel analysis and mapping. Stream bank erosion analysis. Aquatic and terrestrial species habitat management. Environmental management.
MCA Title	Riverine Ecosystem Management
MCA ID	60424
Organization Type	State or U.S. Territorial government
Organization Name	State of Tennessee
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B		
Update Frequency	6-10 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Required			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Required	Highly desirable		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Highly desirable	Nice to have		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Moderate	Minor		
Cost avoidance	Moderate	None		
Increased revenues	None	None		
Mission-driven performance improvements	Major	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		

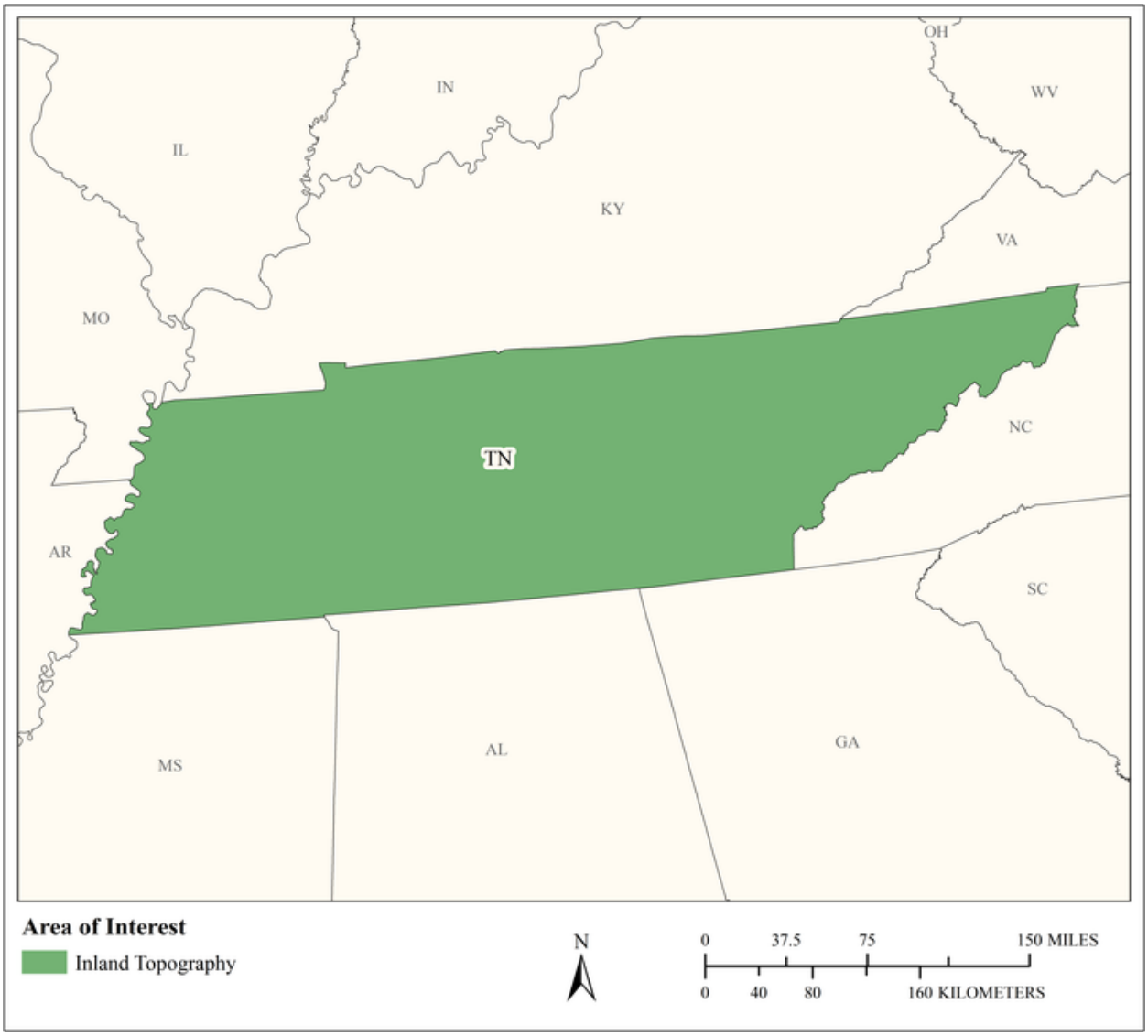
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Moderate		
Improved customer experience	Major	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate		
Environmental	Major	Major		
Public safety, including life and property	Major	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$64,504		Annual dollars saved/ realized	$34,337						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$6,443		Annual dollars saved/ realized	$2,421						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Major			Major								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Forest Resources Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Forest health assessment. Determination of standing inventory of forest resources. Prescribed burn planning. Analysis of carbon stocks for trade. Harvest systems planning.
MCA Title	Forest Resources Management
MCA ID	60425
Organization Type	State or U.S. Territorial government
Organization Name	State of Tennessee
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Highly desirable			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

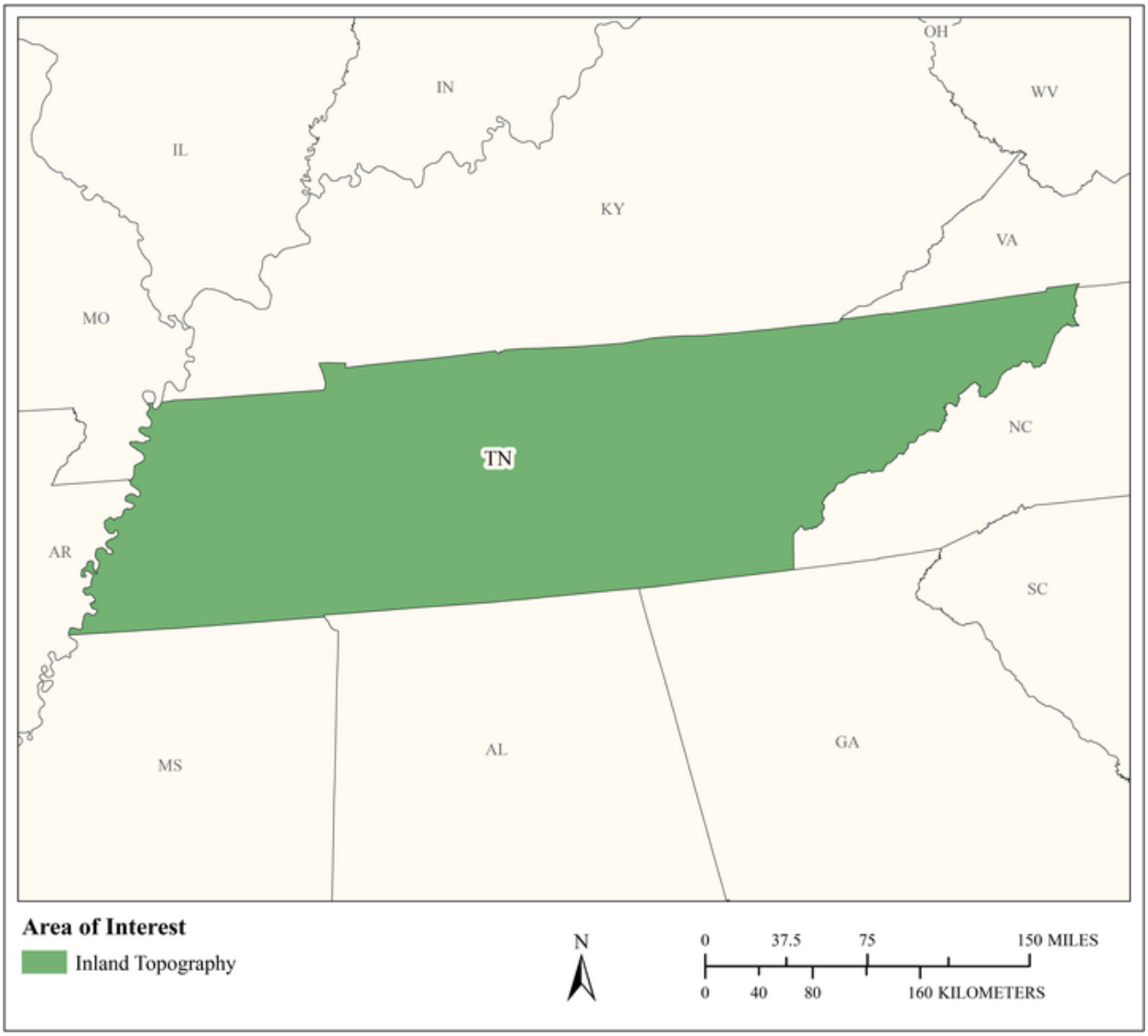
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$166,622									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$241,539									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Natural Resources Conservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation engineering. Soils and wetlands mapping and characterization. Modeling of biological and ecological systems. Erosion control. Rainfall penetration studies, impervious surfaces. Assessment of blue carbon stocks.
MCA Title	Natural Resources Conservation
MCA ID	60426
Organization Type	State or U.S. Territorial government
Organization Name	State of Tennessee
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

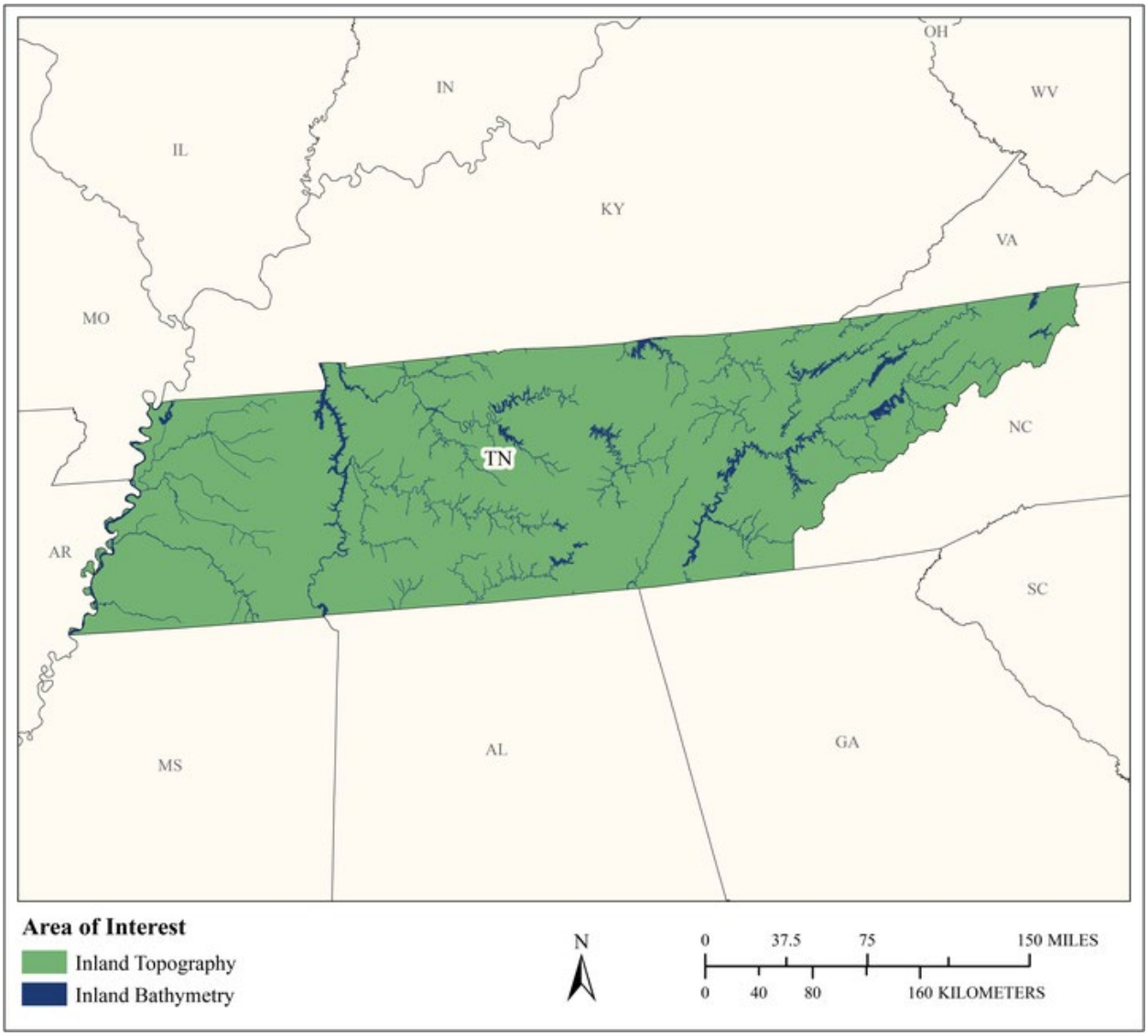
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,652,947									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$6,070,128									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Protect, Conserve, and Manage the Fish and Wildlife of the State and Their Habitats



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Protect, conserve, and manage the fish and wildlife of the state and their habitats. Elevation data are needed for habitat and land cover assessment, determination of forest types at specific elevations and species within those elevations; bathymetry is needed for inland waters for fish species management.
MCA Title	Protect, Conserve, and Manage the Fish and Wildlife of the State and Their Habitats
MCA ID	21496
Organization Type	State or U.S. Territorial government
Organization Name	Tennessee Wildlife Resources Agency
Sub-Agency or Division	
Organization Mission	The mission of the Tennessee Wildlife Resources Agency is to protect, preserve, and perpetuate Tennessee's wildlife and ecosystems for the sustainable use and recreational benefits for our state's residents and visitors.
Program Name	The Tennessee Wildlife Resources Agency Strategic Plan
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	BU 06 - Natural Resources Conservation
Tertiary Business Use	BU 27 - Recreation

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Not required
Tops of vegetation	Required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	A field or forest stand. Underwater vegetation

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	Cross sections and/or transects meet needs		
Update Frequency	4-5 years	Event driven only – Data need to coincide with a specific event.		
Event type(s)		Flood or other event that would change conditions, bottom depths		
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	I don't know	I don't know		
Acceptable Vertical Error	I don't know	I don't know		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial	Yes		
Cross section/transect requirement	I don't know	I don't know		

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Not required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable			Not required	
Entire AOI under same environmental conditions	Highly desirable	Required			Not required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Not required			Not required	
DEM for entire AOI needs to be seamless	Highly desirable	Not required			Not required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Required	Not required		
DEM	Required	Highly desirable		
Raw point cloud data	Highly desirable	Not required		
Classified point cloud	Highly desirable	Not required		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Highly desirable		
Ground control/ground truthing	Not required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Nice to have		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Highly desirable	Not required		
Wetlands	Highly desirable	Not required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Nice to have		
Bridges/culverts	Not required	Nice to have		
Landmark features	Nice to have	Nice to have		
Cultural resources	Not required	Not required		
Coastal and riverine structures	Nice to have	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Topographic LiDAR	Bathymetric data unavailable		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	State of Tennessee, STS-GIS Services			
Other		Yes		
Other description		Inland bathy data not available		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available		

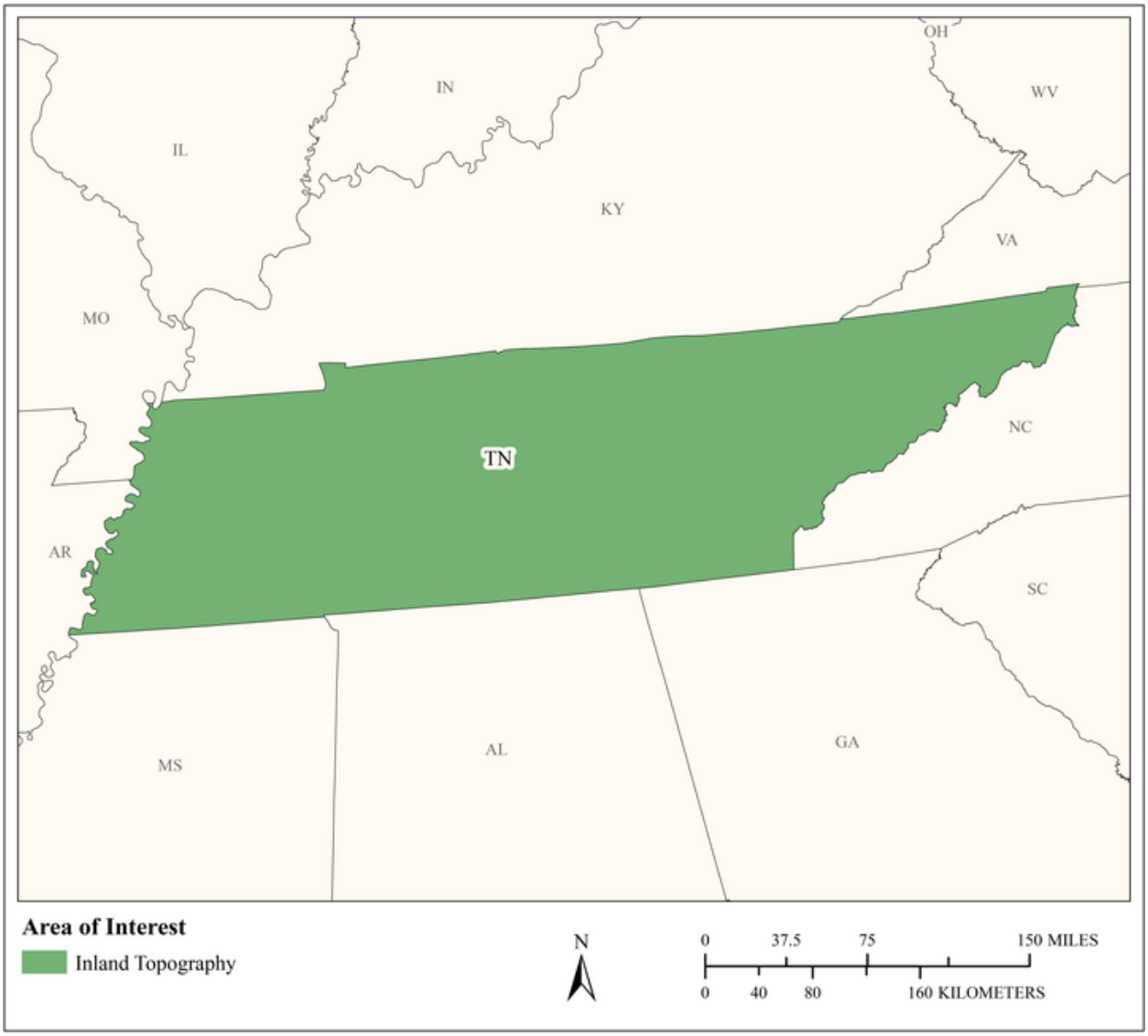
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost savings/cost reduction	Major	Inland bathy data not available		
Cost avoidance	I don't know	Inland bathy data not available		
Increased revenues	None	Inland bathy data not available		
Mission-driven performance improvements	Moderate	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None	Inland bathy data not available		
Improved response or timeliness	None	Inland bathy data not available		
Improved customer experience	Minor	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Inland bathy data not available		
Environmental	Moderate	Inland bathy data not available		
Public safety, including life and property	None	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide							
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide							
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	I don't know	Unable to provide		I don't know	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$10,038		Annual dollars saved/ realized	$80,450						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	None			I don't know	Unable to provide							
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$28,994		Annual dollars saved/ realized	$48,628						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			I don't know								
Environmental	I don't know			I don't know								
Public safety, including life and property	None			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Agriculture and Precision Farming



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Farm pond design. Irrigation system design. Detailed site analysis to support precision farming. Analysis of farm sedimentation and runoff. Calibration of fertilizer application, fertilizer management, and irrigation planning. Optimized terraforming.
MCA Title	Agriculture and Precision Farming
MCA ID	60427
Organization Type	State or U.S. Territorial government
Organization Name	State of Tennessee
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 08 - Agriculture and Precision Farming
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

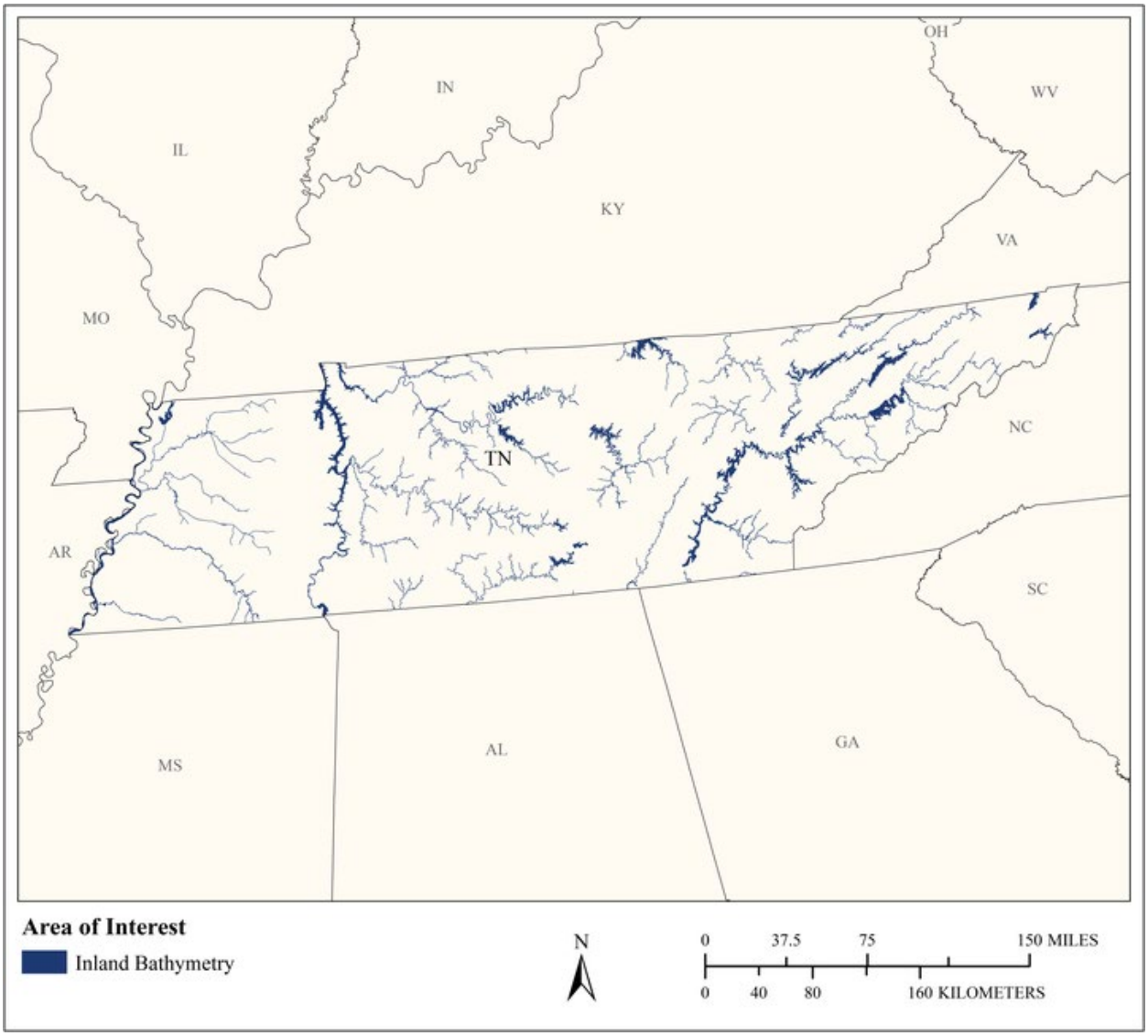
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$48,791									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$38,680									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Minor											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Fisheries Management and Aquaculture



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type		Required		
Geographic Area Requirements		One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Management of fisheries. Sustainable aquaculture.
MCA Title	Fisheries Management and Aquaculture
MCA ID	60428
Organization Type	State or U.S. Territorial government
Organization Name	State of Tennessee
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Nice to have
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order		QL0B		
Update Frequency		6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error		Up to 2 meters		
Acceptable Vertical Error		Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season		Highly desirable				
Entire AOI under same environmental conditions		Highly desirable				
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless		Highly desirable				
DEM for entire AOI needs to be seamless		Required				
Amount of acceptable vertical manipulation to achieve spatial seamlessness		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM		Highly desirable		
DTM		Highly desirable		
DEM		Required		
Raw point cloud data		Nice to have		
Classified point cloud		Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform		Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening		Highly desirable		
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery		Nice to have		
Ground control/ground truthing		Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery		Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data		Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates		Highly desirable		
Land use/land cover		Highly desirable		
Wetlands		Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features		Required		
Bridges/culverts		Highly desirable		
Landmark features		Nice to have		
Cultural resources		Nice to have		
Coastal and riverine structures		Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings		Major		
Cost savings/cost reduction		Moderate		
Cost avoidance		Moderate		
Increased revenues		Moderate		
Mission-driven performance improvements		Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services		Major		

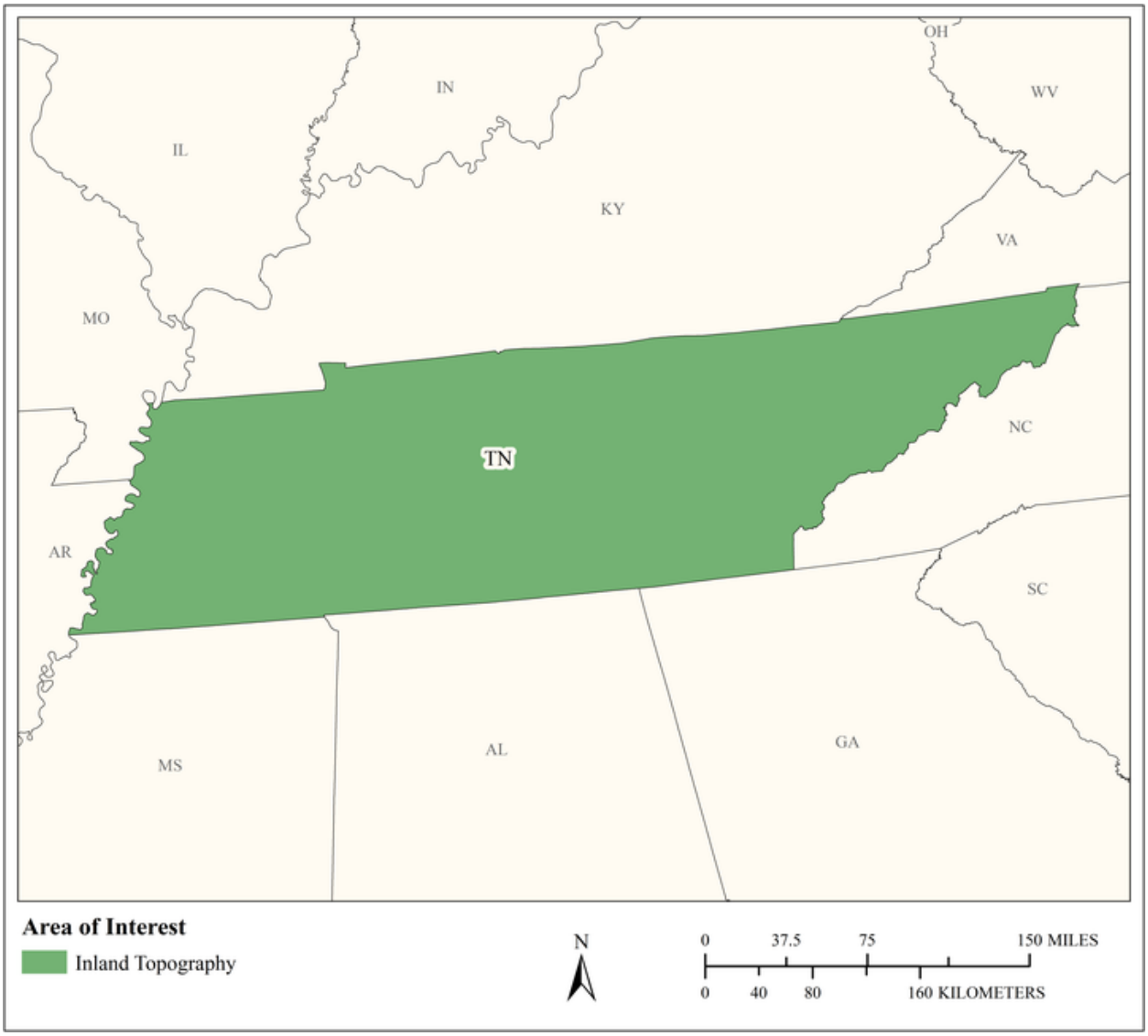
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness		Major		
Improved customer experience		Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach		Minor		
Environmental		Moderate		
Public safety, including life and property		Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings				Major	Unable to provide							
Cost savings/cost reduction				Major	Unable to provide							
Cost avoidance				Major	Unable to provide							
Increased revenues				None								
Mission-driven performance improvements				Major	Unable to provide							
Future annual operational benefits added during validation					Annual dollars saved/ realized	$84,322						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services				Major	Unable to provide							
Improved response or timeliness				Major	Unable to provide							
Improved customer experience				Major	Unable to provide							
Future annual customer service benefits added during validation					Annual dollars saved/ realized	$38,378						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach				Major								
Environmental				Major								
Public safety, including life and property				Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours		Yes		
Hillshades		Yes		
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Renewable Energy Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Alternate energy development – solar, tidal, wind, wave, and ocean current. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Low head power potential for hydropower.
MCA Title	Renewable Energy Resources
MCA ID	60429
Organization Type	State or U.S. Territorial government
Organization Name	State of Tennessee
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Not required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Minor			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor			

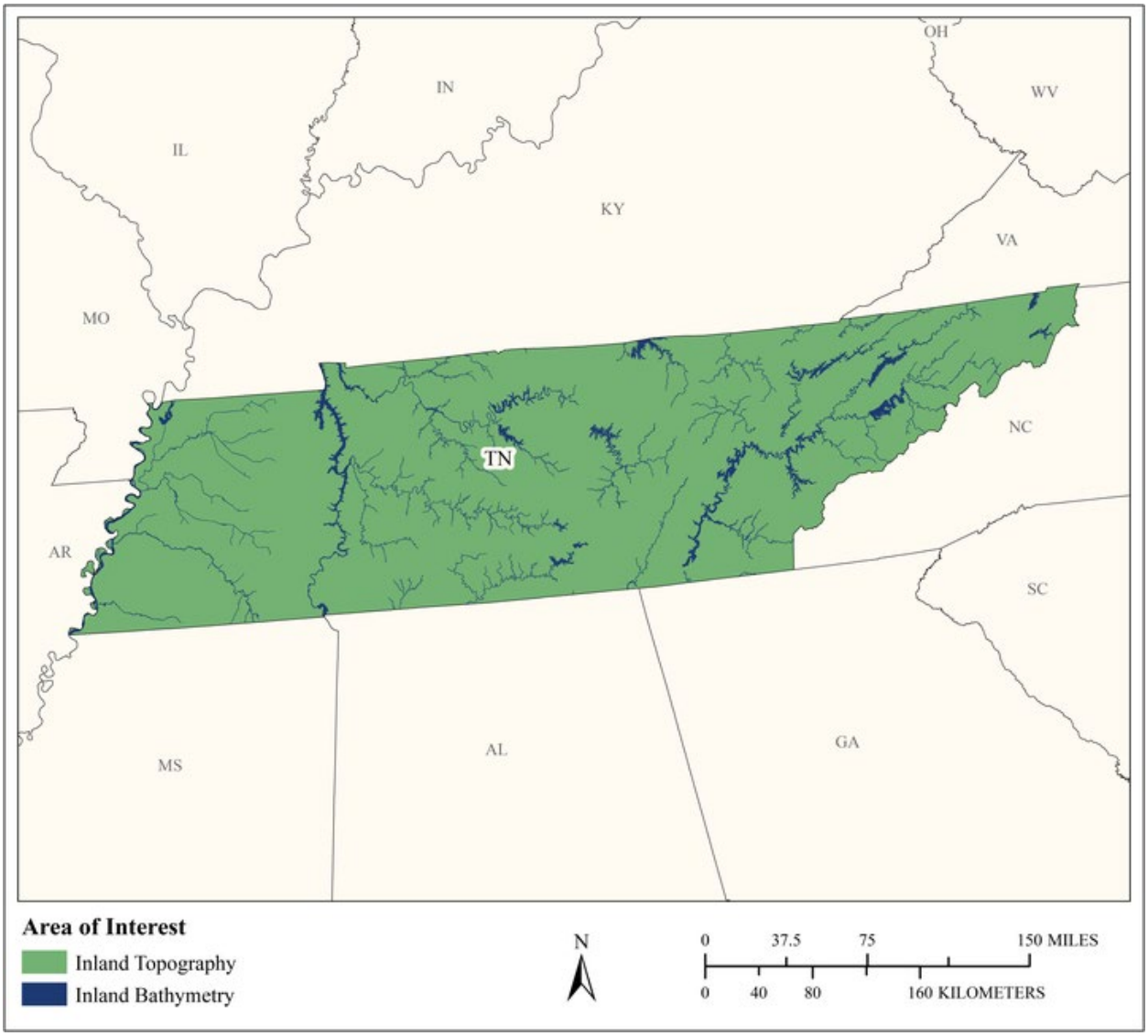
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Minor			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	None											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Statewide GIS Coordination



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	My agency supports other agencies with their GIS needs through coordination efforts and pooling funding to develop statewide GIS datasets. As part of our mission, we work with FEMA to support their Risk MAP efforts and elevation data plays a critical role in developing an accurate flood risk model through the DFIRM data products. BU 27 – Recreation is an additional Business Use.
MCA Title	Statewide GIS Coordination
MCA ID	1407
Organization Type	State or U.S. Territorial government
Organization Name	State of TN, F&A, GIS Services
Sub-Agency or Division	
Organization Mission	To coordinate and facilitate the collection, use, maintenance, and analysis of geospatial data within the state of Tennessee.
Program Name	FEMA Risk MAP
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 04 - Forest Resources Management
Tertiary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Small features

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have

Inland Bathy Feature Size Requirements	Response
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B		
Update Frequency	6-10 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	Up to 2 meters		
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Not required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Not required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable		
DTM	Highly desirable	Required		
DEM	Required	Required		
Raw point cloud data	Not required	Highly desirable		
Classified point cloud	Required	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Nice to have	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Highly desirable		
Land use/land cover	Nice to have	Highly desirable		
Wetlands	Nice to have	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have	Required		
Bridges/culverts	Nice to have	Required		
Landmark features	Nice to have	Highly desirable		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Nice to have	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Currently using QL2 lidar from the USGS 3DEP			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Tngis.org			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	Major	Moderate		
Increased revenues	I don't know	Minor		
Mission-driven performance improvements	I don't know	Minor		

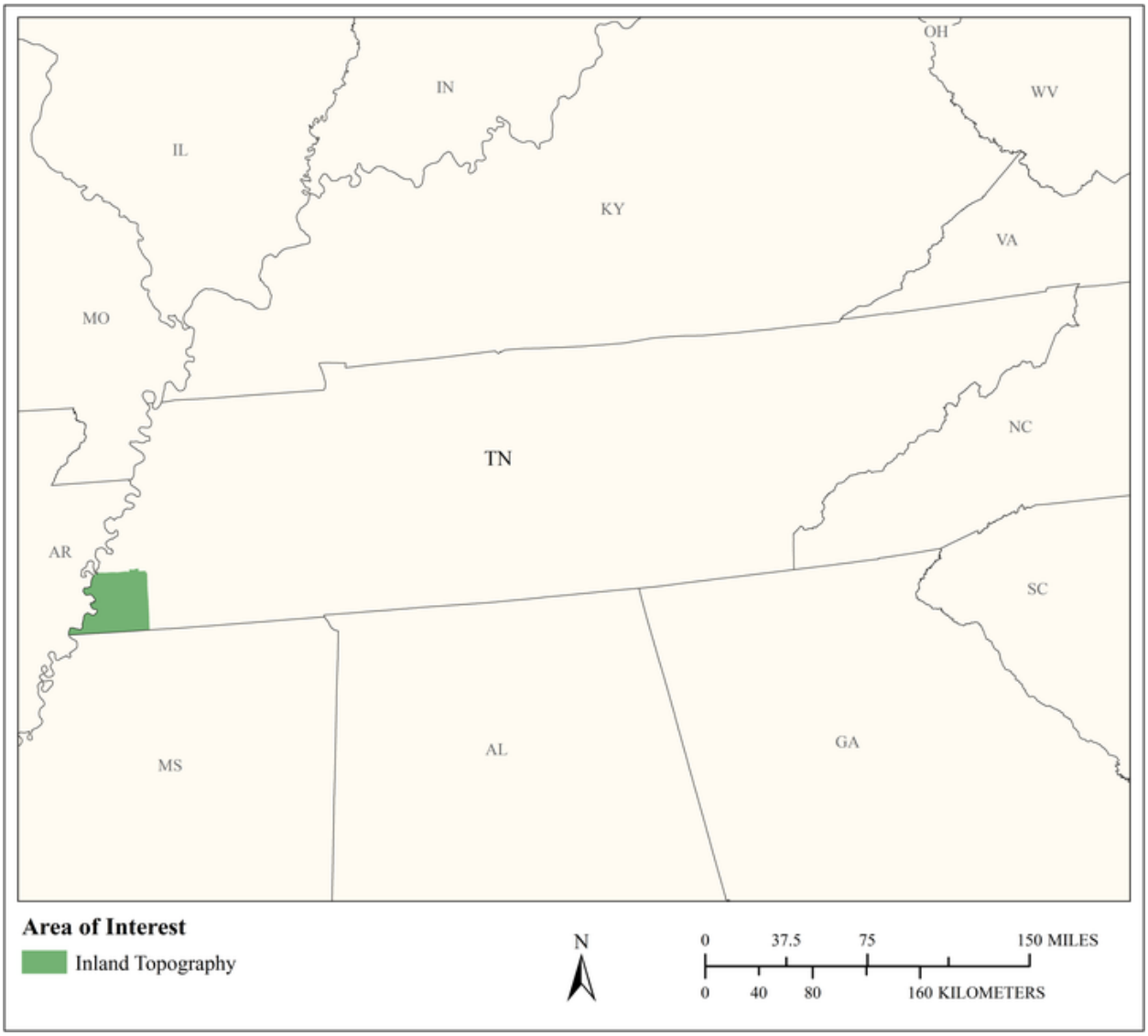
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Major		
Improved response or timeliness	Minor	Minor		
Improved customer experience	Moderate	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor		
Environmental	Major	Moderate		
Public safety, including life and property	Moderate	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	I don't know	Unable to provide		None								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$5,917,041		Annual dollars saved/ realized	$411,038						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,035,296		Annual dollars saved/ realized	$461,491						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate								
Environmental	Major			Moderate								
Public safety, including life and property	I don't know			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geospatial Support to County and Local Government Agencies



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements	Shelby County, TN			

MCA Description	Response
Mission Critical Activity	Coordinate geospatial data creation, updates, and data storage and availability for the Shelby County government and other local governmental agencies. Create and maintain data sharing agreements between the various governmental agencies within Shelby county and the surrounding counties. Host a data sharing portal to allow collaboration of geospatial information between the partnering agencies and host websites serving the general public. A county consortium of 13 agencies along with USGS, funded a $39,000 collect. The data were flown in March 2017, being QC'd now, QL2+, 4 ppsm, refresh in 4-5 years planned. Once received, the plan is to publish the data on the web site for use with planimetrics; local engineers also want contours, (clip and ship from web site). The data will also be used to support TVA for hydrology, engineering and environmental studies, and bridges. Topography will go to consortium agencies and will support their H&H studies.
MCA Title	Geospatial Support to County and Local Government Agencies
MCA ID	21951
Organization Type	Regional, County, City, or other local government
Organization Name	Shelby County, Tennessee Government
Sub-Agency or Division	
Organization Mission	Coordinate geospatial activities for the Shelby County, Tennessee region.
Program Name	Regional GIS Office of Information Technology Services, Shelby County Government
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Tertiary Business Use	BU 23 - Urban and Regional Planning

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Buildings 3 meter/side and greater

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 30 cm			
Acceptable Vertical Error	Up to 30 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Not required			
Wetlands	Nice to have			
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Nice to have			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Planimetric, LIDAR and orthoimagery acquired in March 2017 for Shelby County. 4 pts/sq.meter collected			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	Local data acquisition 2017			

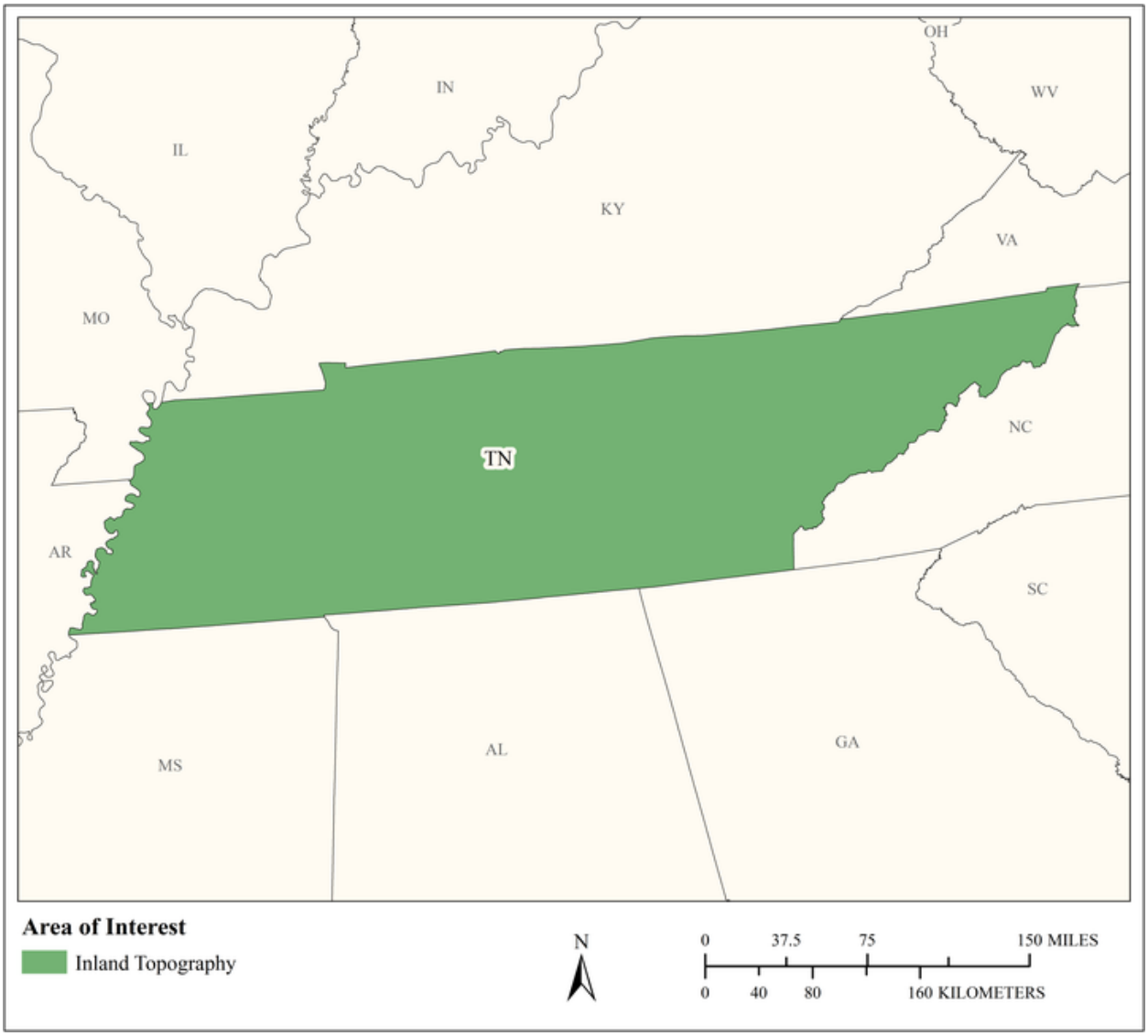
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Moderate			
Cost avoidance	Major			
Increased revenues	Major			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Moderate			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Other operational benefits	Major	Unable to provide										
Other operational benefits description	Data as a service to the public.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Other customer service benefits	Major	Unable to provide										
Other customer service benefits description	Economic development support.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Minor											
Public safety, including life and property	Moderate											
Other	Geospatial data availability											
Other benefits	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Wildfire Management, Planning, and Response



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of forest fuel and fire susceptibility. Fire behavior modeling to support wildfire suppression activities. Wildland/urban interface building identification. Post fire analysis to determine landslide prone areas.
MCA Title	Wildfire Management, Planning, and Response
MCA ID	60430
Organization Type	State or U.S. Territorial government
Organization Name	State of Tennessee
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 17 - Wildfire Management, Planning, and Response
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

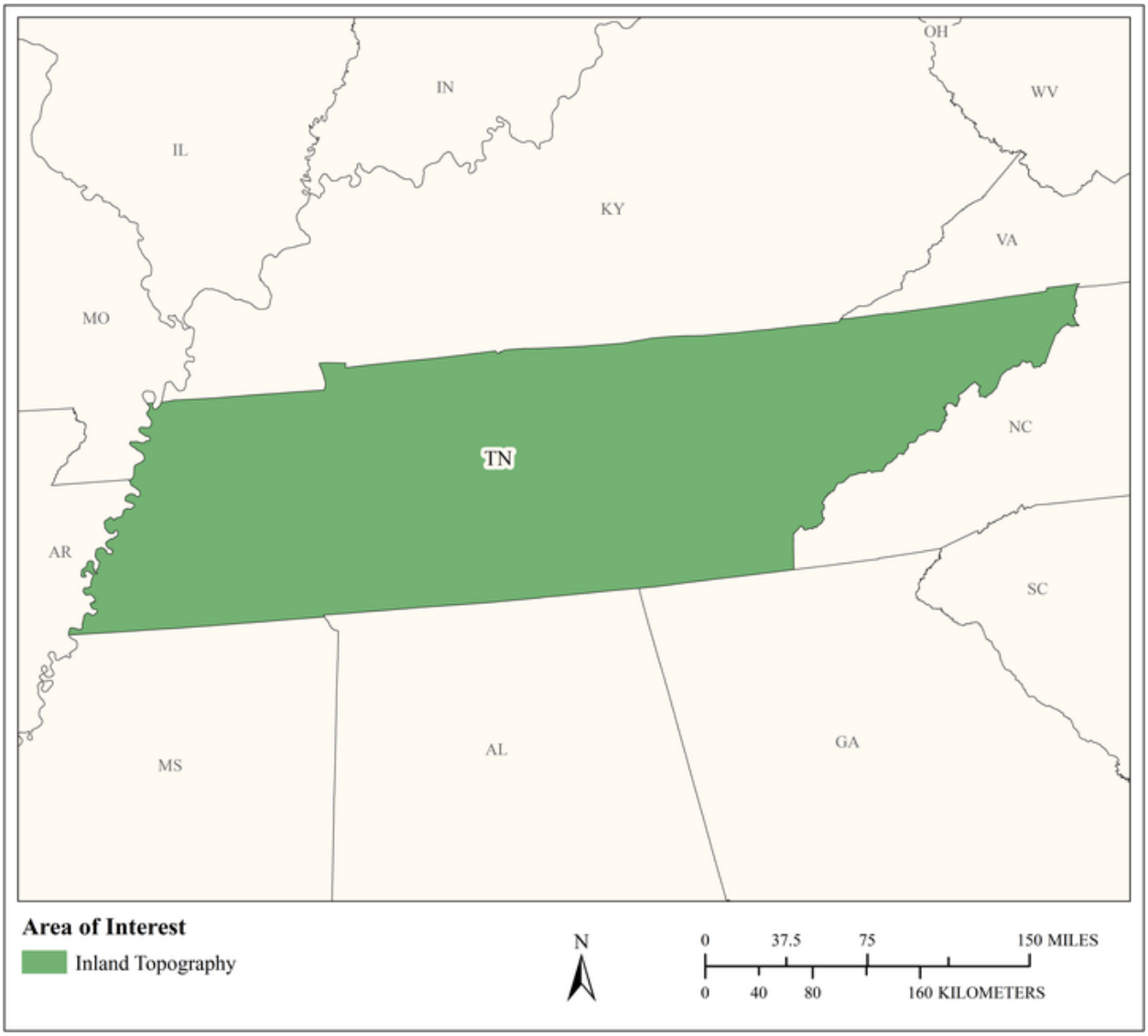
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$226,425									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Homeland Security, Law Enforcement, Disaster Response, and Emergency Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Infrastructure and border protection. Coastal search and rescue. Population dynamics. Emergency fuel supply and movement. Line of sight analysis in urban areas. Disaster response. Flood risk analysis resulting from acts of terrorism.
MCA Title	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
MCA ID	60431
Organization Type	State or U.S. Territorial government
Organization Name	State of Tennessee
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

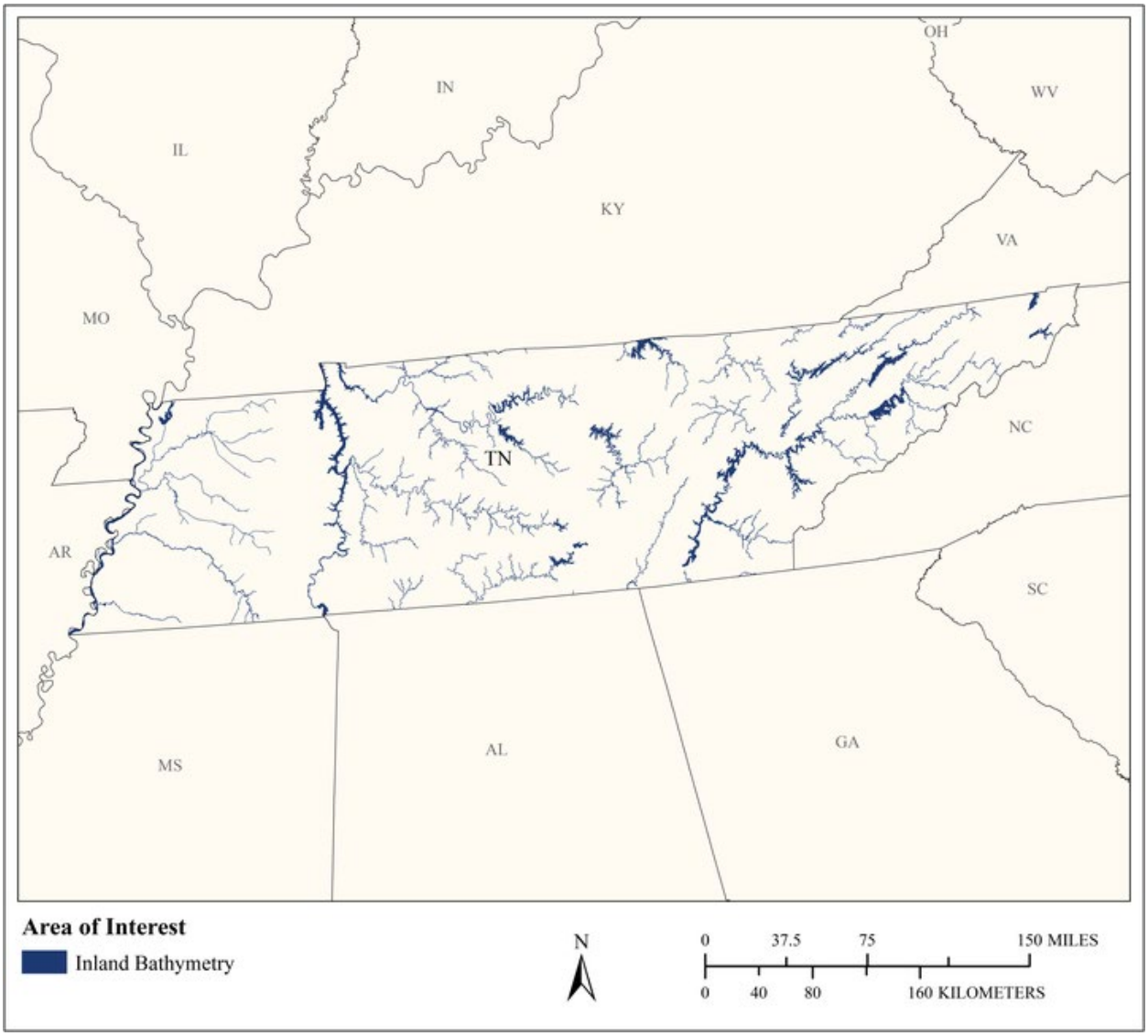
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Minor			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,243,208									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$21,973									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Moderate											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Marine and Riverine Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type		Required		
Geographic Area Requirements		One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Nautical charting. Bathymetric measurements of nearshore submerged coastal topography. Identification of hazards to navigation. Sediment management at coastal navigation projects. Precision marine navigation. Movement of goods and fishing vessels.
MCA Title	Marine and Riverine Navigation and Safety
MCA ID	60432
Organization Type	State or U.S. Territorial government
Organization Name	State of Tennessee
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Nice to have
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order		QL0B		
Update Frequency		2-3 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error		Up to 2 meters		
Acceptable Vertical Error		Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season		Nice to have				
Entire AOI under same environmental conditions		Nice to have				
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless		Required				
DEM for entire AOI needs to be seamless		Required				
Amount of acceptable vertical manipulation to achieve spatial seamlessness		Up to double the required TVU at the 95% confidence level				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM		Highly desirable		
DTM		Highly desirable		
DEM		Required		
Raw point cloud data		Nice to have		
Classified point cloud		Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform		Not required		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening		Not required		
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery		Nice to have		
Ground control/ground truthing		Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery		Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data		Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates		Required		
Land use/land cover		Nice to have		
Wetlands		Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features		Required		
Bridges/culverts		Highly desirable		
Landmark features		Nice to have		
Cultural resources		Highly desirable		
Coastal and riverine structures		Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts		Yes		
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings		Major		
Cost savings/cost reduction		I don't know		
Cost avoidance		Major		
Increased revenues		None		
Mission-driven performance improvements		Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services		None		

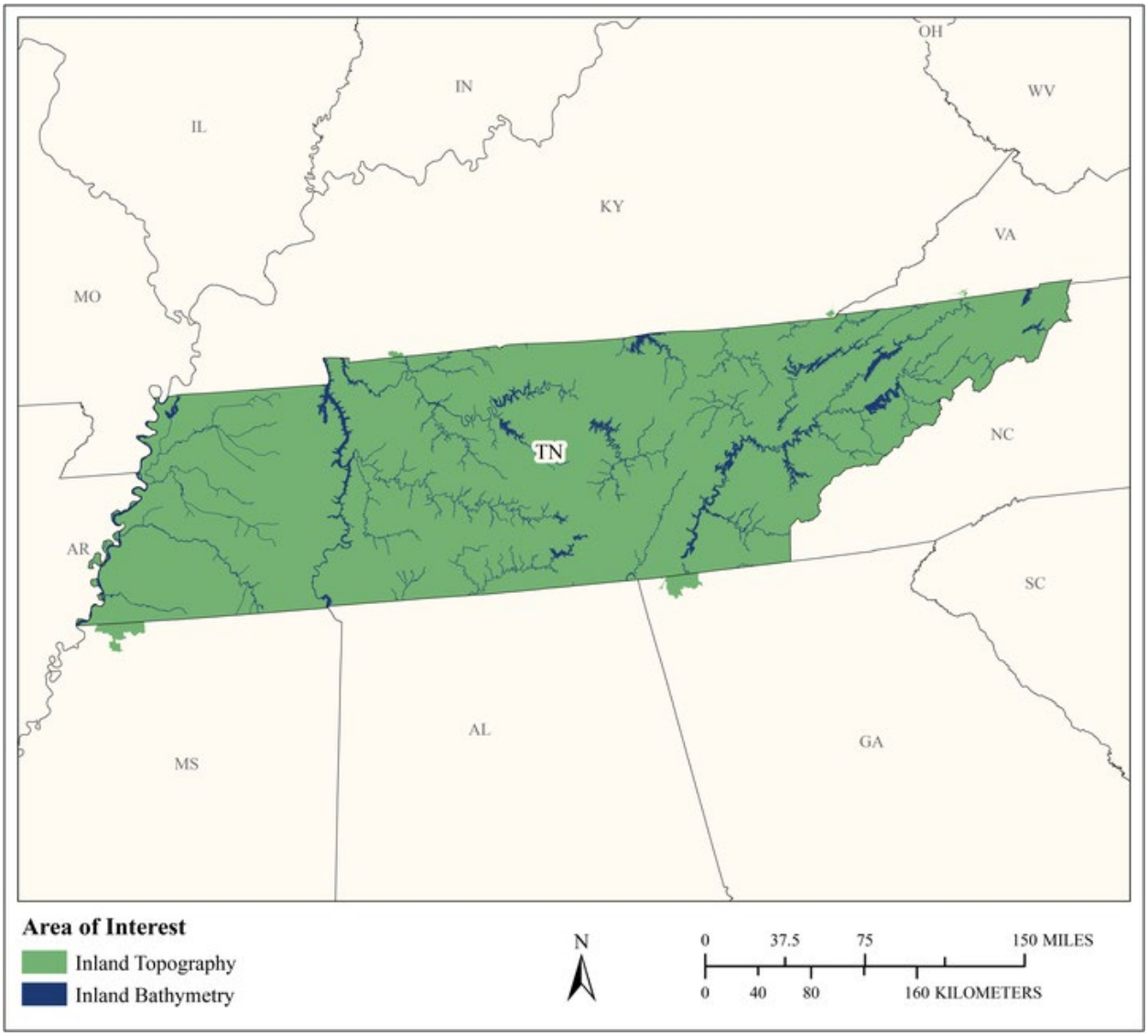
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness		None		
Improved customer experience		None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach		None		
Environmental		None		
Public safety, including life and property		None		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings				Major	Unable to provide							
Cost savings/cost reduction				Major	Unable to provide							
Cost avoidance				Moderate	Unable to provide							
Increased revenues				Moderate	Unable to provide							
Mission-driven performance improvements				Major	Unable to provide							
Future annual operational benefits added during validation					Annual dollars saved/ realized	$768,712						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services				Minor	Unable to provide							
Improved response or timeliness				Major	Unable to provide							
Improved customer experience				Moderate	Unable to provide							
Future annual customer service benefits added during validation					Annual dollars saved/ realized	$101,171						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach				Moderate								
Environmental				Moderate								
Public safety, including life and property				Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes		
Contours		Yes		
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints		Yes		
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Management and Modification of the Multimodal Transportation Systems in Tennessee



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Nice to have		
Geographic Area Requirements	Area split by varying quality level or update frequency	One or more states, territories, or counties		
Sub Area Requirements	Tennessee			

MCA Description	Response
Mission Critical Activity	Management and modification of the multimodal transportation systems in Tennessee. The Department of Transportation manages highways, railroads, transit, airports (commercial), and general aviation. Elevation data are needed for transportation planning and preliminary design, engineering work, and hydrologic analysis. For evaluation of obstructions in airport approach and takeoff, annual photogrammetry collections are required (by UAVs). Watersheds derived from elevation data are input into hydrologic models, and to analyze scour around structures that cross streams. The profile of the stream bed is also needed for the H&H analyses.
MCA Title	Management and Modification of the Multimodal Transportation Systems in Tennessee
MCA ID	21753
Organization Type	State or U.S. Territorial government
Organization Name	Tennessee Dept. of Transportation
Sub-Agency or Division	
Organization Mission	To serve the public by providing the best multimodal transportation system in the nation.
Program Name	Tennessee Department of Transportation
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 19 - Land Navigation and Safety
Tertiary Business Use	BU 21 - Aviation Navigation and Safety

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Individual drainage features such as ditches or swales. Edge of pavement, billboards, any slight deviation in terrain that will impact engineering design. Individual trees for airport obstacle management and avoidance.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required

Inland Bathy Feature Size Requirements	Response
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	Cross sections and/or transects meet needs		
Update Frequency	(a) 4-5 years (b) 6-10 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI	Quality level is consistent across entire state. But, rural areas do not need anywhere near the update cycle of urban areas.			
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter		
Acceptable Vertical Error	Up to 1 meter	Up to 1 meter		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs		Yes		
Cross section/transect requirement		It varies with project.		

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required			Not required	
Entire AOI under same environmental conditions	Nice to have	Highly desirable			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Required		
DTM	Required	Required		
DEM	Highly desirable	Required		
Raw point cloud data	Required	Required		
Classified point cloud	Required	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Required		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Required		
Cultural resources	Highly desirable	Nice to have		
Coastal and riverine structures	Highly desirable	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Half of the state is now 3DEP LiDAR derived, QL2 data. The other half of the state is a mix of photogrammetry derived data from the 1990's.	Only collected by land surveyors on an as needed basis. No statewide dataset available.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts		Yes		
USGS Inland Waters server		Yes		
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes			

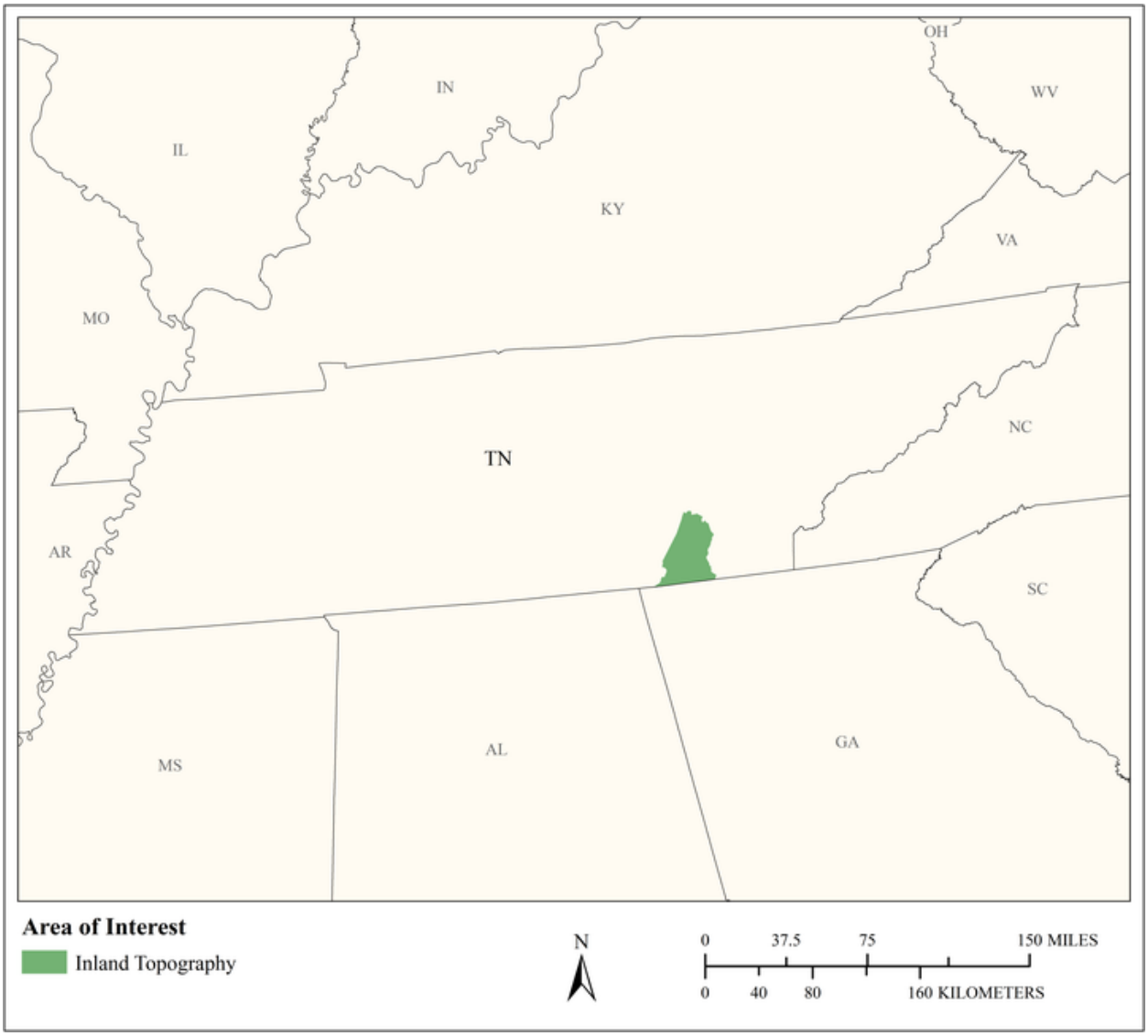
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State repositories used	Internal repository in the agency, Statewide GIS service from state GIS office and open sourced GIS repository maintained by the Tennessee Geographic Information Council.			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	Major	Minor		
Increased revenues	None	None		
Mission-driven performance improvements	Major	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None		
Improved response or timeliness	None	None		
Improved customer experience	None	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	None		
Environmental	Major	Minor		
Public safety, including life and property	Major	None		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	None			None								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Other operational benefits				Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,893,868		Annual dollars saved/ realized	$638,074						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$5,573,274		Annual dollars saved/ realized	$66,256						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			None								
Environmental	I don't know			Major								
Environmental description				Better understanding of watersheds								
Public safety, including life and property	Major			I don't know								
Public safety, including life and property description	Will facilitate better road design, thereby improving safety.											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Coordination and Support of Government Agencies and Utilities Within Hamilton County



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements	Hamilton County, TN			

MCA Description	Response
Mission Critical Activity	To provide elevation data to various Hamilton County, TN departments as needed. Projects include construction, long term planning, etc. Data acquired under a BAA in 2015-2016 are served on a public web site.
MCA Title	Coordination and Support of Government Agencies and Utilities Within Hamilton County
MCA ID	1461
Organization Type	Regional, County, City, or other local government
Organization Name	Hamilton County TN GIS
Sub-Agency or Division	
Organization Mission	Provide GIS data for Hamilton County
Program Name	Hamilton County GIS
Total Annual Program Budget	
Primary Business Use	BU 25 - Real Estate, Banking, Mortgage, and Insurance
Secondary Business Use	BU 22 - Infrastructure and Construction Management
Tertiary Business Use	BU 23 - Urban and Regional Planning

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Survey-level features

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need			
Acceptable Vertical Error	I don't know			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have					
DEM for entire AOI needs to be seamless	Nice to have					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	2017 QL2 3DEP data			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	State of TN			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	None			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			

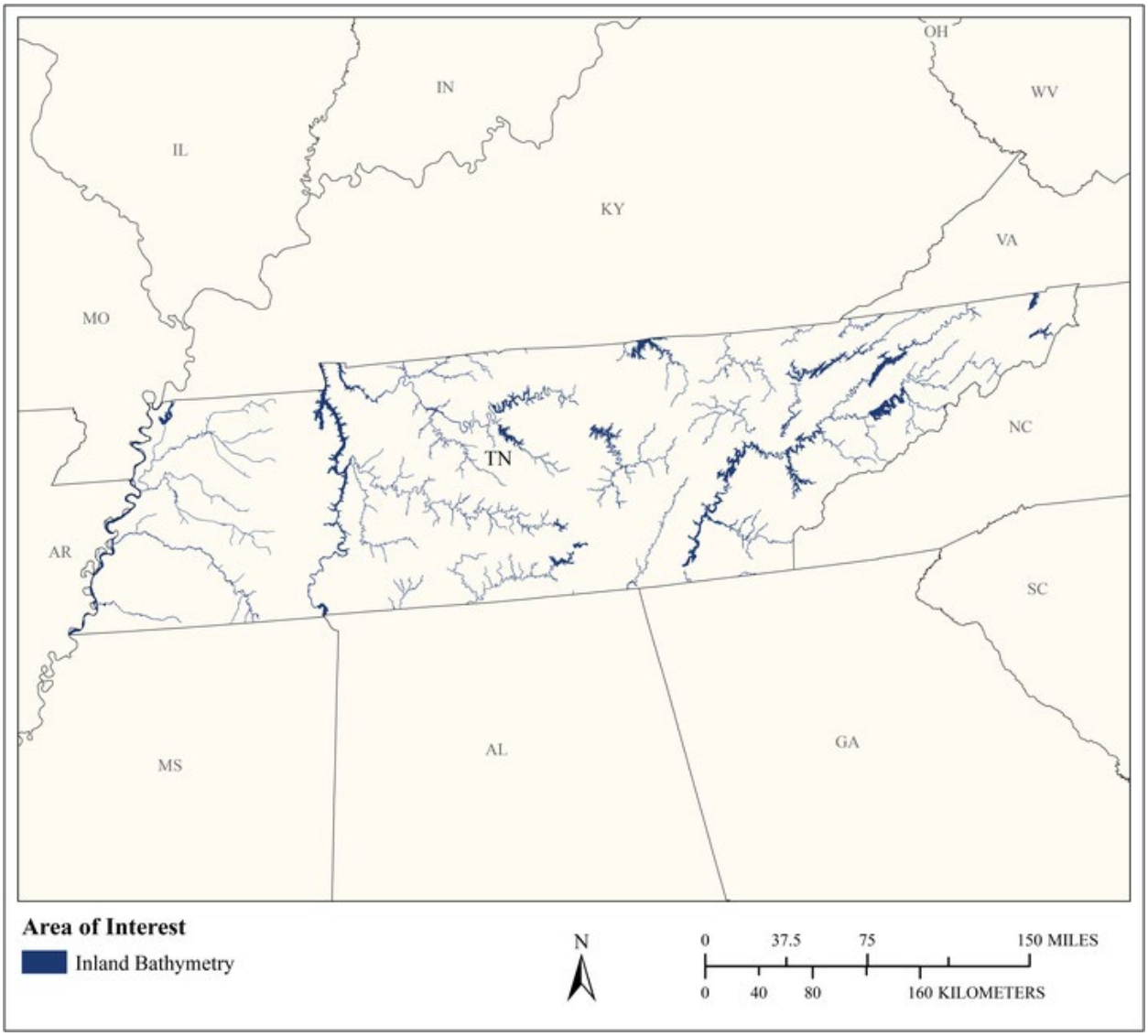
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Moderate			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide										
Cost savings/cost reduction	Major	Annual dollars saved/realized	$20,000									
Cost savings/cost reduction description	Being involved in the 3DEP projects saved us over $100,000 if we had contracted the project for only Hamilton County TN (data are good for 5 years).											
Cost avoidance	Moderate	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Moderate	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None											
Environmental	Minor											
Public safety, including life and property	Minor											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Recreation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type		Required		
Geographic Area Requirements		One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Planning and development of recreational facilities such as rafting, boating, swimming, diving, and fishing areas; ski slopes; and golf courses. Location- based products and services such as maps and guides. Tourism. Trail and vista site planning. Orienteering.
MCA Title	Recreation
MCA ID	60433
Organization Type	State or U.S. Territorial government
Organization Name	State of Tennessee
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 27 - Recreation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order		QL0B		
Update Frequency		4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error		Up to 2 meters		
Acceptable Vertical Error		Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season		Not required				
Entire AOI under same environmental conditions		Not required				
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless		Nice to have				
DEM for entire AOI needs to be seamless		Nice to have				
Amount of acceptable vertical manipulation to achieve spatial seamlessness		I don't know				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM		Required		
DTM		Highly desirable		
DEM		Required		
Raw point cloud data		Nice to have		
Classified point cloud		Highly desirable		
Edited/cube XYZ		Highly desirable		
Full waveform		Nice to have		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening		Highly desirable		
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery		Nice to have		
Ground control/ground truthing		Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery		Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data		Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates		Highly desirable		
Land use/land cover		Highly desirable		
Wetlands		Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features		Required		
Bridges/culverts		Highly desirable		
Landmark features		Highly desirable		
Cultural resources		Highly desirable		
Coastal and riverine structures		Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings		Minor		
Cost savings/cost reduction		Minor		
Cost avoidance		Minor		
Increased revenues		Minor		
Mission-driven performance improvements		Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services		Minor		

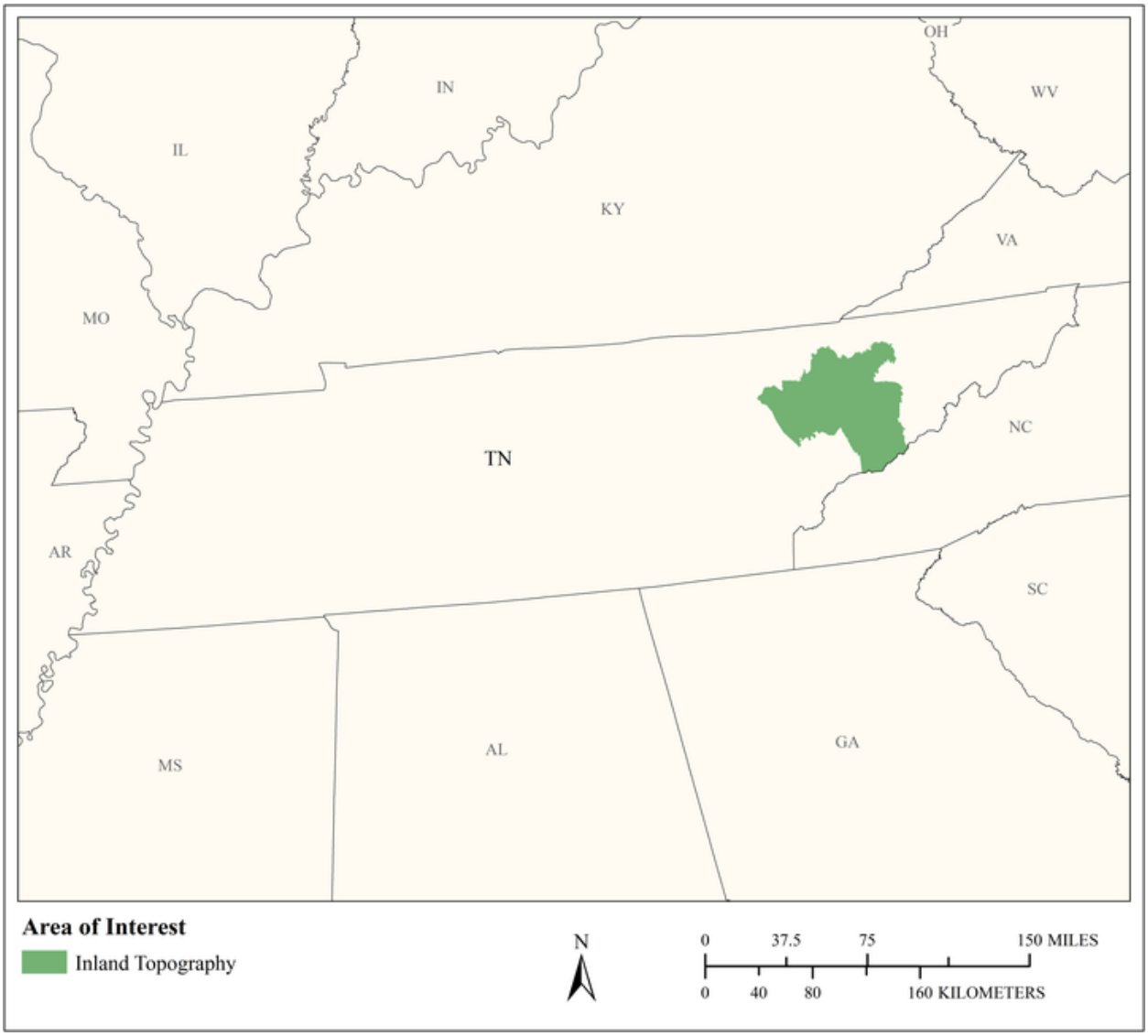
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness		Minor		
Improved customer experience		Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach		Minor		
Environmental		Minor		
Public safety, including life and property		Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings				Major	Unable to provide							
Cost savings/cost reduction				Major	Unable to provide							
Cost avoidance				Major	Unable to provide							
Increased revenues				Moderate	Unable to provide							
Mission-driven performance improvements				Major	Unable to provide							
Future annual operational benefits added during validation					Annual dollars saved/ realized	$5,823						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services				Major	Unable to provide							
Improved response or timeliness				Major	Unable to provide							
Improved customer experience				Major	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach				Major								
Environmental				Major								
Public safety, including life and property				Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes		
Contours		Yes		
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes		
Building footprints		Yes		
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness		Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Address and Cadastral Information Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements	Knox, Union, Sevier, Jefferson, Anderson, and Grainger Counties, TN			

MCA Description	Response
Mission Critical Activity	Address and Cadastral Information Management. Water, sewer, electric, and gas utilities are covered under this activity. Elevation is critical to land development and review for engineering and utilities. Local ordinances address sinkholes, elevation, detention, and water runoff; developers must verify elevations on contour maps in order to get approvals.
MCA Title	Address and Cadastral Information Management
MCA ID	22180
Organization Type	Regional, County, City, or other local government
Organization Name	Knoxville, Knox County, Knoxville Utilities Board, TN,
Sub-Agency or Division	
Organization Mission	Provide coordinated geographic information management for the City of Knoxville, Knox County and Knoxville Utilities Board to support the public need.
Program Name	Landbase Management
Total Annual Program Budget	
Primary Business Use	BU 30 - Maritime and Land Boundary Management
Secondary Business Use	BU 23 - Urban and Regional Planning
Tertiary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Retaining walls, culverts, storm drains, manholes

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	6-10 years			
Event type(s)				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI	Knox County TN has higher accuracy requirements than the other adjacent counties. City requires 2 foot contours on all design plans, county req 2-4 foot. Other counties may not be as stringent, ex urban areas.			
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 60 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Highly desirable			
Raw point cloud data	Nice to have			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Highly desirable			
Wetlands	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Nice to have			
Cultural resources	Not required			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			
Other	Highly desirable			
Other description	Retaining Walls			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	2016 QL2 Lidar to support 2' contours, but with compiled breaklines consisting of stream / swale linear centerlines, water shoreline (double - sided streams) > 5' width, water bodies > .25 acre, retaining walls, supplemental breaklines under bridges			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State repositories used				
Other	Yes			
Other description	Local partnerships			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor			
Cost savings/cost reduction	Moderate			
Cost avoidance	Minor			
Increased revenues	Minor			
Mission-driven performance improvements	I don't know			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor			
Improved response or timeliness	I don't know			
Improved customer experience	I don't know			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	I don't know			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$90,450									
Time savings description	Significant savings, but mostly during the normal 2 year burst of activity required for a typical 3d project acquisition.											
Cost savings/cost reduction	I don't know	Unable to provide										
Cost savings/cost reduction description	Most savings would probably be offset by potential loss of revenue stream from existing data sharing partnerships.											
Cost avoidance	Major	Unable to provide										
Cost avoidance description	QA/QC costs saved could be significant.											
Increased revenues	None											
Mission-driven performance improvements	Minor	Unable to provide										
Other operational benefits	Minor	Unable to provide										
Other operational benefits description	Standardized and well-published data accuracy provides better foundation for Legal and liability of the resulting products.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide										
Improved response or timeliness	Minor	Unable to provide										
Improved response or timeliness description	This, along with other potential benefits, would depend upon the frequency of updates in order to determine whether the benefits are over and above the levels of data that our organization currently achieves.											
Improved customer experience	Moderate	Unable to provide										
Improved customer experience description	Federal mapping authority assurances regarding the data accuracy would bring additional value to our program.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Education or outreach description	If data is to be a free source for use by educational institutes, then it would supplement our communication with that sector											
Environmental	None											
Public safety, including life and property	None											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

Texas

Current status of elevation data for Texas

In 1997, the 75th Texas Legislature passed Senate Bill 1 that established the Texas Strategic Mapping Program (StratMap) to develop consistent statewide digital data layers. Since then the primary goal of StratMap has been to acquire and improve digital geographic data for statewide mapping applications. In spring 2014, a data needs assessment was conducted in which elevation data was indicated to be a priority by 17 agencies (state, local, and federal) in the state. The Texas Natural Resources Information System (TNRIS), a division of the Texas Water Development Board (TWDB), acquires lidar data through partnerships with other state and federal agencies through the StratMap Contract. Since 2009, 24 partner agencies have been associated with 30 project Statements of Work (SOW), with a total value of $14.1 million spent on lidar products for the state through cost-share initiatives. These projects, along with other acquisitions by federal partners such as Federal Emergency Management Agency (FEMA), Natural Resources Conservation Service (NRCS), and U.S. Geological Survey (USGS), have led to expected 100 percent lidar coverage for the state by 2021. Many of the acquisitions since 2015 meet the current specification for the 3D Elevation Program (3DEP), but older datasets largely do not meet this specification.

Importance of elevation data to Texas

In this study, 25 Mission Critical Activities (MCAs) were identified, which represent 25 primary Business Uses (BUs) by the State of Texas, eight state agencies, and one local government. Examples include:

- TWDB identified an MCA of Environmental Modeling, within the BU of Water Supply and Quality. The Surface Water Resources Division provides scientific and engineering expertise to better inform the activities of agency programs in water planning, development, and flood mitigation. This includes coastal hydrodynamic modeling, reservoir capacity determinations, sedimentation studies, fresh water inflow requirements, and siting of weather stations. Elevation data are needed for all forms of environmental modeling including flood pool modeling for lakes, hydraulic models, sediment transport modeling, habitat identification (fish and oysters), coastal inundation assessment, and oil spill modeling.
- Bureau of Economic Geology (BEG) identified an MCA of Geologic Mapping, Hazards, and Coastal Monitoring, within the BU of Geologic Assessment and Hazard Mitigation. BEG acquires topographic and bathymetric lidar data for several mission-critical earth science applications, including geologic hazards assessment, geologic mapping, beach and dune monitoring, subsidence monitoring, and storm impact and recovery.
- Railroad Commission of Texas identified an MCA of Regulation of Surface Coal Mining in the state of Texas, within the BU of Geologic Resource Mining and Extraction. Elevation data are used for assessment of abandoned mine lands, review of mine structures, and could be used for reducing uncertainty in the permitting process.
- Texas General Land Office (GLO) identified Coastal Resource Management as an MCA within the BU of Oil and Gas Resources. GLO uses elevation data for specific activities such as state land and asset management, oil and gas leasing, coastal zone management, permitting, emergency management and disaster recovery, and oil spill prevention and response.
- City of Austin identified Modeling and Prediction of Riverine Flood Hazards as an MCA within the BU of Flood Risk Management. Elevation data are needed for accurate hydrologic and hydraulic modeling to protect lives and property from the devastating effects of flooding.

- Texas A&M Forest Service identified Texas Wildfire Risk Assessment as an MCA within the BU of Wildfire Management. Elevation data are used to provide accurate and reliable products for wildfire risk assessment and mitigation, such as mapping wildland fuels, canopy base height, and canopy bulk density. Higher resolution lidar would improve the ability to create realistic wildfire simulations and impact analysis, leading to increased situational awareness and enhanced decision-making.
- TNRIS identified Data Acquisition and Clearinghouse as an MCA within the BU of Homeland Security. TNRIS acquires elevation data and distributes it to state users, supports emergency management, and tries to unify data across the state. The goal is to provide common data with common parameters. TNRIS also extracts data products from the raw data as needed by state users (e.g. building footprints, building heights, contours, and other derivative products). TNRIS is involved in planning water projects across the state and flood risk management with the TWDB.
- Texas Parks and Wildlife Department (TPWD) identified Recreational Planning, Habitat Modeling, and Species Monitoring as an MCA within the primary BU of Recreation. TPWD provides recreational opportunities while implementing best management and conservation practices for the natural and cultural resources of Texas. Improved elevation data could assist in streamlining processes for better products, lead to increased confidence in data accuracy and program effectiveness, assist in expedited habitat modeling and monitoring efforts, be of use in future public applications such as elevation profiles of trails in state parks, and improve decision-making in emergency situations.
- Texas Commission on State Emergency Communications (CSEC) identified an MCA of Support for Next Generation 9-1-1 Services, within the BU of Telecommunications. CSEC supports the continued development and improvement of 9-1-1 data for NG9-1-1 services and Wireless 9-1-1 call mapping and is responsible for emergency response nine nautical miles offshore. Elevation data are needed for accurate response, including locations within high-rise buildings, offshore oil rigs, and rural locations.

High-level summary of elevation data requirements

Quality Level 2 (QL2) inland topographic lidar with an average refresh cycle of 4-5 years is adequate for half of the MCAs, with more frequent and/or event-driven refresh needed for other MCAs that require a higher quality level of either QL1 or QL0. Also, areas of east Texas as well as urban and coastal areas require more frequent updates than rural areas and/or west Texas.

Bathymetry requirements range from QL0B to QL2B with an average refresh cycle of 4-5 years for all types: inland, nearshore, and offshore bathymetry.

High-level summary of benefits that would come from higher resolution elevation data

Statewide publicly available QL2 lidar data will finally become available in 2021 after almost 20 years of lidar collection efforts from federal, state, regional and local entities. Due to the large size of Texas, varying landcover, and wide range of lidar collection dates, yearly continued efforts are needed to ensure the state remains at QL2 data qualities. Continued collection of higher resolution elevation data would provide needed data for state and local entities to accomplish their MCAs more accurately, in greater detail, and in less time, leading to innovative solutions and applications that will benefit Texas and its citizens.

With the completion of statewide lidar elevation data coverage, state entities have shown a renewed desire in pursuing inland and coastal bathymetry data to support emergency management, coastal planning and management, vegetation and habitat analysis, restoration efforts and transportation. High resolution

bathymetric data that can be joined with topographic lidar to create seamless elevation models is highly desirable to support many of these efforts.

The State of Texas has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

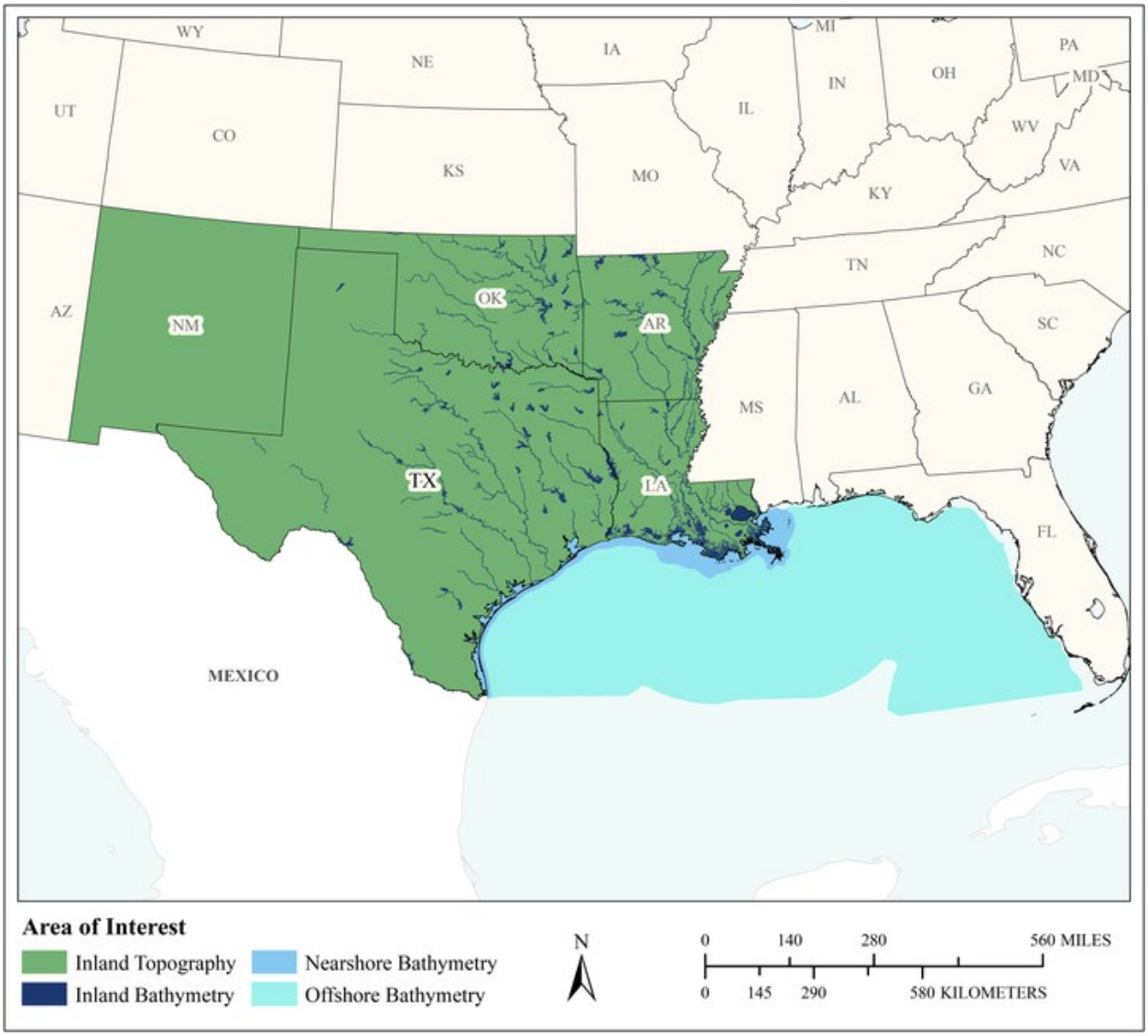
Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	Texas Water Development Board	1267	Environmental Modeling	Inland Topo	QL0 HD	2-3 years	$133,611	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	2-3 years	$169,139	Unable to quantify	Moderate	Moderate	Moderate
				Nearshore Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
				Offshore Bathy	Order 1a	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 02 – Riverine Ecosystem Management	State of Texas	60434	Riverine Ecosystem Management	Inland Topo	QL1 HD	6-10 years	$405,176	$40,471	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$215,688	$15,208	Major	Major	Major
				Nearshore Bathy	QL0B	2-3 years	$397,400	$303,676	Moderate	Moderate	Moderate
BU 03 – Coastal Zone Management	State of Texas	60435	Coastal Zone Management	Inland Topo	QL1	4-5 years	$13,647,596	$2,385,885	Major	Major	Major
				Inland Bathy	QL1B	4-5 years	$5,856,518	$3,433,370	Minor	Moderate	Moderate
				Nearshore Bathy	QL0B	4-5 years	$889,876	$1,505,333	Moderate	Major	Major
				Offshore Bathy	Order 1b	6-10 years	$208,589	$41,645	Minor	Moderate	Moderate
BU 04 – Forest Resource Management	State of Texas	60436	Forest Resources Management	Inland Topo	QL1	2-3 years	$1,046,620	$1,517,201	Major	Major	Major
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 05 – Rangeland Management	State of Texas	60437	Rangeland Management	Inland Topo	QL2	Annually	Unable to quantify	Unable to quantify	Minor	Major	I don't know
BU 06 – Natural Resource Management	State of Texas	60438	Natural Resources Conservation	Inland Topo	QL1 HD	4-5 years	$10,382,782	$38,128,742	Major	Major	Major
				Inland Bathy	QL0B	6-10 years	$1,407,269	$63,351	Major	Major	Major
				Nearshore Bathy	QL1B	6-10 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate
BU 07 – Wildlife and Habitat Management	State of Texas	60439	Wildlife and Habitat Management	Inland Topo	QL2	4-5 years	$63,056	$182,124	Moderate	Major	Moderate
				Inland Bathy	QL2B	4-5 years	$505,342	$305,450	Moderate	Moderate	Moderate
				Nearshore Bathy	QL0B	4-5 years	$3,934	$232	Moderate	Major	Moderate
				Offshore Bathy	Special Order	4-5 years	$2,627	$183	Moderate	Major	Major
BU 08 – Agriculture	State of Texas	60440	Agriculture and Precision Farming	Inland Topo	QL2	2-3 years	$306,480	$242,966	Major	Major	Minor
				Inland Bathy	QL4B	4-5 years	$536,955	$242,966	Moderate	Major	Major
BU 09 – Fisheries Management and Aquaculture	State of Texas	60441	Fisheries Management and Aquaculture	Inland Topo	QL2	2-3 years	$270,589	$587,742	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	6-10 years	$529,663	$241,071	Major	Major	Moderate
				Nearshore Bathy	QL0B	6-10 years	$624,160	$45,839	Moderate	Major	Minor

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 10 – Geologic Assessment	Bureau of Economic Geology	22390	Geologic Mapping, Hazards, and Coastal Monitoring	Inland Topo	QL0	2-3 years	$55,878,076	$980,939	Moderate	Moderate	Major
				Nearshore Bathy	QL1B	6-10 years	Unable to quantify	Unable to quantify	Minor	Major	Moderate
BU 11 – Geologic Resource Extraction	Railroad Commission of Texas	22126	Regulation of Surface Coal Mining in the State of Texas	Inland Topo	QL2	Event driven	$68,934	$2,894	None	Minor	Minor
BU 12 – Renewable Energy Resources	State of Texas	60442	Renewable Energy Resources	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	None
BU 13 – Oil and Gas Resources	Texas General Land Office	21661	Coastal Resource Management	Inland Topo	QL2	2-3 years	$216,611	Unable to quantify	Major	Major	Major
				Inland Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	QL2B	2-3 years	$322,652	Unable to quantify	Major	Major	Major
BU 14 – Cultural Resource Management	State of Texas	60443	Cultural Resources Preservation and Management	Inland Topo	QL1	4-5 years	$48,519	$42,421	Minor	Minor	Minor
				Inland Bathy	QL0B	6-10 years	$116,352	Unable to quantify	Moderate	Minor	Minor
				Nearshore Bathy	QL0B	4-5 years	$11,371	Unable to quantify	Minor	Moderate	Minor
BU 15 – Flood Risk Management	City of Austin	21982	Modeling and Prediction of Riverine Flood Hazards	Inland Topo	QL2	4-5 years	$100,000	Unable to quantify	Minor	Minor	Moderate
				Inland Bathy	QL2B	6-10 years	Unable to quantify	Unable to quantify	I don't know	I don't know	Minor
BU 16 – Sea Level Rise and Subsidence	State of Texas	60444	Sea Level Rise and Subsidence	Inland Topo	QL1 HD	4-5 years	$13,936,419	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 17 – Wildfire Management	Texas A&M Forest Service	22088	Texas Wildfire Risk Assessment	Inland Topo	QL1	(a) 2-3 years (b) 4-5 years	$1,422,260	Unable to quantify	Moderate	Major	Major
BU 18 – Homeland Security	Texas Natural Resources Information System	1344	Texas Data Acquisition and Clearinghouse	Inland Topo	QL2	4-5 years	$334,472	$60,100	I don't know	I don't know	Major
				Inland Bathy	QL0B	4-5 years	$138,090	$9,798	I don't know	I don't know	Major
BU 20 – Marine and Riverine Navigation	State of Texas	60445	Marine and Riverine Navigation and Safety	Inland Topo	QL0 HD	2-3 years	$10,140,673	Unable to quantify	None	None	Minor
				Inland Bathy	QL0B	2-3 years	$4,828,570	$635,495	Moderate	Moderate	Moderate
				Nearshore Bathy	QL0B	2-3 years	$3,045,610	$103,115	Minor	Major	Major

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 21 – Aviation Navigation	State of Texas	60446	Aviation Navigation and Safety	Inland Topo	QL1 HD	Annually	$894,872	$1,114,532	Minor	Moderate	Moderate
BU 22 – Infrastructure Management	State of Texas	60447	Infrastructure and Construction Management	Inland Topo	QL0 HD	4-5 years	$11,896,097	$35,007,816	Minor	Moderate	Major
				Inland Bathy	QL0B	4-5 years	$4,007,986	$416,182	Minor	Moderate	Moderate
BU 23 – Urban and Regional Planning	State of Texas	60448	Urban and Regional Planning	Inland Topo	QL1	4-5 years	$71,223,748	$8,222,814	Moderate	Major	Major
BU 27 – Recreation	Texas Parks & Wildlife Department	22057	Recreational Planning, Habitat Modeling, and Species Monitoring	Inland Topo	QL1	4-5 years	$516	Unable to quantify	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$36,579	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL0B	Event driven	$514,183	Unable to quantify	Major	Major	Major
BU 28 – Telecom-munications	TX Commission on State Emergency Communications	21755	Support for NG9-1-1 Services	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Inland Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	Major
				Nearshore Bathy	QL2B	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Offshore Bathy	Cross sections and/or transects meet needs	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 30 – Maritime and Land Boundary Management	State of Texas	60449	Maritime and Land Boundary Management	Inland Topo	QL1	6-10 years	$297,871	$1,142,055	Moderate	Minor	None
				Inland Bathy	QL2B	6-10 years	$223,542	Unable to quantify	Major	Major	Moderate
				Nearshore Bathy	QL0B	2-3 years	$912,639	Unable to quantify	Moderate	Major	Moderate
				Offshore Bathy	I don't know	2-3 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate

MCA Title: Environmental Modeling



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Custom description	Custom description
Sub Area Requirements			Texas and Louisiana out to the Outer Continental Shelf	Gulf of Mexico out to the Outer Continental Shelf

MCA Description	Response
Mission Critical Activity	The Surface Water department provides scientific and engineering expertise to better inform the activities of agency programs in water planning, development, and flood mitigation. This includes coastal hydrodynamic modeling, reservoir capacity determinations, sedimentation studies, fresh water inflow requirements, and siting of weather stations. Elevation data are needed for all forms of environmental modeling including flood pool modeling for lakes, hydraulic models, sediment transport modeling, habitat identification (fish and oysters), coastal inundation assessment, and oil spill modeling.
MCA Title	Environmental Modeling
MCA ID	1267
Organization Type	State or U.S. Territorial government
Organization Name	Texas Water Development Board
Sub-Agency or Division	
Organization Mission	The mission of the Texas Water Development Board (TWDB) is to provide leadership, information, education, and support for planning, financial assistance, and outreach for the conservation and responsible development of water for Texas.
Program Name	Surface Water Division
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 02 - Riverine Ecosystem Management
Tertiary Business Use	BU 03 - Coastal Zone Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Intake structures

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B	QL0B	Order 1a
Update Frequency	2-3 years	2-3 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	The best horizontal accuracy achievable for the vertical accuracy I need	Up to 1 meter	Up to 1 meter
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm	Less than 10 cm	Less than 1 meter
How far onshore needed			To the fall line	
How far down the beach profile needed	To MHHW		Below MLLW	
Tide correction requirement			MSL	MSL
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Required	Required	Required	Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Required	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Not required	Not required	Not required	Not required
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Nice to have	Not required	Required
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Not required	Nice to have
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Highly desirable	Required
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Required
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Highly desirable	Nice to have
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Required	Required
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Nice to have	Nice to have
Bottom texture			Required	Required
Bottom type			Required	Required
Submerged features			Required	Required
Subbottom characteristics			Required	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Required	Required
Water column properties - Chemical			Required	Required
Water column properties - Biological			Required	Required
Currents			Required	Required
Tide/wave heights			Required	Required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Required	Highly desirable
Boundaries			Required	Highly desirable
Routes			Required	Required
Offshore cadastral			Required	Highly desirable
Lease areas			Highly desirable	Required
Fixed obstructions			Required	Required
Floating observation/navigation systems			Required	Required
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Required	Required	Required	Required
Wetlands	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required	Required	Required	
Bridges/culverts	Highly desirable	Required		
Landmark features	Nice to have	Required	Highly desirable	
Cultural resources	Not required	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			
Other	Required			
Other description	Channel connectivity in marsh and delta areas			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	LIDAR point cloud and DEMs, dates vary 2006-2017, 2-4 points per meter, less than 10 cm vertical accuracy	TWDB collected bathymetry, NOAA DEMS, USGS Hypsography	TWDB collected data, NOAA DEMs	NOAA DEMs
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI	Yes	Yes	Yes	Yes
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes	Yes	
State repositories used	Texas Natural Resources Information System (TNRIS)	TNRIS	TNRIS	
Data that meet my needs are not available				

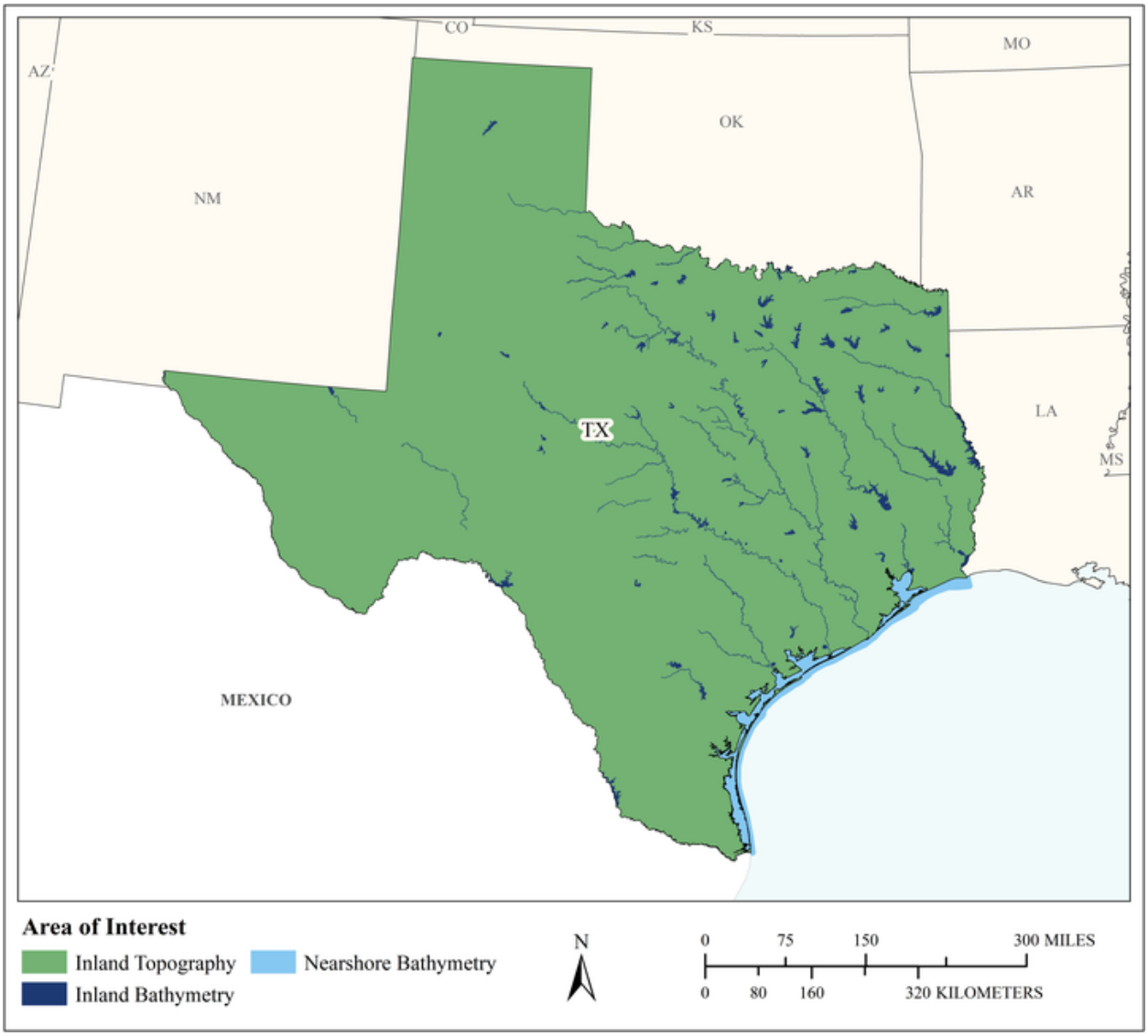
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Major	Major
Cost savings/cost reduction	Major	Minor	Major	Major
Cost avoidance	Major	Moderate	Major	Major
Increased revenues	Moderate	Minor	Moderate	Major
Mission-driven performance improvements	Major	Minor	Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Major	Major
Improved response or timeliness	Major	Minor	Major	Major
Improved customer experience	Major	Minor	Major	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	Moderate
Environmental	Major	Minor	Major	Major
Public safety, including life and property	Major	Minor	Major	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$58,612	Major	Annual dollars saved/realized	$44,140	I don't know	Unable to provide		I don't know	Unable to provide	
Time savings description				Depending on format. Represents one river segment at 2-3 miles long.			Currently use NOAA bathy. NOAA data fits right into model. If have higher resolution than NOAA, could improve models.			Don't currently collect our own.		
Cost savings/cost reduction	Major	Annual dollars saved/realized	$75,000	Major	Annual dollars saved/realized	$75,000	None			None		
Cost savings/cost reduction description							Currently not collecting our own.					
Cost avoidance	Moderate	Unable to provide		Moderate	Annual dollars saved/realized	$50,000	Major	Unable to provide		I don't know	Unable to provide	
Cost avoidance description							Modeling storm surge.					
Increased revenues	None			None			Moderate	Unable to provide		None		
Mission-driven performance improvements	Major	Unable to provide		Major	Annual percent improvement	25%	Moderate	Unable to provide		Major	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide	
Improved response or timeliness description										Potential to improve oil spill modeling.		
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide	
Improved customer experience description										Potential to improve oil spill modeling.		
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate			Major		
Environmental	Moderate			Moderate			Moderate			Major		
Public safety, including life and property	Moderate			Moderate			Moderate			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades				
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes	Yes	
Hydrologic Flow Accumulation Grids	Yes	Yes	Yes	
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Riverine Ecosystem Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Stream channel analysis and mapping. Stream bank erosion analysis. Aquatic and terrestrial species habitat management. Environmental management.
MCA Title	Riverine Ecosystem Management
MCA ID	60434
Organization Type	State or U.S. Territorial government
Organization Name	State of Texas
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B	QL0B	
Update Frequency	6-10 years	4-5 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable		Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Required		Highly desirable	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Required	Required		Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	
DTM	Required	Highly desirable	Required	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Nice to have	Nice to have	
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Not required	Nice to have	
Full waveform	Nice to have	Nice to have	Highly desirable	
Bathymetric Attributed Grid (BAG)		Not required	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Nice to have	
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Highly desirable	Required	
Underwater videography			Not required	
Bottom texture			Highly desirable	
Bottom type			Required	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Nice to have	Nice to have	Not required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates	Nice to have	Nice to have	Highly desirable	
Land use/land cover	Highly desirable	Nice to have	Required	
Wetlands	Highly desirable	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have	Not required	
Cultural resources	Nice to have	Nice to have	Not required	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	
Cost savings/cost reduction	Moderate	Minor	Moderate	
Cost avoidance	Moderate	None	None	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	None	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Minor	

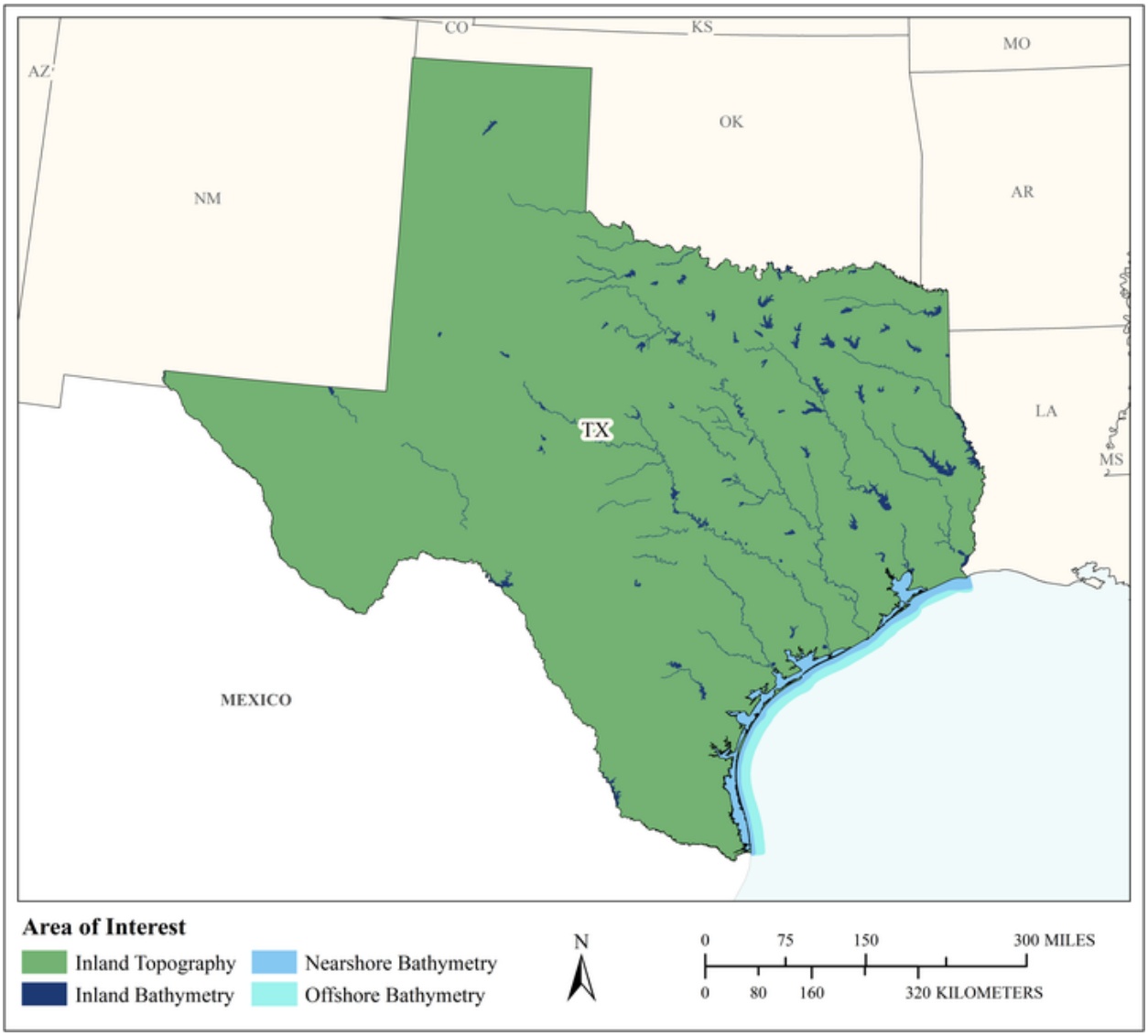
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Moderate	Minor	
Improved customer experience	Major	Minor	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Minor	
Environmental	Major	Major	Moderate	
Public safety, including life and property	Major	Moderate	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$405,176		Annual dollars saved/ realized	$215,688		Annual dollars saved/ realized	$397,400			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$40,471		Annual dollars saved/ realized	$15,208		Annual dollars saved/ realized	$303,676			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate					
Environmental	Major			Major			Moderate					
Public safety, including life and property	Major			Major			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps			Yes	
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints			Yes	
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Coastal Zone Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Analysis of coastal erosion and inundation. Hurricane storm surge and wind damage modeling and assessment. Coastal hazard modeling and mapping. Coastal hazard mitigation. Tsunami modeling. Land use and environmental planning. Coastal resiliency. Oil spill modeling. Littoral zone management including dunes and beaches.
MCA Title	Coastal Zone Management
MCA ID	60435
Organization Type	State or U.S. Territorial government
Organization Name	State of Texas
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL0B	Order 1b
Update Frequency	4-5 years	4-5 years	4-5 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable	Nice to have	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Nice to have	Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable	Highly desirable	Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Nice to have	Highly desirable
DTM	Required	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Nice to have	Nice to have	Nice to have	Highly desirable
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Nice to have
Tide Predictions			Highly desirable	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Highly desirable	Required	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Required
Nautical and/or navigation charts			Nice to have	Nice to have
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Highly desirable
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Highly desirable	Nice to have
Tide/wave heights			Highly desirable	Nice to have
Sea ice conditions			Not required	Nice to have
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Nice to have
Wetlands	Required	Highly desirable	Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Nice to have
Inland surface water features	Highly desirable	Highly desirable	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Highly desirable	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Moderate	Moderate
Cost savings/cost reduction	Moderate	Moderate	Moderate	Moderate
Cost avoidance	Major	Minor	Moderate	Minor
Increased revenues	None	None	None	None
Mission-driven performance improvements	Major	Moderate	Moderate	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Moderate	Minor

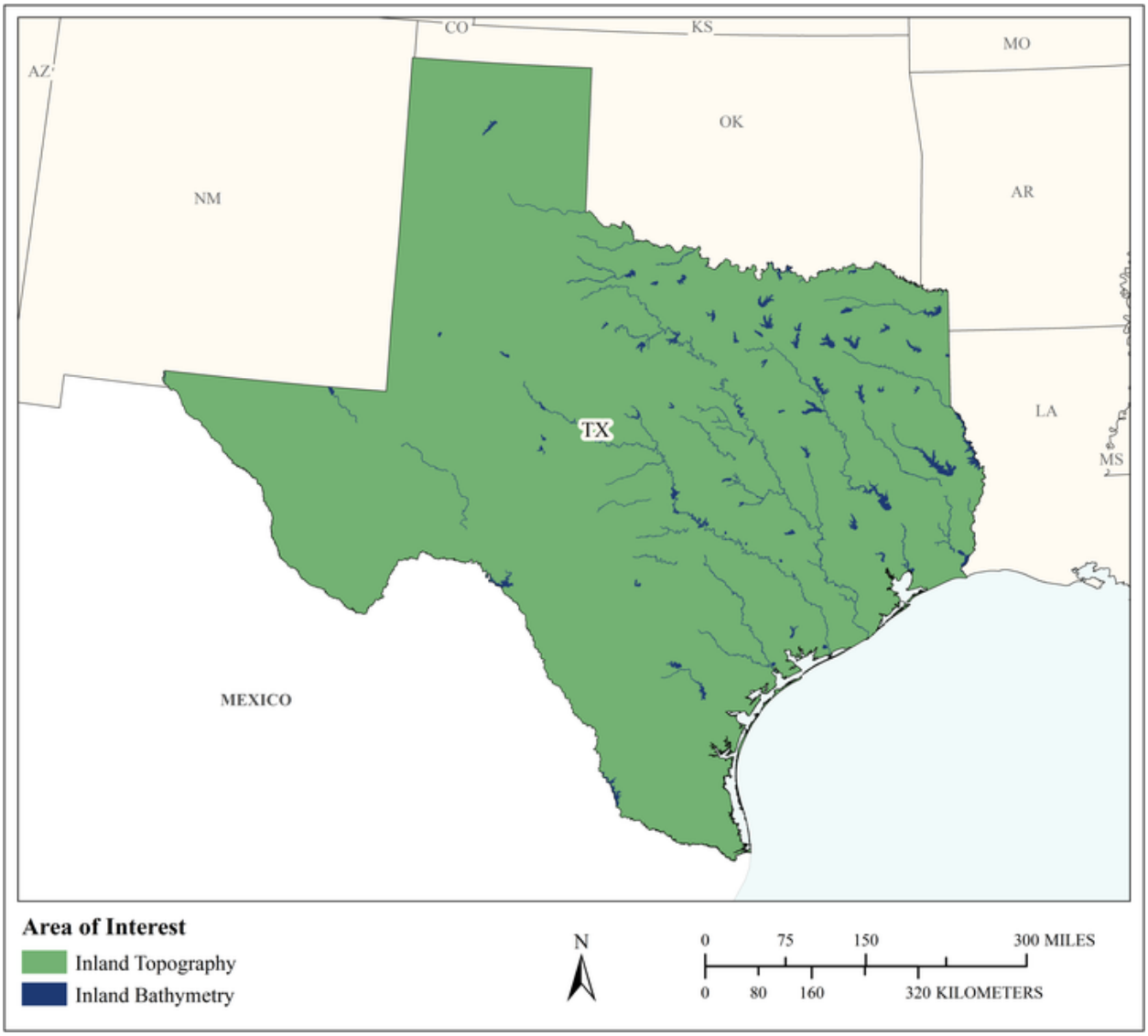
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	Moderate	Minor
Improved customer experience	Major	Moderate	Moderate	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Moderate	Minor
Environmental	Major	Moderate	Moderate	Moderate
Public safety, including life and property	Major	Moderate	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Increased revenues	None			None			Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$13,647,596		Annual dollars saved/ realized	$5,856,518		Annual dollars saved/ realized	$889,876		Annual dollars saved/ realized	$208,589
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$2,385,885		Annual dollars saved/ realized	$3,433,370		Annual dollars saved/ realized	$1,505,333		Annual dollars saved/ realized	$41,645
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Minor			Moderate			Minor		
Environmental	Major			Moderate			Major			Moderate		
Public safety, including life and property	Major			Moderate			Major			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Forest Resources Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Forest health assessment. Determination of standing inventory of forest resources. Prescribed burn planning. Analysis of carbon stocks for trade. Harvest systems planning.
MCA Title	Forest Resources Management
MCA ID	60436
Organization Type	State or U.S. Territorial government
Organization Name	State of Texas
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B		
Update Frequency	2-3 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Not required		
DTM	Required	Not required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Required	Highly desirable		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Required		
Land use/land cover	Required	Required		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Highly desirable	Required		
Landmark features	Nice to have	Nice to have		
Cultural resources	Highly desirable	Nice to have		
Coastal and riverine structures	Nice to have	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Major		
Increased revenues	Minor	Moderate		
Mission-driven performance improvements	Major	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		

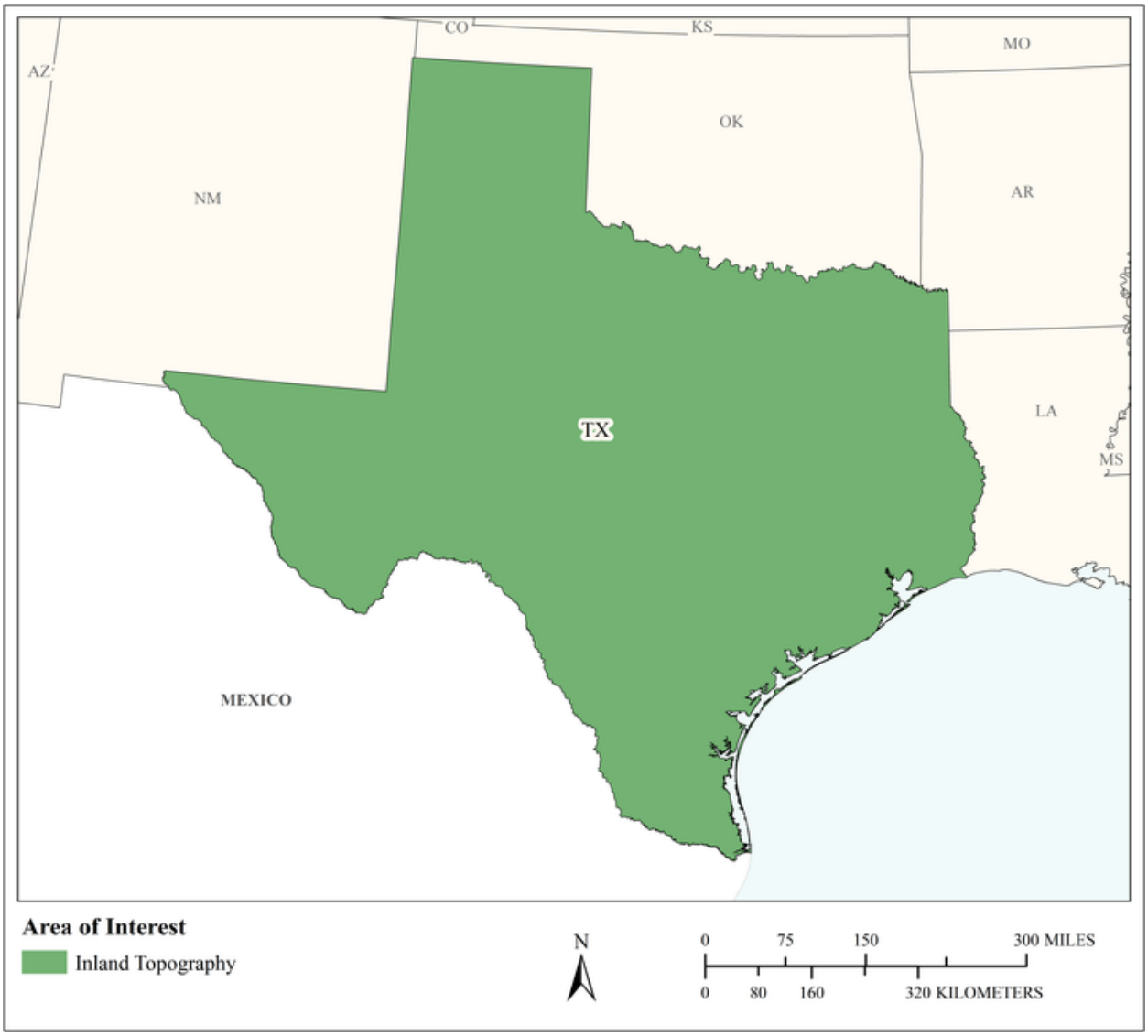
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major		
Improved customer experience	Moderate	Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Major		
Environmental	Major	Major		
Public safety, including life and property	Moderate	Major		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Major	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,046,620									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,517,201									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Major			Major								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes		
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Rangeland Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Assessment of rangeland health. Mapping for soil erosion potential due to grazing.
MCA Title	Rangeland Management
MCA ID	60437
Organization Type	State or U.S. Territorial government
Organization Name	State of Texas
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 05 - Rangeland Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Highly desirable			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Not required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None			
Cost savings/cost reduction	None			
Cost avoidance	None			
Increased revenues	None			
Mission-driven performance improvements	None			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None			

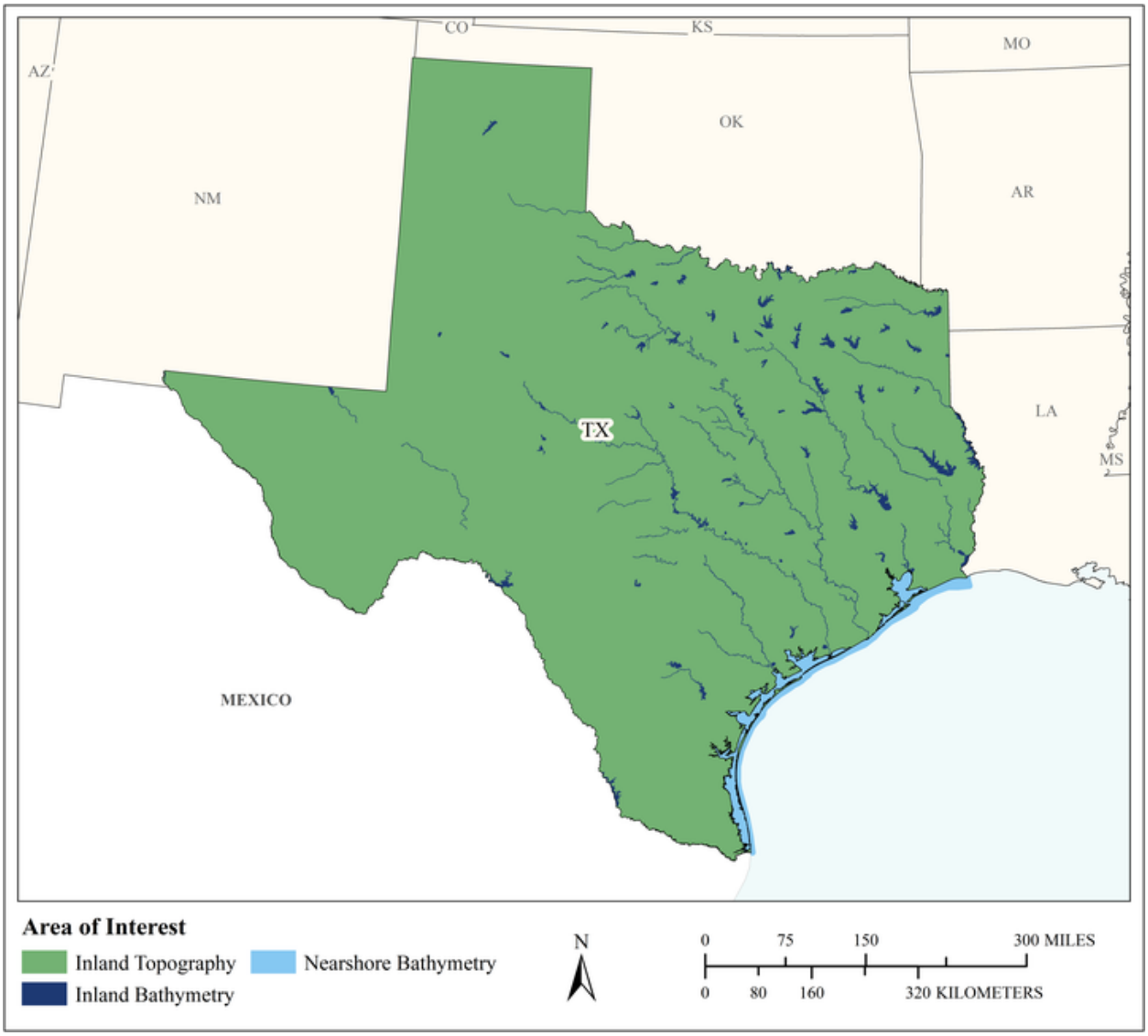
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	None			
Improved customer experience	None			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	None			
Public safety, including life and property	None			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	None											
Cost avoidance	Minor	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Natural Resources Conservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation engineering. Soils and wetlands mapping and characterization. Modeling of biological and ecological systems. Erosion control. Rainfall penetration studies, impervious surfaces. Assessment of blue carbon stocks.
MCA Title	Natural Resources Conservation
MCA ID	60438
Organization Type	State or U.S. Territorial government
Organization Name	State of Texas
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B	QL1B	
Update Frequency	4-5 years	6-10 years	6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Highly desirable	Required		Required	Required
Entire AOI under same environmental conditions	Required	Required	Required		Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required		Required	Required
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Required	Required	Required	
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Highly desirable	Required	
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Nice to have	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Highly desirable	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Required	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Highly desirable	Required	Highly desirable	
Land use/land cover	Required	Required	Highly desirable	
Wetlands	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Nice to have	Highly desirable	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	
Cost savings/cost reduction	Major	Major	Minor	
Cost avoidance	Major	Moderate	Minor	
Increased revenues	Minor	Minor	None	
Mission-driven performance improvements	Major	Major	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Moderate	

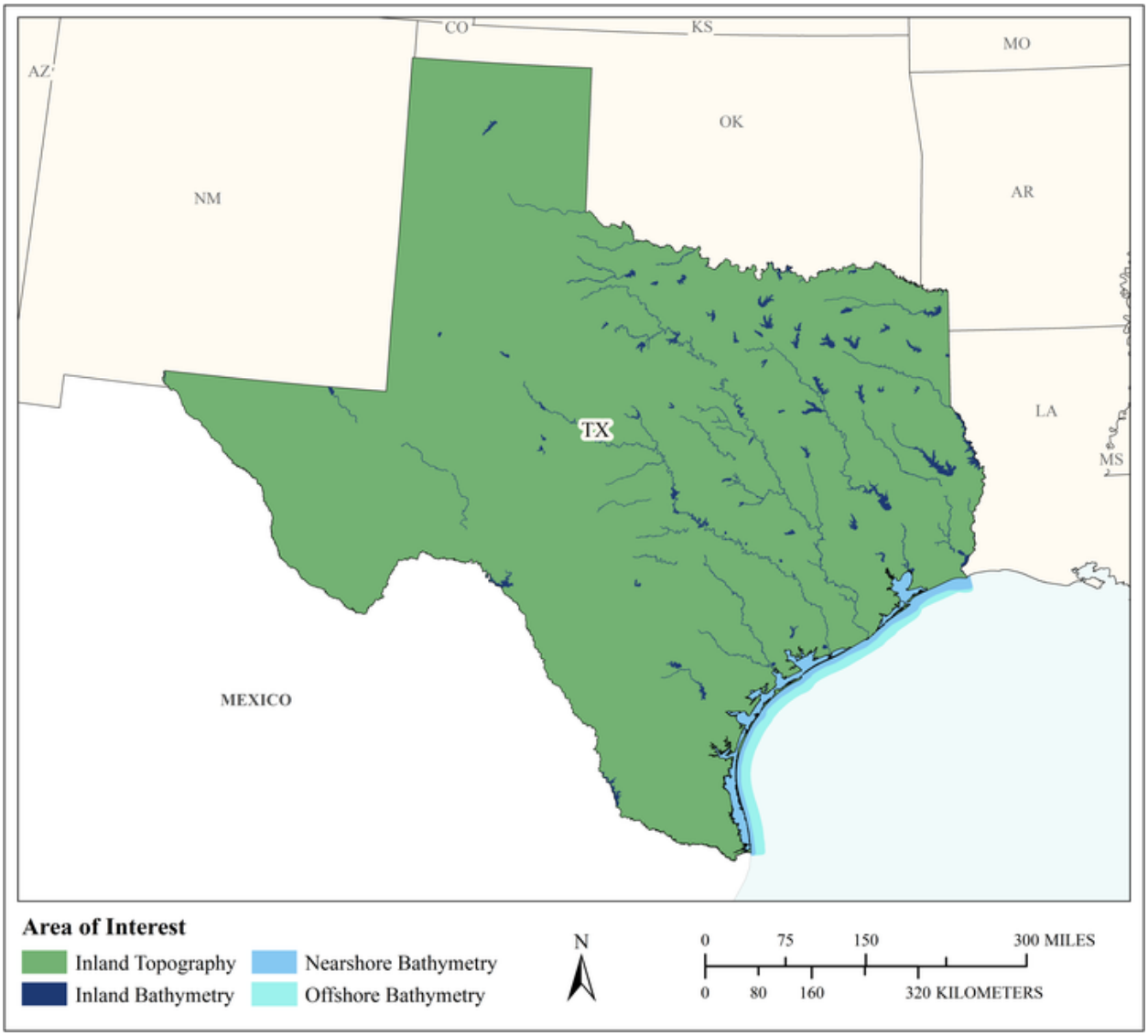
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major	Moderate	
Improved customer experience	Major	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Moderate	
Environmental	Major	Major	Major	
Public safety, including life and property	Major	Moderate	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		None					
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$10,382,782		Annual dollars saved/ realized	$1,407,269						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$38,128,742		Annual dollars saved/ realized	$63,351						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate					
Environmental	Major			Major			Major					
Public safety, including life and property	Major			Major			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes		Yes	
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Wildlife and Habitat Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation planning for wildlife refuges and marine sanctuaries. Conservation of critical habitats. Management of diverse migratory bird habitats, coral reef and coral communities, marine mammals, protected fish species, and trust resources.
MCA Title	Wildlife and Habitat Management
MCA ID	60439
Organization Type	State or U.S. Territorial government
Organization Name	State of Texas
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B	QL0B	Special Order
Update Frequency	4-5 years	4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 2 meters	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DTM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Nice to have	Nice to have	Highly desirable
Classified point cloud	Highly desirable	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Highly desirable
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Highly desirable	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Not required	Nice to have
Lease areas			Not required	Nice to have
Fixed obstructions			Nice to have	Highly desirable
Floating observation/navigation systems			Nice to have	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Nice to have
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Highly desirable	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Nice to have	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Minor	Moderate
Cost savings/cost reduction	Major	Minor	Minor	Minor
Cost avoidance	Major	Minor	Moderate	Major
Increased revenues	None	Minor	None	None
Mission-driven performance improvements	Moderate	Moderate	Moderate	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate	Minor	Minor

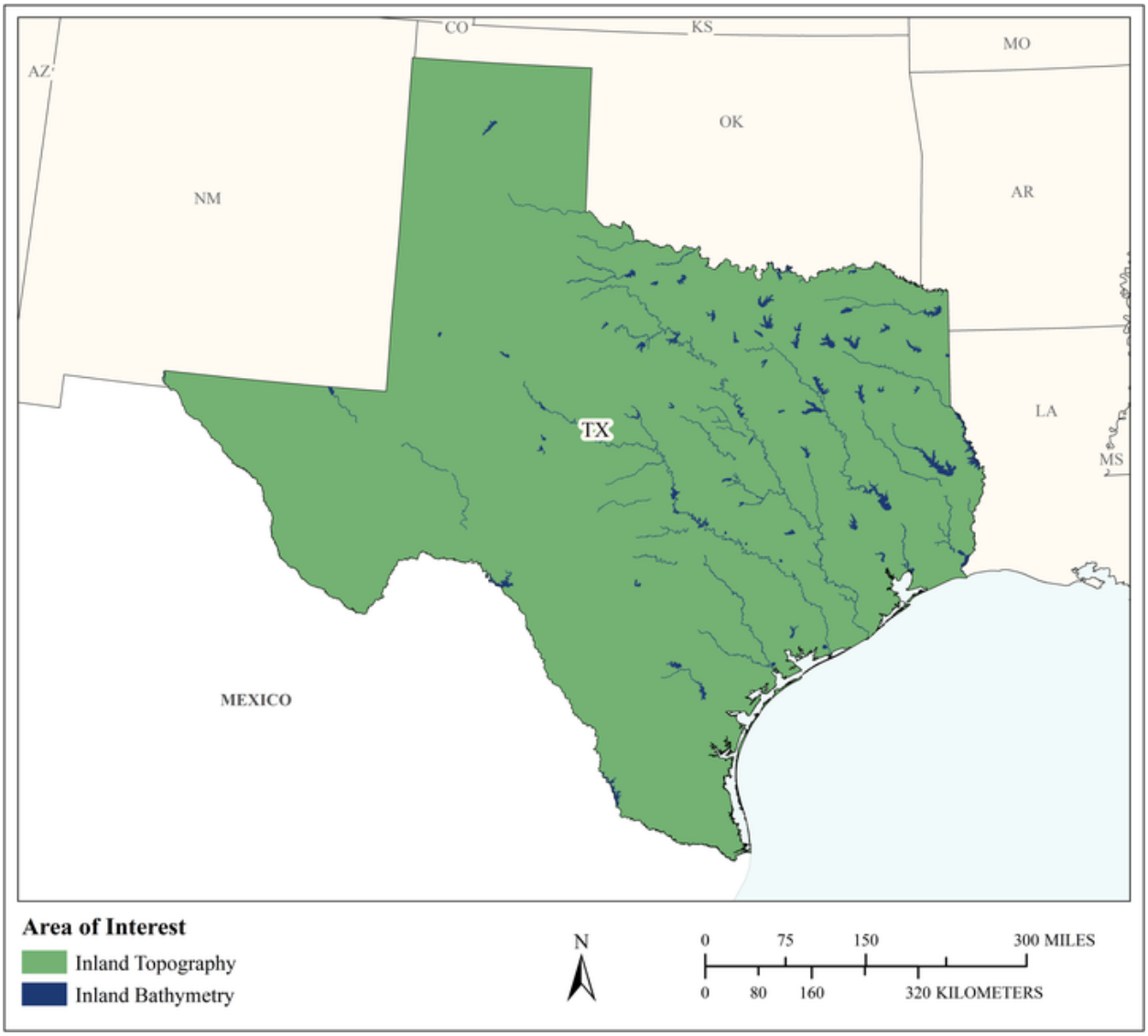
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Minor	Minor	Minor	Minor
Improved customer experience	Minor	Moderate	Minor	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Moderate	Minor	Minor
Environmental	Moderate	Moderate	Moderate	Major
Public safety, including life and property	Minor	Minor	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$63,056		Annual dollars saved/ realized	$505,342		Annual dollars saved/ realized	$3,934		Annual dollars saved/ realized	$2,627
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$182,124		Annual dollars saved/ realized	$305,450		Annual dollars saved/ realized	$232		Annual dollars saved/ realized	$183
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate			Moderate		
Environmental	Major			Moderate			Major			Major		
Public safety, including life and property	Moderate			Moderate			Moderate			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes			Yes
Curvature maps				
Cross sections	Yes			Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Agriculture and Precision Farming



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Farm pond design. Irrigation system design. Detailed site analysis to support precision farming. Analysis of farm sedimentation and runoff. Calibration of fertilizer application, fertilizer management, and irrigation planning. Optimized terraforming.
MCA Title	Agriculture and Precision Farming
MCA ID	60440
Organization Type	State or U.S. Territorial government
Organization Name	State of Texas
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 08 - Agriculture and Precision Farming
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Nice to have
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL4B		
Update Frequency	2-3 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 10 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 50 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required			Not required	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Not required	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Not required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level			Up to double the required TVU at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Nice to have	Nice to have		
Edited/cube XYZ		Highly desirable		
Full waveform	Nice to have	Highly desirable		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Required	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Highly desirable		
Land use/land cover	Highly desirable	Required		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Nice to have	Required		
Cultural resources	Nice to have	Highly desirable		
Coastal and riverine structures	Highly desirable	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	None		
Cost savings/cost reduction	Major	I don't know		
Cost avoidance	Major	Moderate		
Increased revenues	None	I don't know		
Mission-driven performance improvements	Moderate	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None		

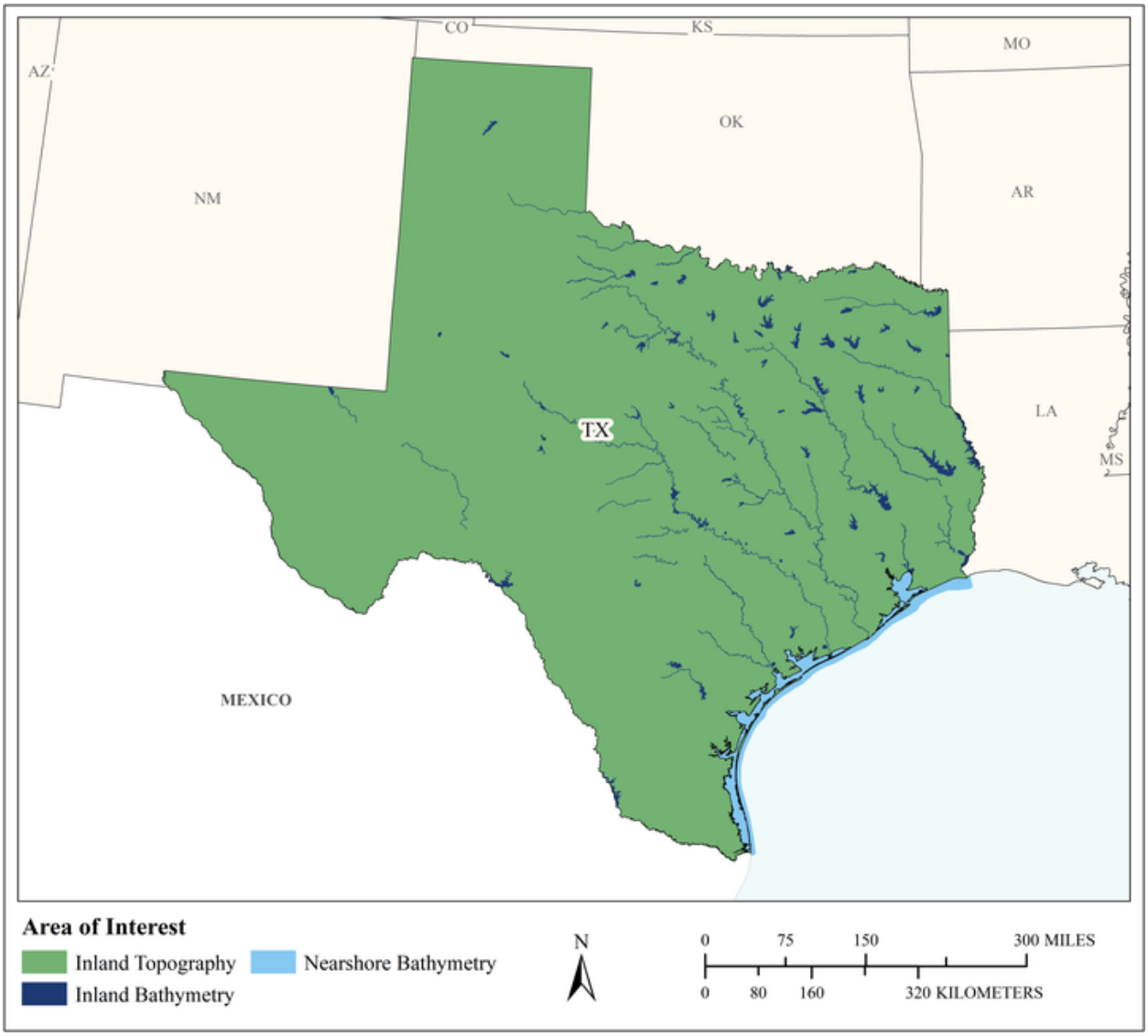
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	None		
Improved customer experience	Moderate	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	None		
Environmental	Major	I don't know		
Public safety, including life and property	Moderate	I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$306,480		Annual dollars saved/ realized	$536,955						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$242,966		Annual dollars saved/ realized	$242,966						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate								
Environmental	Major			Major								
Public safety, including life and property	Minor			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps				
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps		Yes		
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Fisheries Management and Aquaculture



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Management of fisheries. Sustainable aquaculture.
MCA Title	Fisheries Management and Aquaculture
MCA ID	60441
Organization Type	State or U.S. Territorial government
Organization Name	State of Texas
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B	QL0B	
Update Frequency	2-3 years	6-10 years	6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Nice to have		Required	Nice to have
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Required	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	
DTM	Required	Highly desirable	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Nice to have	Highly desirable	
Classified point cloud	Highly desirable	Nice to have	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Highly desirable	
Ground control/ground truthing	Required	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Highly desirable	Nice to have	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Required	Highly desirable	Highly desirable	
Land use/land cover	Required	Highly desirable	Nice to have	
Wetlands	Required	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Nice to have	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Not required	
Coastal and riverine structures	Required	Highly desirable	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	
Cost savings/cost reduction	Major	Moderate	Major	
Cost avoidance	Moderate	Moderate	Minor	
Increased revenues	Moderate	Moderate	Minor	
Mission-driven performance improvements	Major	Major	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Minor	

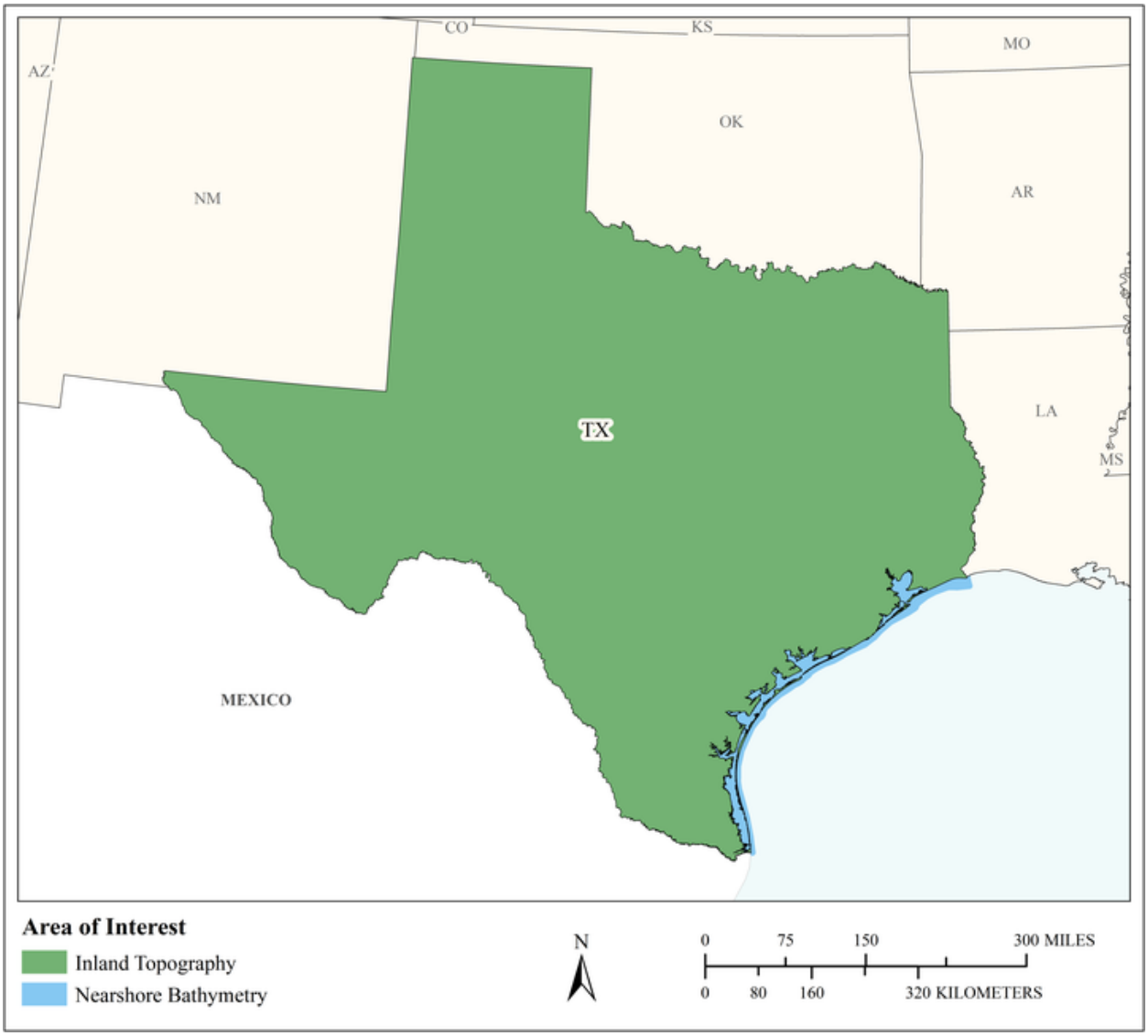
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major	Moderate	
Improved customer experience	Moderate	Major	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Moderate	
Environmental	Major	Moderate	Moderate	
Public safety, including life and property	Moderate	Minor	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Increased revenues	Minor	Unable to provide		None			Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$270,589		Annual dollars saved/ realized	$529,663		Annual dollars saved/ realized	$624,160			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$587,742		Annual dollars saved/ realized	$241,071		Annual dollars saved/ realized	$45,839			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Moderate					
Environmental	Moderate			Major			Major					
Public safety, including life and property	Moderate			Moderate			Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic Mapping, Hazards, and Coastal Monitoring



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	We acquire topographic and bathymetric lidar data for several mission-critical earth science applications, including geologic hazards assessment, geologic mapping, beach and dune monitoring, subsidence monitoring, and storm impact and recovery. Federal data sets give us a good first-pass look at areas we'd like to survey and study in more detail; this works well given the large size of the state, the level of regional coverage, and our much smaller specific study areas.
MCA Title	Geologic Mapping, Hazards, and Coastal Monitoring
MCA ID	22390
Organization Type	State or U.S. Territorial government
Organization Name	Bureau of Economic Geology
Sub-Agency or Division	
Organization Mission	Applied research in earth sciences as the state geological survey of Texas and an academic research organization.
Program Name	Near Surface Observatory
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 03 - Coastal Zone Management
Tertiary Business Use	BU 16 - Sea Level Rise and Subsidence

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	1-meter objects

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0		QL1B	
Update Frequency	2-3 years and certain events.		6-10 years	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Event type(s)	It depends on the project. We acquire our own data at intervals that are appropriate for the rate of change expected. Geologic mapping requires one time only or infrequent updates; geologic hazards and coastal monitoring. Ideally need new data every two or three years.			
Quality Level and/or update frequency variability across AOI	See previous explanation.			
Acceptable Horizontal Error	Less than 20 cm		Up to 1 meter	
Acceptable Vertical Error	Less than 5 cm		Up to 20 cm	
How far onshore needed			500 meters inland	
How far down the beach profile needed	To MHW		To MLLW	
Tide correction requirement			MSL	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required		Highly desirable			Highly desirable
Entire AOI under same environmental conditions	Not required		Highly desirable			Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Not required		Highly desirable			Highly desirable
DEM for entire AOI needs to be seamless	Not required		Highly desirable			Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Not applicable since not stitching together		Up to double the required TVU at the 95% confidence level			Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable		Highly desirable	
DTM	Required		Highly desirable	
DEM	Highly desirable		Required	
Raw point cloud data	Highly desirable		Nice to have	
Classified point cloud	Not required		Nice to have	
Edited/cube XYZ			Not required	
Full waveform	Not required		Not required	
Bathymetric Attributed Grid (BAG)			Not required	
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Not required		Nice to have	
Ground control/ground truthing	Not required		Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Not required		Nice to have	
Underwater videography			Not required	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Not required	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Not required		Highly desirable	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Not required	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates	Not required		Not required	
Land use/land cover	Not required		Nice to have	
Wetlands	Not required		Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Nice to have	
Inland surface water features	Not required		Highly desirable	
Bridges/culverts	Not required			
Landmark features	Not required		Nice to have	
Cultural resources	Not required		Not required	
Coastal and riverine structures	Not required		Highly desirable	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	TNRIS, USGS, BEG		Corps of Engineers, BEG	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	TNRIS			
Other	Yes			
Other description	We have a lidar system and generally acquire our own data.			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		None	
Cost savings/cost reduction	Major		None	
Cost avoidance	Major		None	
Increased revenues	None		None	

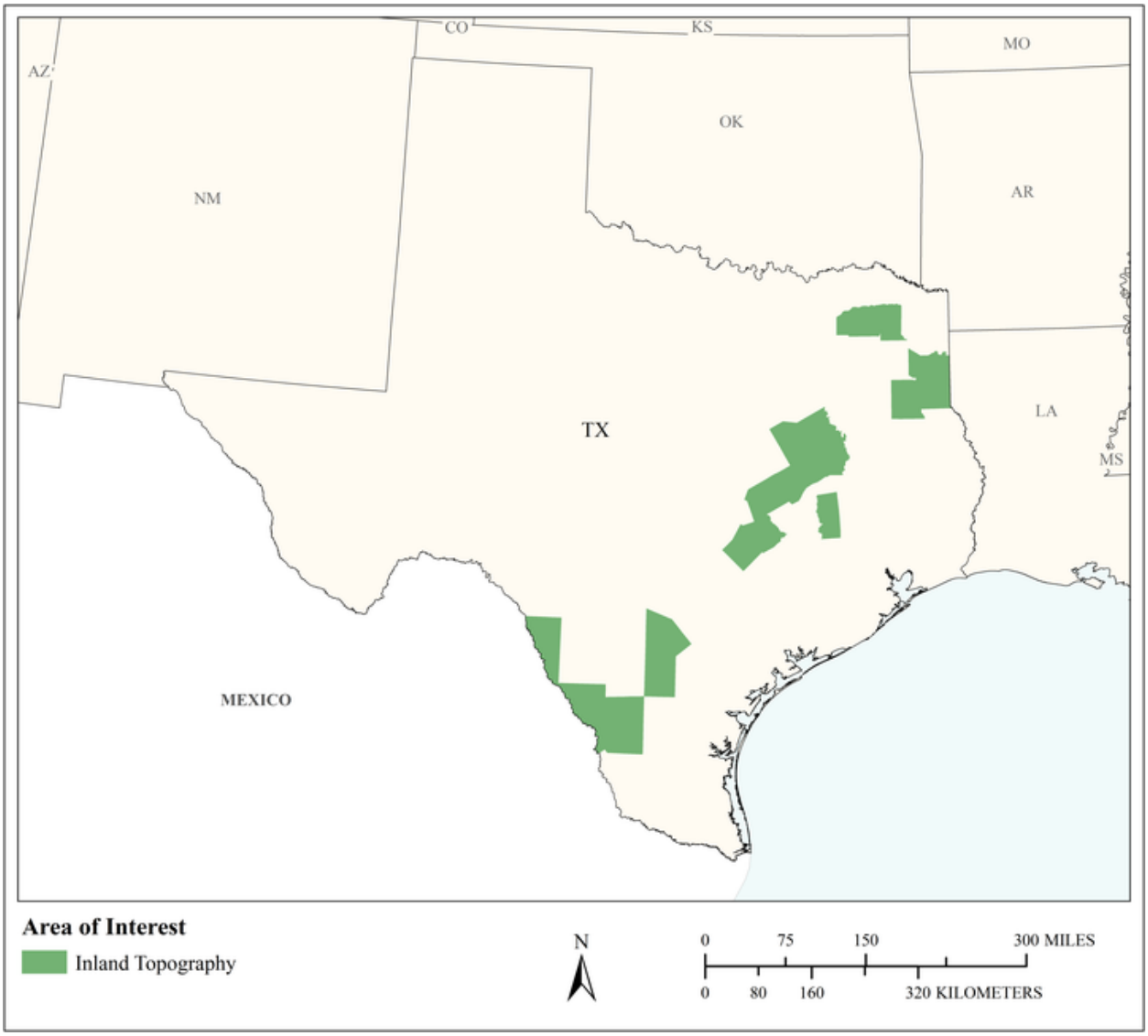
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Mission-driven performance improvements	Minor		None	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor		None	
Improved response or timeliness	Minor		None	
Improved customer experience	Minor		None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor		None	
Environmental	Minor		None	
Public safety, including life and property	Minor		None	
Other Current Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other	Moderate			
Other description	Reconnaissance survey planning			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					Moderate	Unable to provide				
Time savings description	First pass screening for project areas. More accurate estimates of mapping effort required in a prospective project area.											
Cost savings/cost reduction	None						Major	Unable to provide				
Cost savings/cost reduction description							Would reduce the number of specific surveys that need to be flown.					
Cost avoidance	Moderate	Unable to provide					Minor	Unable to provide				
Increased revenues	None						None					
Mission-driven performance improvements	Moderate	Unable to provide					Moderate	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$55,878,076									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide					Moderate	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide					Moderate	Unable to provide				
Improved customer experience	I don't know	Unable to provide					Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$980,939									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate						Minor					
Environmental	Moderate						Major					
Environmental description							Providing baseline pre-storm information about the nearshore zone					
Public safety, including life and property	Major						Moderate					
Public safety, including life and property description	Identifying site specific geologic hazards in a variety of environments											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Regulation of Surface Coal Mining in the State of Texas



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements	Atascosa, McMullen, Maverick, Webb, Bastrop, Lee, Milam, Grimes, Robertson, Limestone, Leon, Freestone, Rusk, Panola, Harrison, Camp, Franklin, Titus, and Hopkins Counties, TX			

MCA Description	Response
Mission Critical Activity	Regulation of surface coal mining in the state of Texas.
MCA Title	Regulation of Surface Coal Mining in the State of Texas
MCA ID	22126
Organization Type	State or U.S. Territorial government
Organization Name	Railroad Commission of Texas
Sub-Agency or Division	
Organization Mission	Our mission is to serve Texas by our stewardship of natural resources and the environment, our concern for personal and community safety, and our support of enhanced development and economic vitality for the benefit of Texans.
Program Name	Surface Mining & Reclamation Division
Total Annual Program Budget	
Primary Business Use	BU 11 - Geologic Resource Mining and Extraction
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	1-meter object

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	Event driven only – Data need to coincide with a specific event.			
Event type(s)	Permitting actions, mine operator's activities, changes in ownership of the land.			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 30 cm			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required					
Entire AOI under same environmental conditions	Not required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Not required					
DEM for entire AOI needs to be seamless	Not required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Not applicable					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Nice to have			
DEM	Nice to have			
Raw point cloud data	Not required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Not required			
Wetlands	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Not required			
Bridges/culverts	Nice to have			
Landmark features	Not required			
Cultural resources	Nice to have			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	TNRIS, National Map, data from mine operators			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	TNRIS			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor			
Cost savings/cost reduction	Minor			
Cost avoidance	I don't know			
Increased revenues	I don't know			
Mission-driven performance improvements	I don't know			

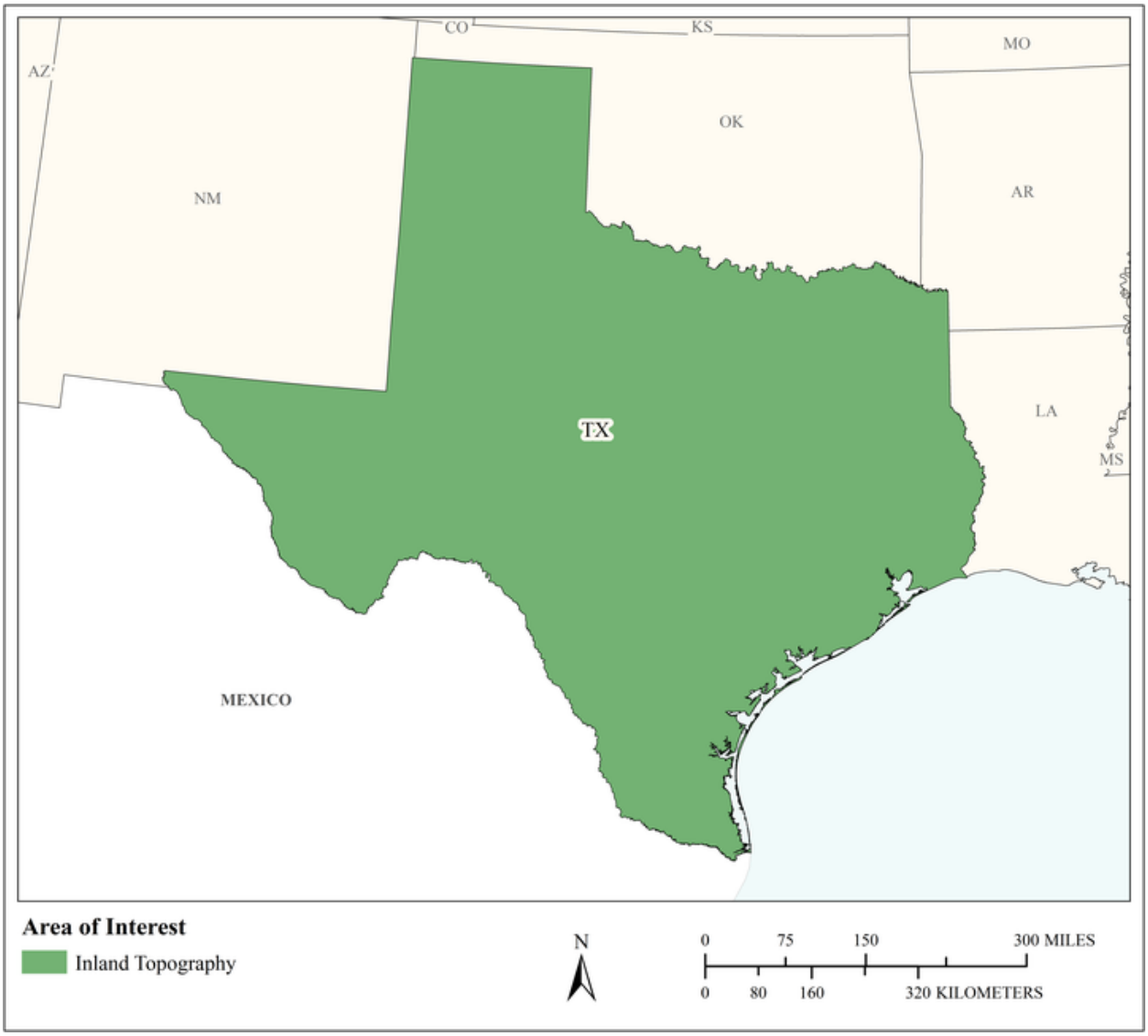
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know			
Improved response or timeliness	I don't know			
Improved customer experience	I don't know			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know			
Environmental	I don't know			
Public safety, including life and property	I don't know			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$18,934									
Time savings description	Approximately 1 less day in the field per inspector, per month. Faster analysis by the engineering staff, one day per month aggregate.											
Cost savings/cost reduction	Minor	Annual dollars saved/realized	$50,000									
Cost savings/cost reduction description	Reduce need for preliminary assessment for large abandoned mine land projects.											
Cost avoidance	None											
Increased revenues	None											
Mission-driven performance improvements	Minor	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	None											
Improved response or timeliness	Minor	Annual dollars saved/realized	$2,894									
Improved response or timeliness description	Faster engineering review of certain mine structures, if measured.											
Improved customer experience	None											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None											
Environmental	Minor											
Environmental description	Minor improvements in analysis of areas of uncertainty in the permitting process.											
Public safety, including life and property	Minor											
Public safety, including life and property description	Minor improvement to public safety in areas of uncertainty in the permitting process, saving back and forth with customer.											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades				
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Renewable Energy Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Alternate energy development – solar, tidal, wind, wave, and ocean current. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Low head power potential for hydropower.
MCA Title	Renewable Energy Resources
MCA ID	60442
Organization Type	State or U.S. Territorial government
Organization Name	State of Texas
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Not required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Minor			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor			

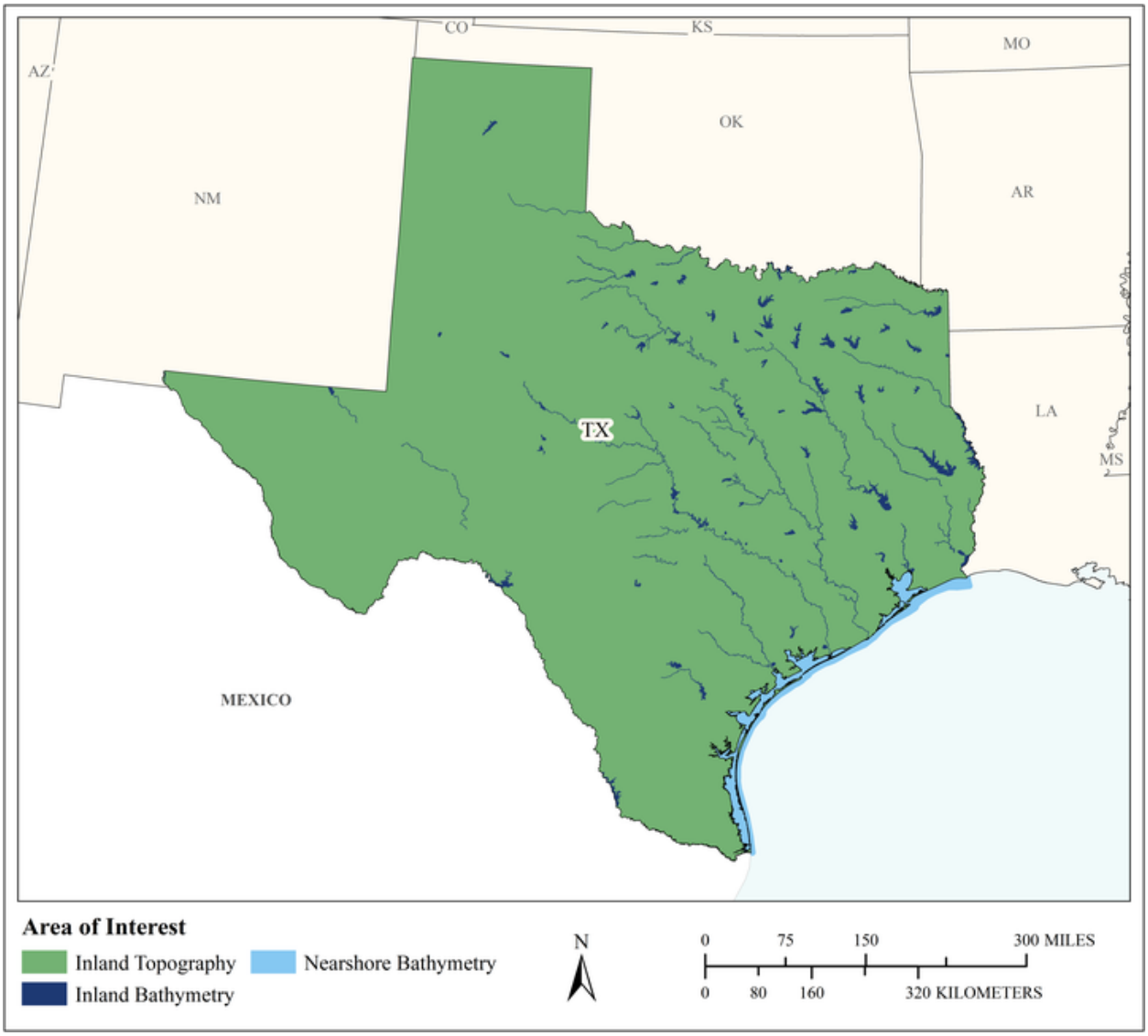
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	None											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Coastal Resource Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Nice to have	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	State land and asset management; oil and gas leasing; coastal resources management; permitting; emergency management and disaster recovery; oil spill prevention and response, recreation and tourism enhancement; veterans' benefits; state history preservation, outreach, and education. In coastal areas, elevation data are needed for post storm damage assessment of dunes, coastal structures, and houses as well as habitat monitoring. Bathymetry data are needed to identify debris, submerged structures, sub surface sand sources for beach renourishment, oil and gas resources, and mining activities on state lands. Bathymetry data are also needed for Dredge Management Placement Areas (DMPAs). When channels and berths are dredged, materials are placed on Permanent School Fund (PSF) lands, and fees are collected for material placed based on volume (only approved materials). The State would also like to be able to calculate post-storm volume loss using bathymetry. Currently bathymetry is collected manually with rods and boat transects. Elevation data are also needed for mine operator audits during operations (open pit mining of hard minerals) to include volume calculations on Permanent School Fund lands. The State has flown lidar and imagery for several mines for volumetric change.
MCA Title	Coastal Resource Management
MCA ID	21661
Organization Type	State or U.S. Territorial government
Organization Name	Texas General Land Office
Sub-Agency or Division	
Organization Mission	The Texas General Land Office primarily serves the schoolchildren, veterans, and the environment of Texas. The agency does so by preserving our history, maximizing state revenue through innovative administration, and through the prudent stewardship of state lands and natural resources.
Program Name	Texas Permanent School Fund
Total Annual Program Budget	
Primary Business Use	BU 13 - Oil and Gas Resources
Secondary Business Use	BU 03 - Coastal Zone Management
Tertiary Business Use	BU 14 - Cultural Resources Preservation and Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Mining excavations/pilings, coastal dune and vegetation features, buildings, submerged debris.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B	QL2B	
Update Frequency	2-3 years	2-3 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	
Acceptable Vertical Error	Up to 10 cm	I don't know	I don't know	
How far onshore needed			500 meters inland	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Required	Required		Nice to have	Nice to have
Entire AOI under same environmental conditions	Required	Required	Required		Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required		Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Required	Required	Required		Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Highly desirable	
DTM	Required	Nice to have	Required	
DEM	Highly desirable	Nice to have	Required	
Raw point cloud data	Required	Nice to have	Required	
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Not required	Nice to have	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Not required	Not required	
Breaklines required for standard hydro-flattening	Not required	Not required		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Not required	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Nice to have	Not required	Not required	
Ground control/ground truthing	Required	Not required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Not required	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Highly desirable	Nice to have	Highly desirable	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Required	
Subbottom characteristics			Not required	
Geologic and seismic data	Nice to have	Nice to have	Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Highly desirable	
Routes			Highly desirable	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Highly desirable	Nice to have	Required	
Land use/land cover	Nice to have	Nice to have	Nice to have	
Wetlands	Highly desirable	Nice to have	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Not required	Nice to have	Nice to have	
Bridges/culverts	Not required	Nice to have		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Nice to have	Nice to have	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL2 data, July 2018	None	None	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts		Yes	Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Texas Natural Resources Information System (TNRIS)			
Other	Yes			
Other description	University of Texas Bureau of Economic Geology			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	I don't know	I don't know	
Cost savings/cost reduction	Moderate	I don't know	I don't know	

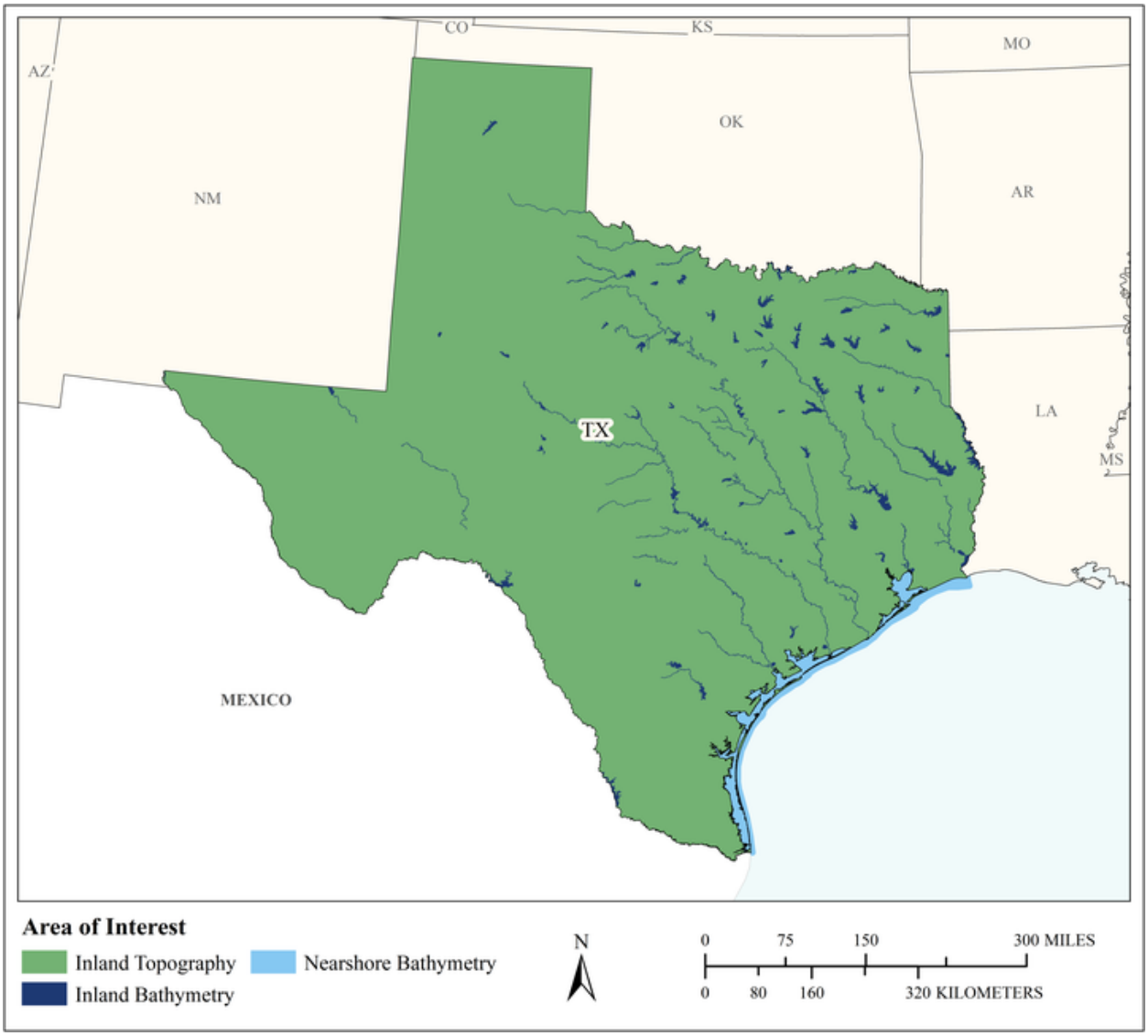
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost avoidance	None	I don't know	I don't know	
Increased revenues	Major	I don't know	I don't know	
Mission-driven performance improvements	Major	I don't know	I don't know	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	I don't know	I don't know	
Improved response or timeliness	Major	I don't know	I don't know	
Improved customer experience	Major	I don't know	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	I don't know	I don't know	
Environmental	Major	I don't know	I don't know	
Public safety, including life and property	Major	I don't know	I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$58,612	I don't know	Unable to provide		Major	Annual dollars saved/realized	$14,653			
Time savings description	Total time savings.						Total time savings.					
Cost savings/cost reduction	Major	Annual dollars saved/realized	$75,000	I don't know	Unable to provide		Major	Annual dollars saved/realized	$225,000			
Cost avoidance	Major	Annual dollars saved/realized	$83,000	I don't know	Unable to provide		Major	Annual dollars saved/realized	$83,000			
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved customer experience	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			I don't know			Major					
Environmental	Major			I don't know			Major					
Public safety, including life and property	Major			I don't know			Major					
Other												
Other benefits	Major						Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps				
Aspect maps				
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Cultural Resources Preservation and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Discovery and analysis of underwater archaeological and historical cultural sites. Site protection and preservation planning. Discovery and analysis of Native American and other historical cultural sites and subsistence activities.
MCA Title	Cultural Resources Preservation and Management
MCA ID	60443
Organization Type	State or U.S. Territorial government
Organization Name	State of Texas
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	
Update Frequency	4-5 years	6-10 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Not required	Nice to have		Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	
DTM	Required	Highly desirable	Nice to have	
DEM	Required	Required	Required	
Raw point cloud data	Not required	Not required	Not required	
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Not required	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Nice to have	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	
Ground control/ground truthing	Nice to have	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Required	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Highly desirable	Highly desirable	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Highly desirable	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Highly desirable	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Required	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Required	
Land use/land cover	Nice to have	Highly desirable	Nice to have	
Wetlands	Nice to have	Highly desirable	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Nice to have	Highly desirable	Nice to have	
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Nice to have	Highly desirable	Highly desirable	
Cultural resources	Required	Highly desirable	Required	
Coastal and riverine structures	Nice to have	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	
Cost savings/cost reduction	Moderate	Minor	Minor	
Cost avoidance	Minor	Minor	Minor	
Increased revenues	None	Minor	None	
Mission-driven performance improvements	Moderate	Moderate	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor	None	

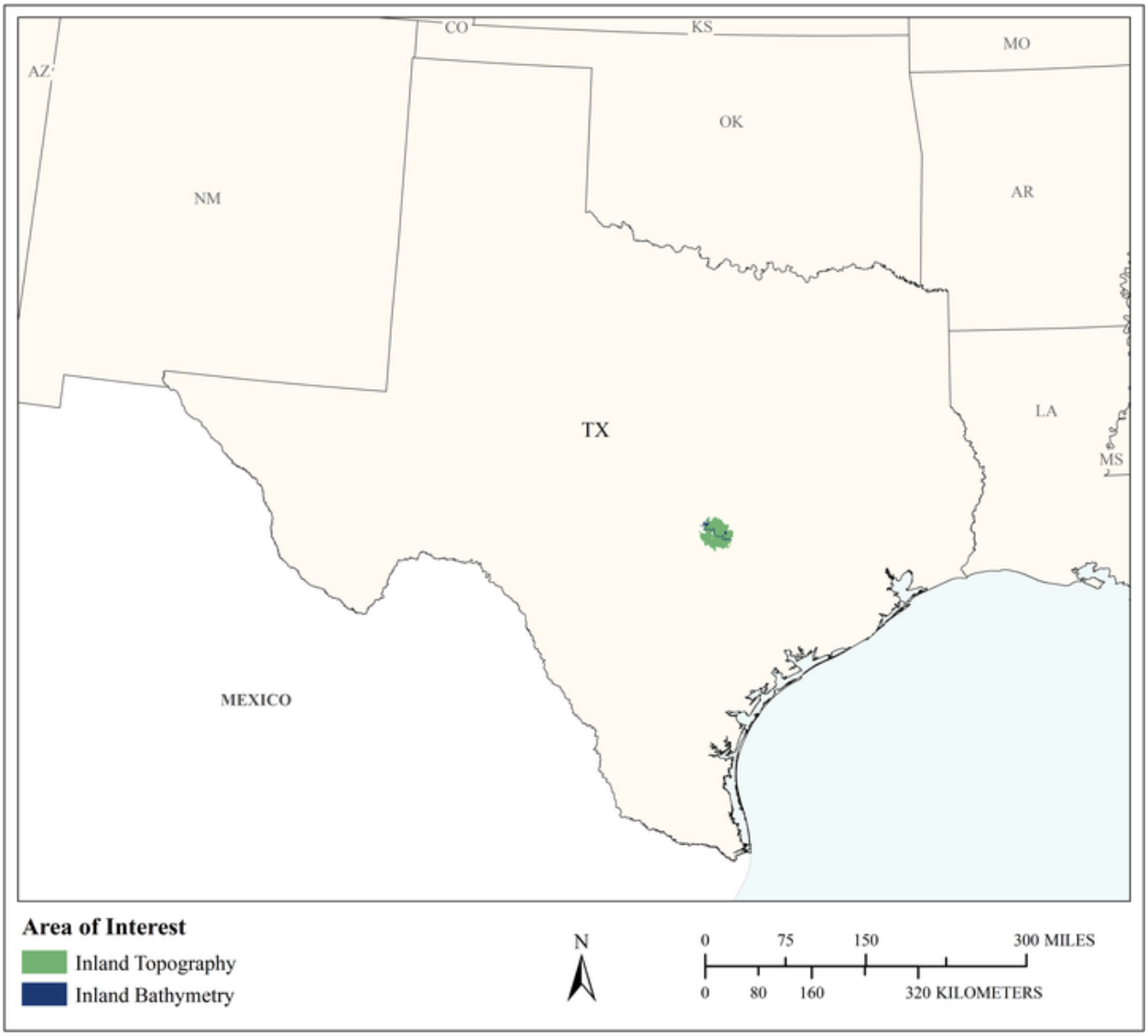
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major	Minor	
Improved customer experience	Moderate	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	Minor	
Environmental	Minor	Moderate	Minor	
Public safety, including life and property	Minor	Moderate	None	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Increased revenues	None			None			None					
Mission-driven performance improvements	Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$48,519		Annual dollars saved/ realized	$116,352		Annual dollars saved/ realized	$11,371			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$42,421									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Moderate			Minor					
Environmental	Minor			Minor			Moderate					
Public safety, including life and property	Minor			Minor			Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes	Yes	
Hillshades	Yes		Yes	
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Modeling and Prediction of Riverine Flood Hazards



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Highly desirable		
Geographic Area Requirements	Respondent provided own shapefile, KML, or geodatabase	Respondent provided own shapefile, KML, or geodatabase		
Sub Area Requirements	City of Austin, TX	City of Austin, TX		

MCA Description	Response
Mission Critical Activity	Modeling and prediction of riverine flood hazards. Elevation data are needed for H&H modeling, elevation studies, viewshed analyses, and vegetation analysis (mass of vegetation) for wildfire calculations. For land development, elevation data are needed for site suitability assessments (developers get the data). Impervious surface determinations are planned as a future use of elevation data, also electric line surveys.
MCA Title	Modeling and Prediction of Riverine Flood Hazards
MCA ID	21982
Organization Type	Regional, County, City, or other local government
Organization Name	City of Austin
Sub-Agency or Division	
Organization Mission	As it approaches its 200th anniversary, Austin is a beacon of sustainability, social equity, and economic opportunity; where diversity and creativity are celebrated; where community needs and values are recognized; where leadership comes from its citizens, and where the necessities of life are affordable and accessible to all
Program Name	Watershed Engineering
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 17 - Wildfire Management, Planning, and Response
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Curblines

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B		
Update Frequency	4-5 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter		
Acceptable Vertical Error	Up to 10 cm	Up to 40 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial	Partial		
Cross section/transect requirement	<10cm, approximately every 1000'	<10cm, approximately every 1000'		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Required	Highly desirable		
DEM	Highly desirable	Highly desirable		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Required	Required		
Edited/cube XYZ		Highly desirable		
Full waveform	Highly desirable	Highly desirable		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Highly desirable		
Land use/land cover	Highly desirable	Not required		
Wetlands	Nice to have	Not required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Highly desirable		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Not required		
Cultural resources	Nice to have	Not required		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL2 Data from 2017	TWDB Data from 2012 and 2009		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories		Yes		
State repositories used		TWDB Lake Surveys		
Other	Yes			
Other description	We maintain a copy on internal servers			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Major	Moderate		
Cost avoidance	Moderate	Moderate		
Increased revenues	Minor	Minor		

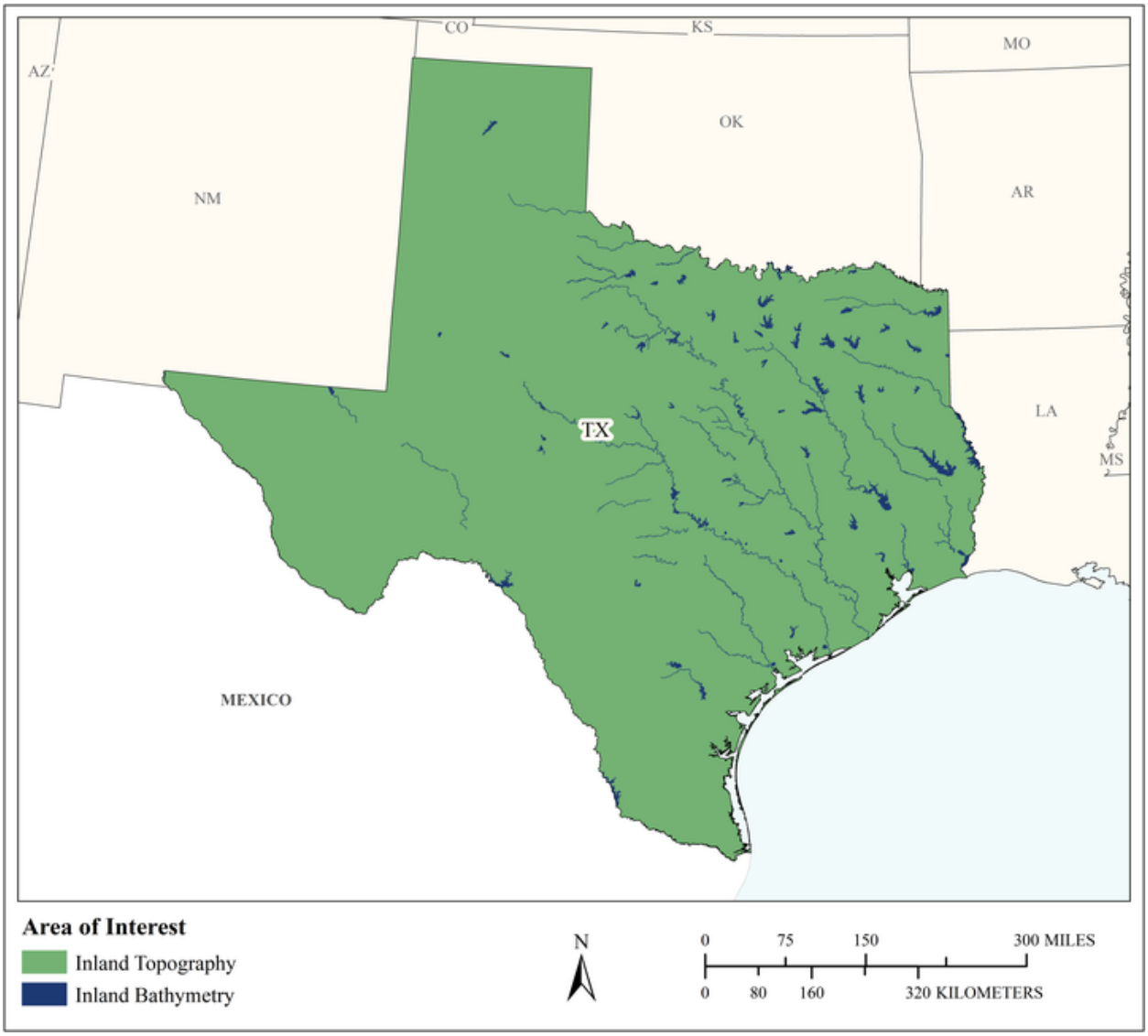
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Mission-driven performance improvements	Moderate	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	Moderate		
Improved response or timeliness	Moderate	Moderate		
Improved customer experience	Moderate	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	Minor		
Environmental	Minor	Moderate		
Public safety, including life and property	Moderate	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Annual dollars saved/realized	$100,000	Major	Unable to provide							
Cost savings/cost reduction description	4-5 year lidar collection by TNRIS avoids 100K / yr.			TWB collects bathy for lakes.								
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide							
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			I don't know								
Environmental	Minor			I don't know								
Public safety, including life and property	Moderate			Minor								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Sea Level Rise and Subsidence



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Modeling and mapping the effects of sea level rise or subsidence. Population and economic vulnerability assessments. Coastal inundation and infrastructure assessment.
MCA Title	Sea Level Rise and Subsidence
MCA ID	60444
Organization Type	State or U.S. Territorial government
Organization Name	State of Texas
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 16 - Sea Level Rise and Subsidence
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL1B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Required			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Required	Nice to have		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Nice to have		
Ground control/ground truthing	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required	Required		
Land use/land cover	Required	Required		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Required		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Required	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes	Yes		
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Major		
Increased revenues	None	Minor		
Mission-driven performance improvements	Major	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		

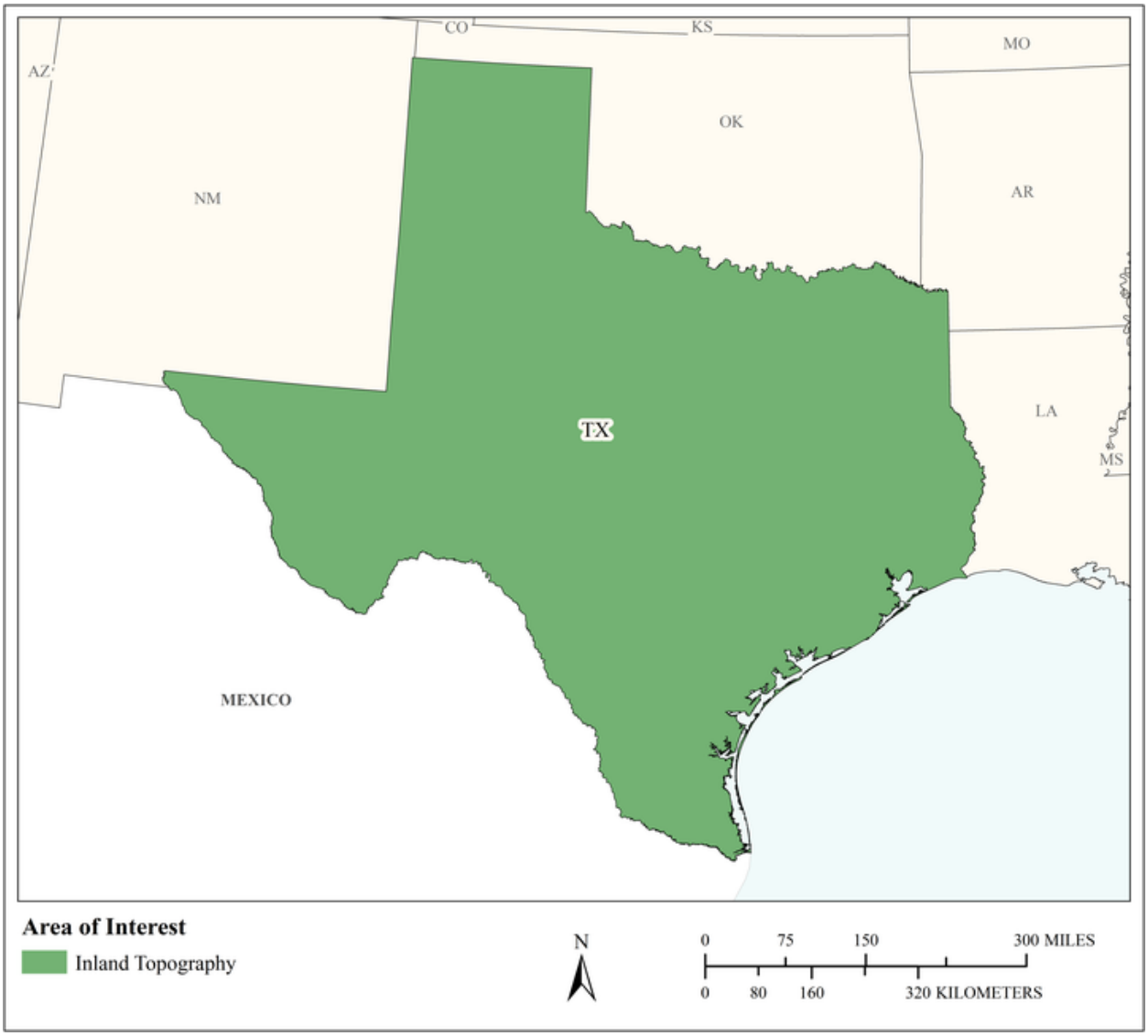
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Minor		
Improved customer experience	Moderate	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate		
Environmental	Moderate	Moderate		
Public safety, including life and property	Major	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Moderate	Unable to provide		Moderate	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$13,936,419									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major								
Environmental	Moderate			Major								
Public safety, including life and property	Moderate			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Texas Wildfire Risk Assessment



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Area split by varying quality level or update frequency			
Sub Area Requirements	Texas			

MCA Description	Response
Mission Critical Activity	To develop a wildland fire risk assessment portal which requires a lifeform vegetation GIS layer to be used for development of a fuel map.
MCA Title	Texas Wildfire Risk Assessment
MCA ID	22088
Organization Type	State or U.S. Territorial government
Organization Name	Texas A&M Forest Service
Sub-Agency or Division	
Organization Mission	Texas A&M Forest Service provides statewide leadership to assure the state's trees, forests and related natural resources are protected and sustained for the benefit of all. TFS also provides technical assistance, program delivery and readily-available, easily-accessible, science-based information along with providing protection against wildland fires and other all-hazard emergencies.
Program Name	Wildland Fire Fuels Map
Total Annual Program Budget	
Primary Business Use	BU 17 - Wildfire Management, Planning, and Response
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	2' tall shrubs

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	(a) 2-3 years (b) 4-5 years			
Event type(s)				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI	Needed every 2-3 years for areas in the East Texas Piney Woods (EPA Level III Ecoregion Zone 35, South Central Plains) and 4-5 years for everywhere else			
Acceptable Horizontal Error	Up to 50 cm			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Highly desirable			
DEM	Highly desirable			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Not required			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Planning to use LIDAR for counties where it is available, not yet sure of the dates or quality			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	TNRIS			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	Moderate			

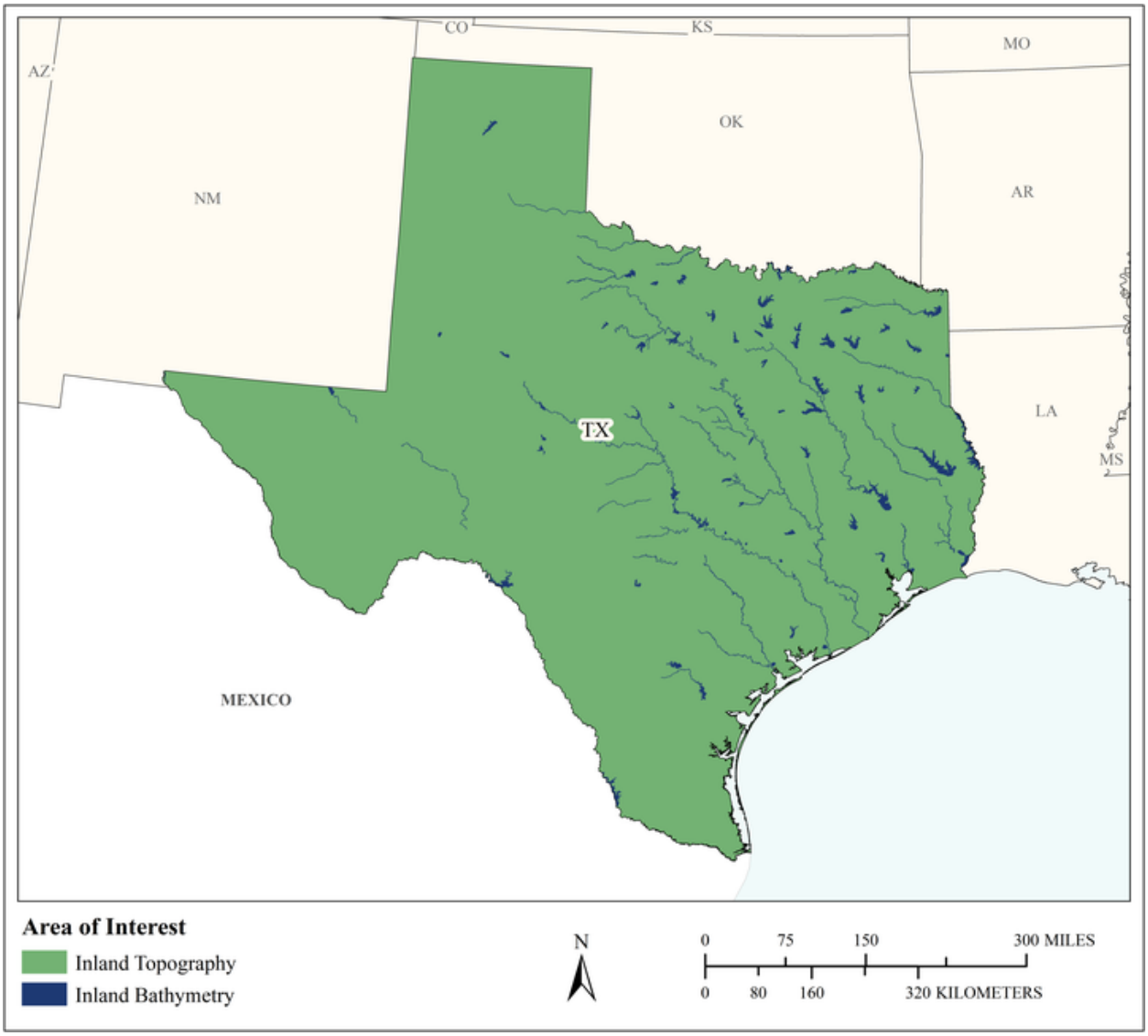
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Time savings description	Travel time and collecting detailed data about the vegetation. Better data provides better modeling.											
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Major	Unable to provide										
Cost avoidance description	Lidar is the best technology to map canopy fuels (canopy base height, canopy bulk density, canopy ceiling height, and canopy cover), which is important for modeling canopy fire behavior. Using this technology we will be able to identify these areas on the ground and coordinate mitigation efforts. Enhances wildfire risk assessment by improving the mapping accuracy of the wildand fuels.											
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Mission-driven performance improvements description	A key mission of TFS is to protect lives, homes, and property. Lidar will improve our ability to create realistic wildfire simulations and impact analysis which are used to increase situational awareness and enhance decision-making. Improves our ability to provide accurate and reliable products for wildfire mitigation and operations, which enhances our agency's overall credibility.											
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,422,260									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Education or outreach description	Citizens can evaluate their risks and mitigate them											
Environmental	Major											
Public safety, including life and property	Major											
Public safety, including life and property description	Reducing loss of life and property											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Texas Data Acquisition and Clearinghouse



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Serve Texas agencies and citizens as a centralized clearinghouse and referral center for: (1) natural resource data; (2) census data; (3) data related to emergency management; and (4) other socioeconomic data. Acquire and improve digital geographic data for statewide mapping applications. The Texas Natural Resources Information System (TNRIS) acquires data and distributes it to state users, supports emergency management, and tries to unify data across the state. The goal is to provide common data with common parameters. TNRIS also extracts data products from the raw data as needed by state users (e.g. building footprints, building heights, contours, and other derivative products). TNRIS is involved in planning water projects across the state and flood risk management with the Texas Water Development Board (TWDB). Post event sonar bathymetry is currently captured for debris management.
MCA Title	Texas Data Acquisition and Clearinghouse
MCA ID	1344
Organization Type	State or U.S. Territorial government
Organization Name	Texas Natural Resources Information System
Sub-Agency or Division	
Organization Mission	Provide the Highest Level of Geographic Data Services to the People of Texas
Program Name	Strategic Mapping program handles data acquisition activities that support mission critical activities.
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	BU 23 - Urban and Regional Planning
Tertiary Business Use	BU 15 - Flood Risk Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Medium vegetation, manmade structures

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required

Inland Bathy Feature Size Requirements	Response
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI	West Texas is less populated and flat requiring less of a need – 4-5 yrs for urban areas and coastal areas, the rest could be 6-10 yrs. List of counties would be extremely long. The criteria for the 4-5 year refresh would be dependent on two main factors: population/landuse change, and areas that consistently have high repetitive loss from flooding.			
Acceptable Horizontal Error	Up to 30 cm	Up to 2 meters		
Acceptable Vertical Error	Up to 10 cm	Up to 20 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required			Not required	
Entire AOI under same environmental conditions	Required	Required			Not required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Required			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Highly desirable		
DTM	Not required	Required		
DEM	Required	Required		
Raw point cloud data	Not required	Not required		
Classified point cloud	Required	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Required	Not required		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Required	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Required		
Land use/land cover	Nice to have	Required		
Wetlands	Not required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Required		
Bridges/culverts	Highly desirable	Required		
Landmark features	Not required	Required		
Cultural resources	Not required	Nice to have		
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	StratMap Specification is preferred. 4ppsm 10cm RMSEz classification of ground, building, high/med/low vegetation, bridges, culverts There have been over 50 lidar collections in Texas. Non-StratMap projects have specifications that vary widely.	TWDB data and whatever can be extracted from lidar.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other	Yes	Yes		
Other description	We host and distribute Lidar for Texas through our website TNRIS.org	We host and distribute Lidar for Texas through our website TNRIS.org		
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor	Inland bathy data not available		
Cost savings/cost reduction	None	Inland bathy data not available		
Cost avoidance	None	Inland bathy data not available		
Increased revenues	None	Inland bathy data not available		
Mission-driven performance improvements	Major	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available		
Improved response or timeliness	None	Inland bathy data not available		
Improved customer experience	Major	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Inland bathy data not available		
Environmental	Moderate	Inland bathy data not available		
Public safety, including life and property	Major	Inland bathy data not available		

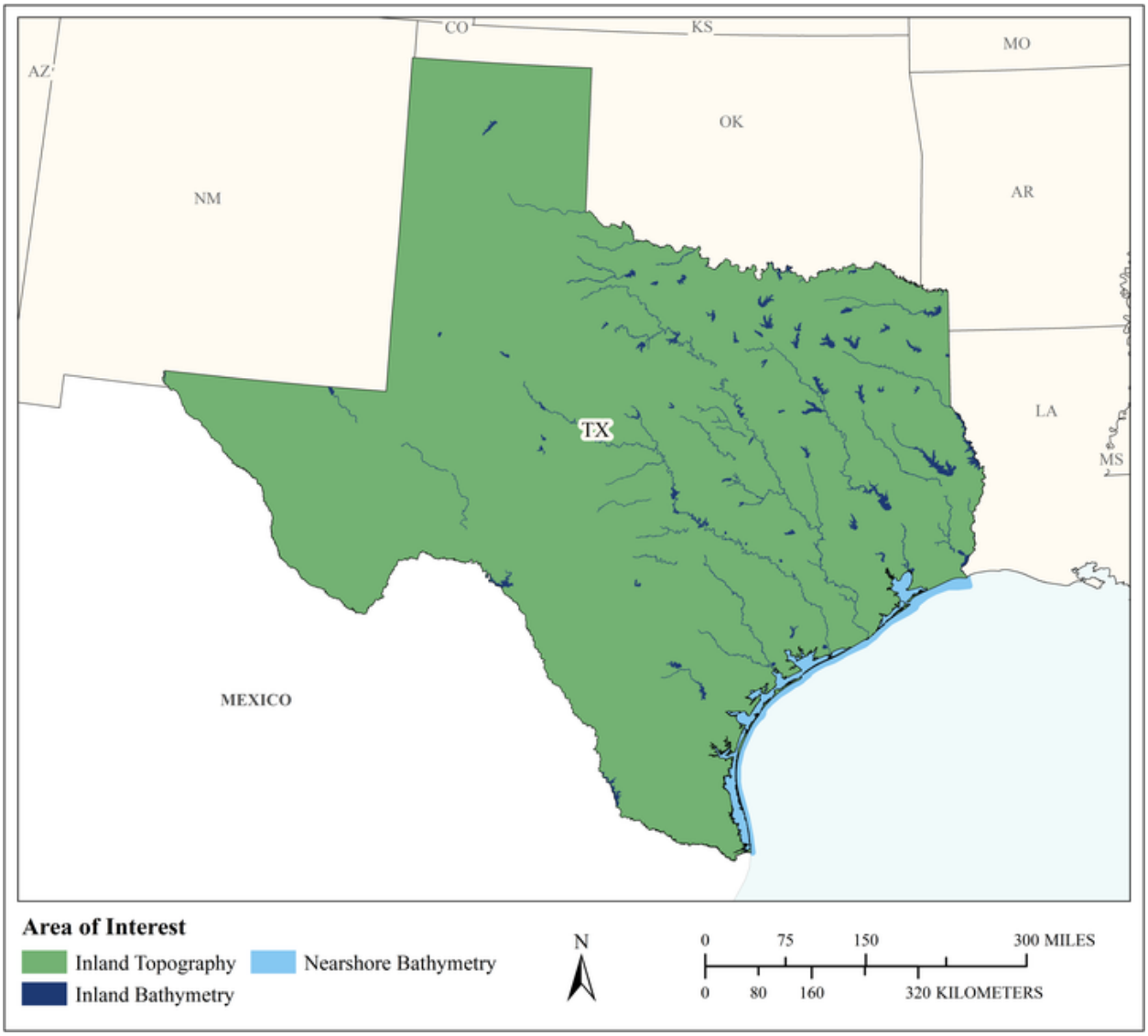
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$14,472	Major	Annual dollars saved/realized	$18,090						
Time savings description	Newer data requires less upkeep, reformatting, adjusting in order to fit in with current initiatives. It also results in less problems or inquiries from the public. New data fits into our distribution infrastructure and can be dropped in without modifying for public release. Iterations of processing is minimized with better more seamless data.			Ability to represent the stream channel would eliminate need for cross sections and support state efforts for modeling flood by having a better surface from which to model. New data fits into our distribution infrastructure and can be dropped in without modifying for public release. Iterations of processing is minimized with better more seamless data in addition to more accurate results.								
Cost savings/cost reduction	Moderate	Annual dollars saved/realized	$250,000	Moderate	Annual dollars saved/realized	$50,000						
Cost savings/cost reduction description	Yearly average allocation for lidar data. These funds could supplement data expansion and derivative products from existing data to support the public.			Yearly average allocation for lidar data. These funds could supplement data expansion and derivative products from existing data to support the public.								
Cost avoidance	Major	Annual dollars saved/realized	$65,000	Major	Annual dollars saved/realized	$65,000						
Cost avoidance description	Staff time or vendor cost to develop and process lidar classifications that support initiatives for producing derivative data products. Staff time cost to facilitate needed to develop methods to mitigate errors and additional processing steps.			Staff time or vendor cost to develop and process lidar classifications that support initiatives for producing derivative data products. Staff time cost to facilitate needed to develop methods to mitigate errors and additional processing steps.								
Increased revenues	Minor	Annual dollars saved/realized	$5,000	Minor	Annual dollars saved/realized	$5,000						
Increased revenues description	Revenue generated from bulk lidar copy request from the public.			Revenue generated from bulk lidar copy request from the public.								
Mission-driven performance improvements	Moderate	Annual percent improvement	15%	Major	Unable to provide							
Mission-driven performance improvements description	Remaining percent of Texas without lidar acquisitions/data. Remaining percent of Texas without lidar acquisitions/data. Mission would be satisfied when entire state has publicly accessible data.			Obtaining and distributing this type of dataset would satisfy the high demand for a publicly available dataset that currently doesn't exist for most Texas rivers. We currently do not have a set standard or established repository of inland bathymetric data that is available to the public.								
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Annual dollars saved/realized	$9,045	Major	Annual dollars saved/realized	$7,236						
Value added to products or services description	Staff/computer time to process data up to our standards with regard to classifications. Minimizes need to reprocess and QC/Correct issues from more accurate data.			Minimizes need to reprocess and QC/Correct issues from more accurate data. Allows for better representation of bathy surfaces compared to exiting datasets. Data would be integrated into several state initiatives and allow for faster/more accurate models when needed.								
Improved response or timeliness	Major	Annual dollars saved/realized	$1,055	Major	Annual dollars saved/realized	$2,563						

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Improved response or timeliness description	High priority areas in Texas have data nearing 10 years old and is in some cases are no longer viable for accurate representation. Ability to provide readily available data without need for additional processing in emergency situations.			Ability to model emergency events related to flooding would be expedited and readily available in a centralized location eliminating error and required time to find and process data. Publicly available inland bathy data is limited and/or non-existent in a common standard. Ability to provide readily available data without need for additional processing in emergency situations.								
Improved customer experience	Major	Annual dollars saved/realized	$50,000	Major	Unable to provide							
Improved customer experience description	Staff time required to develop and produce derivative products/services that require full classifications. High priority areas in Texas have data nearing 10 years old and is in some cases are no longer viable for accurate representation.			Online applications and viewers for emergency responses would benefit from the modeling done from this datasets. Current bathy data is unstandardized and limited publicly depending on how it was acquired and by whom.								
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know								
Environmental	I don't know			I don't know								
Public safety, including life and property	Major			Major								
Public safety, including life and property description	Capable of providing high quality, up to date data for emergency situations			Capable of providing high quality, up to date data for emergency situations								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades				
Slope maps		Yes		
Aspect maps				
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps		Yes		
Viewshed maps				
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Marine and Riverine Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Nautical charting. Bathymetric measurements of nearshore submerged coastal topography. Identification of hazards to navigation. Sediment management at coastal navigation projects. Precision marine navigation. Movement of goods and fishing vessels.
MCA Title	Marine and Riverine Navigation and Safety
MCA ID	60445
Organization Type	State or U.S. Territorial government
Organization Name	State of Texas
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Nice to have
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B	QL0B	
Update Frequency	2-3 years	2-3 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Nice to have	Nice to have		Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required		Required	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Required	
DTM	Required	Highly desirable	Required	
DEM	Required	Required	Required	
Raw point cloud data	Required	Nice to have	Required	
Classified point cloud	Required	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Highly desirable	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	
Breaklines required for standard hydro-flattening	Highly desirable	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Highly desirable	
Ground control/ground truthing	Required	Nice to have	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Required	Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Not required	Not required	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Highly desirable	
Boundaries			Nice to have	
Routes			Required	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Required	
Floating observation/navigation systems			Required	
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Nice to have	Nice to have	Nice to have	
Wetlands	Highly desirable	Required	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Highly desirable	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Required	Nice to have	Nice to have	
Cultural resources	Highly desirable	Highly desirable	Nice to have	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts		Yes	Yes	
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	
Cost savings/cost reduction	Major	I don't know	Minor	
Cost avoidance	Moderate	Major	Minor	
Increased revenues	Moderate	None	Minor	
Mission-driven performance improvements	Moderate	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	None	Minor	

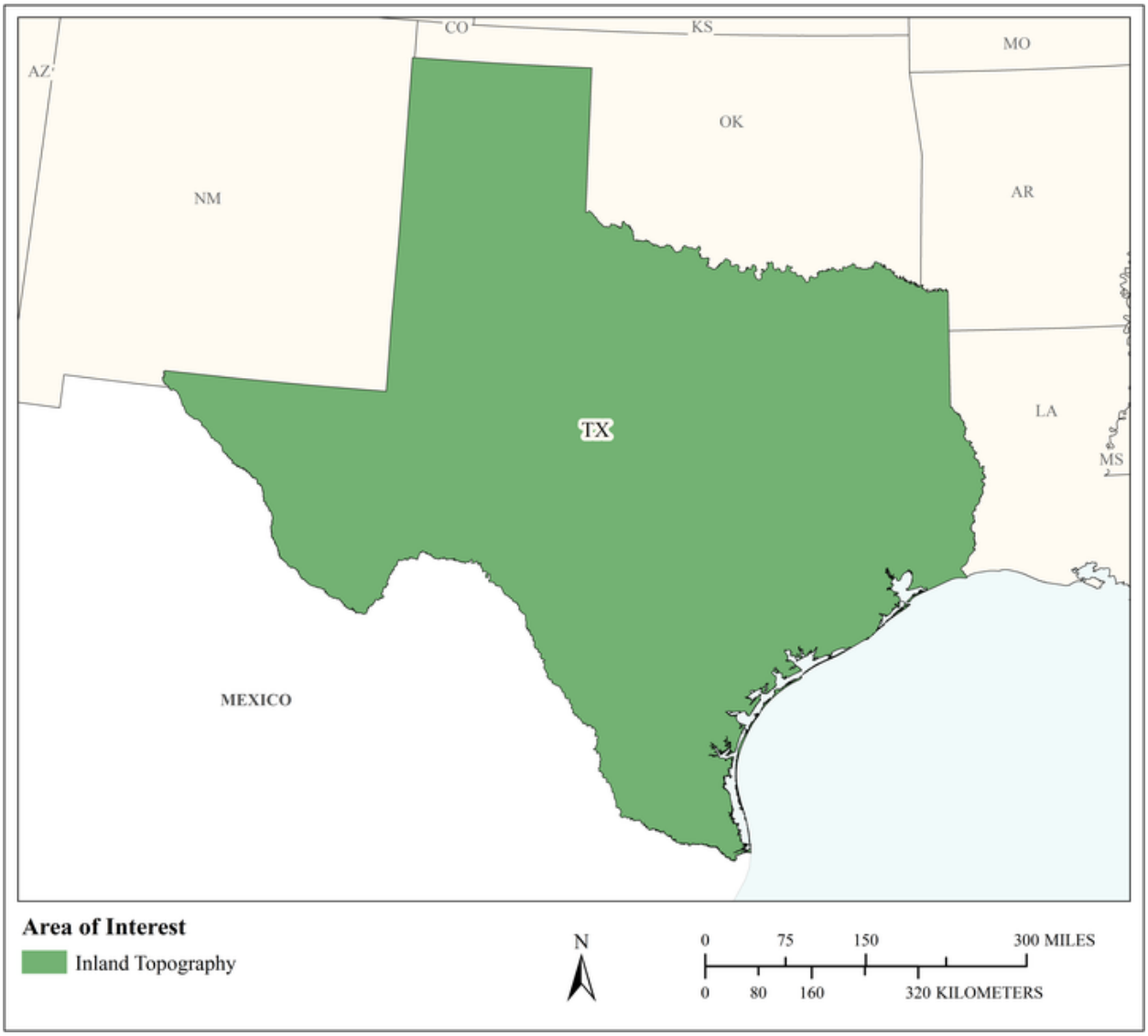
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor	None	Minor	
Improved customer experience	Moderate	None	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	None	Minor	
Environmental	Moderate	None	Minor	
Public safety, including life and property	Major	None	Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Increased revenues	None			Moderate	Unable to provide		Major	Unable to provide				
Mission-driven performance improvements	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$10,140,673		Annual dollars saved/ realized	$4,828,570		Annual dollars saved/ realized	$3,045,610			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Future annual customer service benefits added during validation					Annual dollars saved/ realized	$635,495		Annual dollars saved/ realized	$103,115			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			Moderate			Minor					
Environmental	None			Moderate			Major					
Public safety, including life and property	Minor			Moderate			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps				
Aspect maps				
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Aviation Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of in-flight hazards and path obstructions. Aeronautical charting. Runway construction and repair.
MCA Title	Aviation Navigation and Safety
MCA ID	60446
Organization Type	State or U.S. Territorial government
Organization Name	State of Texas
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 21 - Aviation Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes			
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Major			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

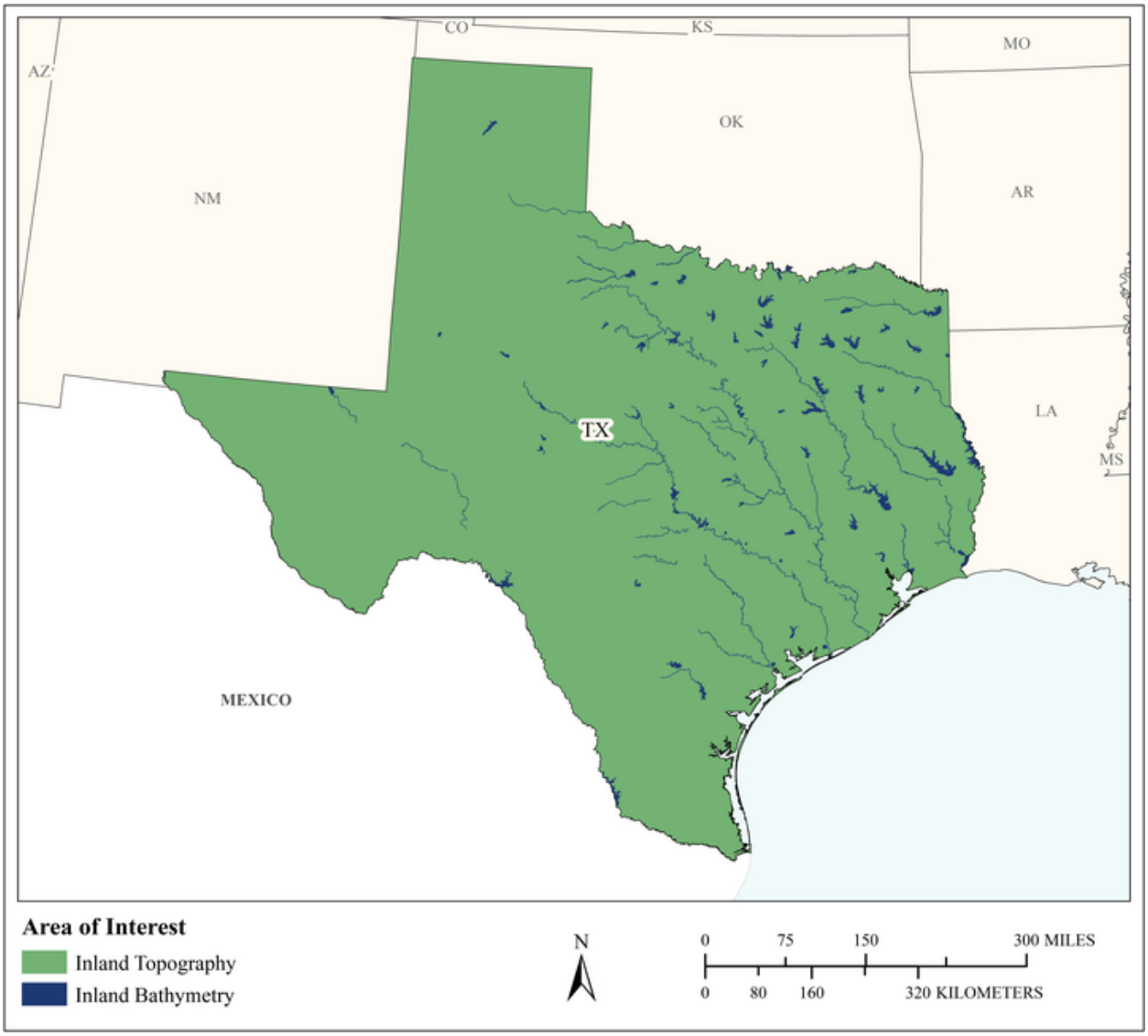
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$894,872									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,114,532									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Moderate											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Infrastructure and Construction Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Marine construction. Bridge design and construction. Engineering and construction of dams, levees, dikes, reservoirs, and coastal structures. Shipyard and port construction. Water, sewer, or power line planning and vegetation analysis. Pump, drain, and well placement. Stormwater modeling. Cut and fill analysis for earth-moving. Building site analysis. Road infrastructure. Infrastructure hardening or mitigation for climate change effects, e.g. sea level change.
MCA Title	Infrastructure and Construction Management
MCA ID	60447
Organization Type	State or U.S. Territorial government
Organization Name	State of Texas
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	Up to 2 meters		
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Nice to have		
Classified point cloud	Required	Highly desirable		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Nice to have		
Coastal and riverine structures	Highly desirable	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Moderate		
Increased revenues	Minor	None		
Mission-driven performance improvements	Moderate	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate		

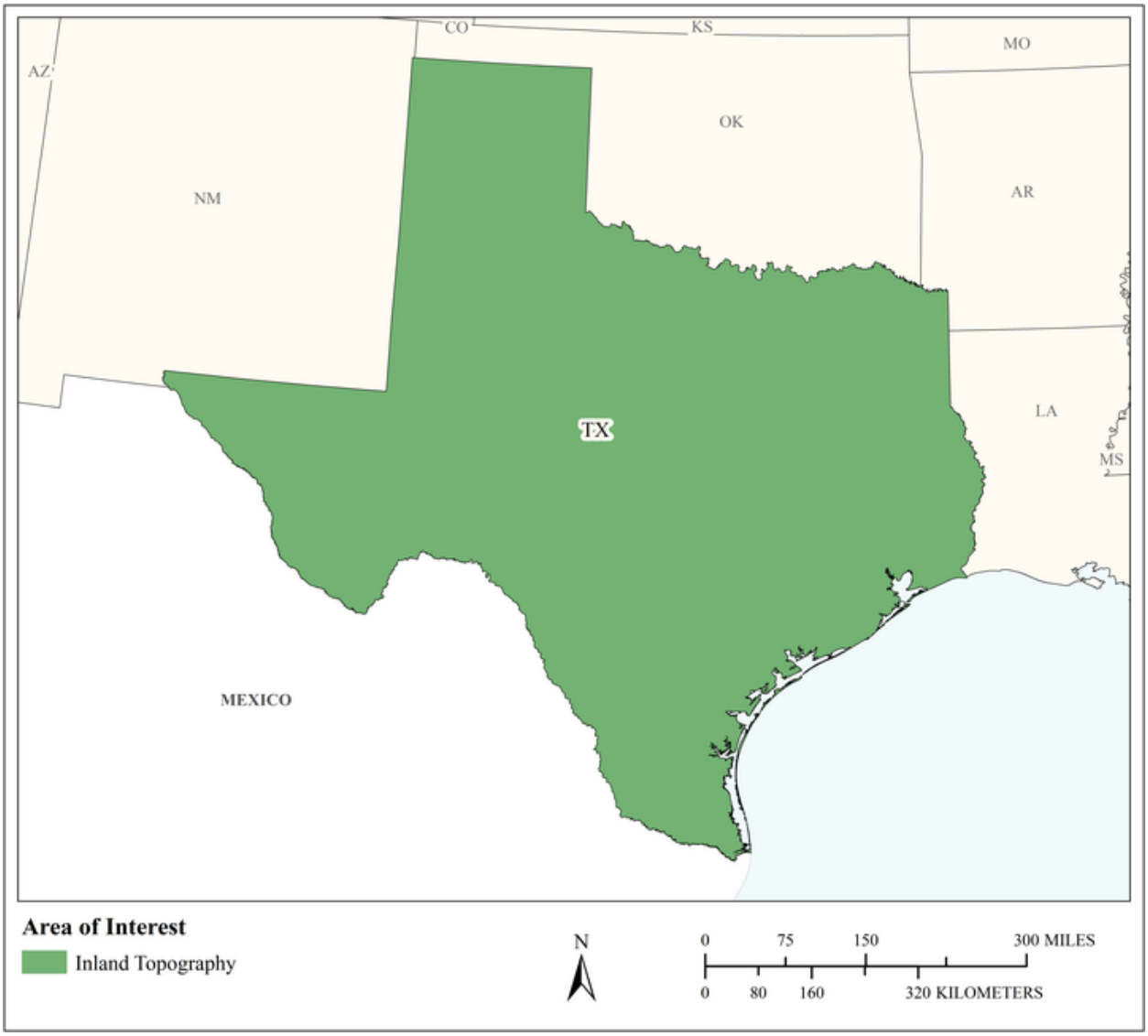
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major		
Improved customer experience	Moderate	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor		
Environmental	Moderate	Minor		
Public safety, including life and property	Moderate	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide							
Increased revenues	None			None								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$11,896,097		Annual dollars saved/ realized	$4,007,986						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Minor	Unable to provide							
Improved customer experience	Major	Unable to provide		Minor	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$35,007,816		Annual dollars saved/ realized	$416,182						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor								
Environmental	Moderate			Moderate								
Public safety, including life and property	Major			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Urban and Regional Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Land development and zoning. Municipal mapping of building footprints and elevations. Port resilience planning. Parks and transportation planning. Virtual city creation. Urban ecology planning.
MCA Title	Urban and Regional Planning
MCA ID	60448
Organization Type	State or U.S. Territorial government
Organization Name	State of Texas
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Required			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

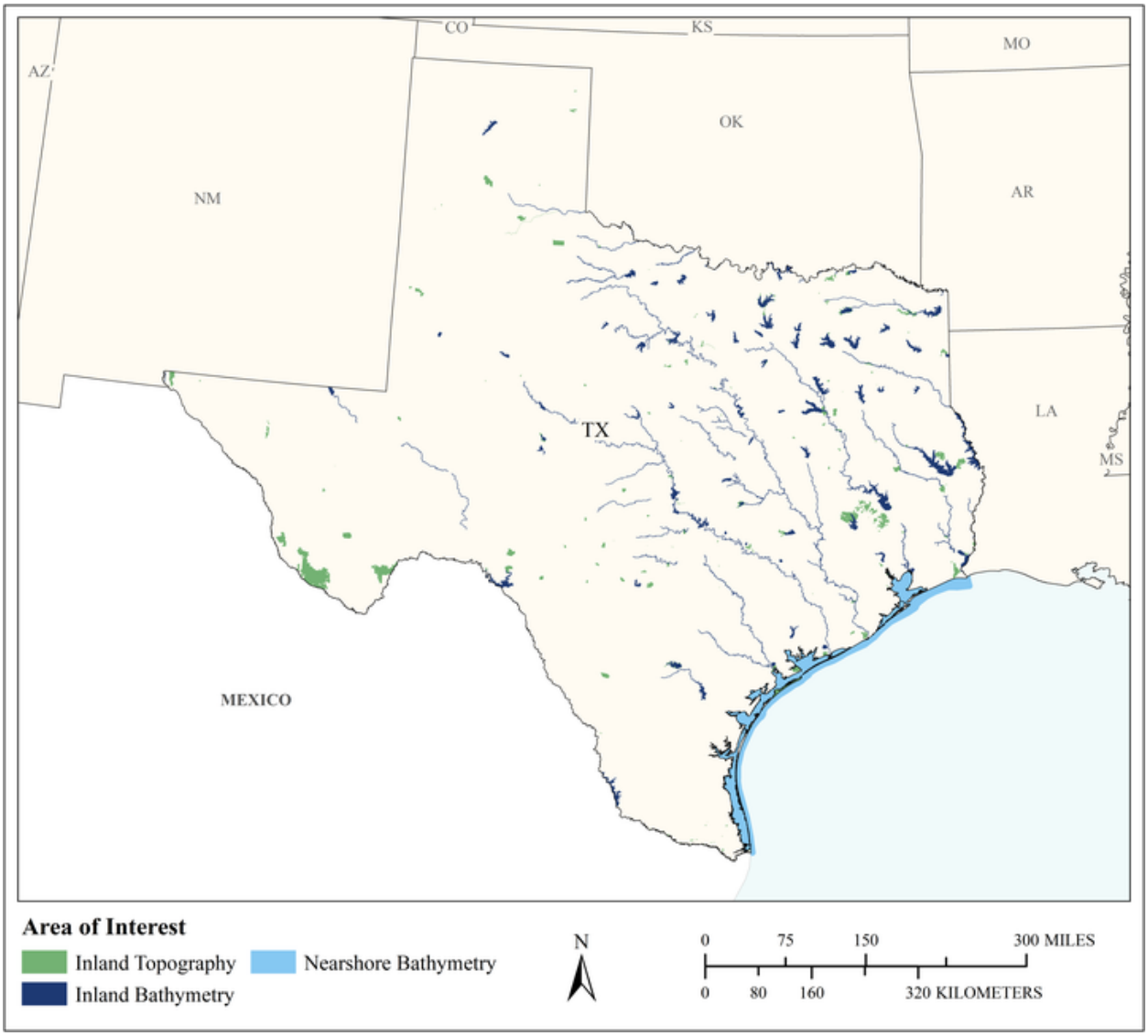
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$71,223,748									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$8,222,814									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Recreational Planning, Habitat Modeling, and Species Monitoring



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Respondent provided own shapefile, KML, or geodatabase	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements	Texas Parks & Wildlife Department Recreation Properties			

MCA Description	Response
Mission Critical Activity	Provide recreational opportunities while implementing best management and conservation practices for the natural and cultural resources of Texas. Inland bathymetry is needed for modeling entire rivers, sand and gravel permitting processes, and for emergency response activities.
MCA Title	Recreational Planning, Habitat Modeling, and Species Monitoring
MCA ID	22057
Organization Type	State or U.S. Territorial government
Organization Name	Texas Parks & Wildlife Department
Sub-Agency or Division	
Organization Mission	To manage and conserve the natural and cultural resources of Texas and to provide hunting, fishing and outdoor recreation opportunities for the use and enjoyment of present and future generations.
Program Name	Texas Parks & Wildlife Department
Total Annual Program Budget	
Primary Business Use	BU 27 - Recreation
Secondary Business Use	BU 07 - Wildlife and Habitat Management
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Tree trunks (as underwater hazards), utility features (infrastructure within parks), small vegetation, microdepressions (as potential habitats)

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have

Inland Bathy Feature Size Requirements	Response
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	
Update Frequency	4-5 years	4-5 years	Event driven only – Data need to coincide with a specific event.	
Event type(s)			Hurricane or other catastrophic event that has the potential to change the underwater surface.	
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 30 cm	Up to 1 meter	Up to 1 meter	
Acceptable Vertical Error	Up to 10 cm	Up to 20 cm	Up to 20 cm	
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Not required	Highly desirable		Not required	Not required
Entire AOI under same environmental conditions	Required	Not required	Highly desirable		Not required	Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Nice to have		Nice to have	Not required
DEM for entire AOI needs to be seamless	Required	Nice to have	Nice to have		Nice to have	Not required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	I don't know		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	
DTM	Highly desirable	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Highly desirable	Nice to have	
Classified point cloud	Highly desirable	Highly desirable	Nice to have	
Edited/cube XYZ		Highly desirable	Nice to have	
Full waveform	Nice to have	Highly desirable	Nice to have	
Bathymetric Attributed Grid (BAG)		Highly desirable	Nice to have	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Nice to have	
Ground control/ground truthing	Highly desirable	Highly desirable	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required	Required	Not required	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Highly desirable	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Not required	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Required	Highly desirable	Highly desirable	
Cultural resources	Required	Highly desirable	Highly desirable	
Coastal and riverine structures	Nice to have	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	All lidar data available from TNRIS...repository for all available elevation data from various sources	Self-collected side sonar and manually collected transects (per project basis)	Self-collected side sonar (per project basis)	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	TNRIS			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Minor	

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Cost savings/cost reduction	Major	Minor	Minor	
Cost avoidance	Major	Minor	Minor	
Increased revenues	None	Minor	Minor	
Mission-driven performance improvements	Major	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Minor	
Improved response or timeliness	Major	Minor	Minor	
Improved customer experience	Major	Minor	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor	Minor	
Environmental	Major	Minor	Minor	
Public safety, including life and property	Major	Minor	Minor	

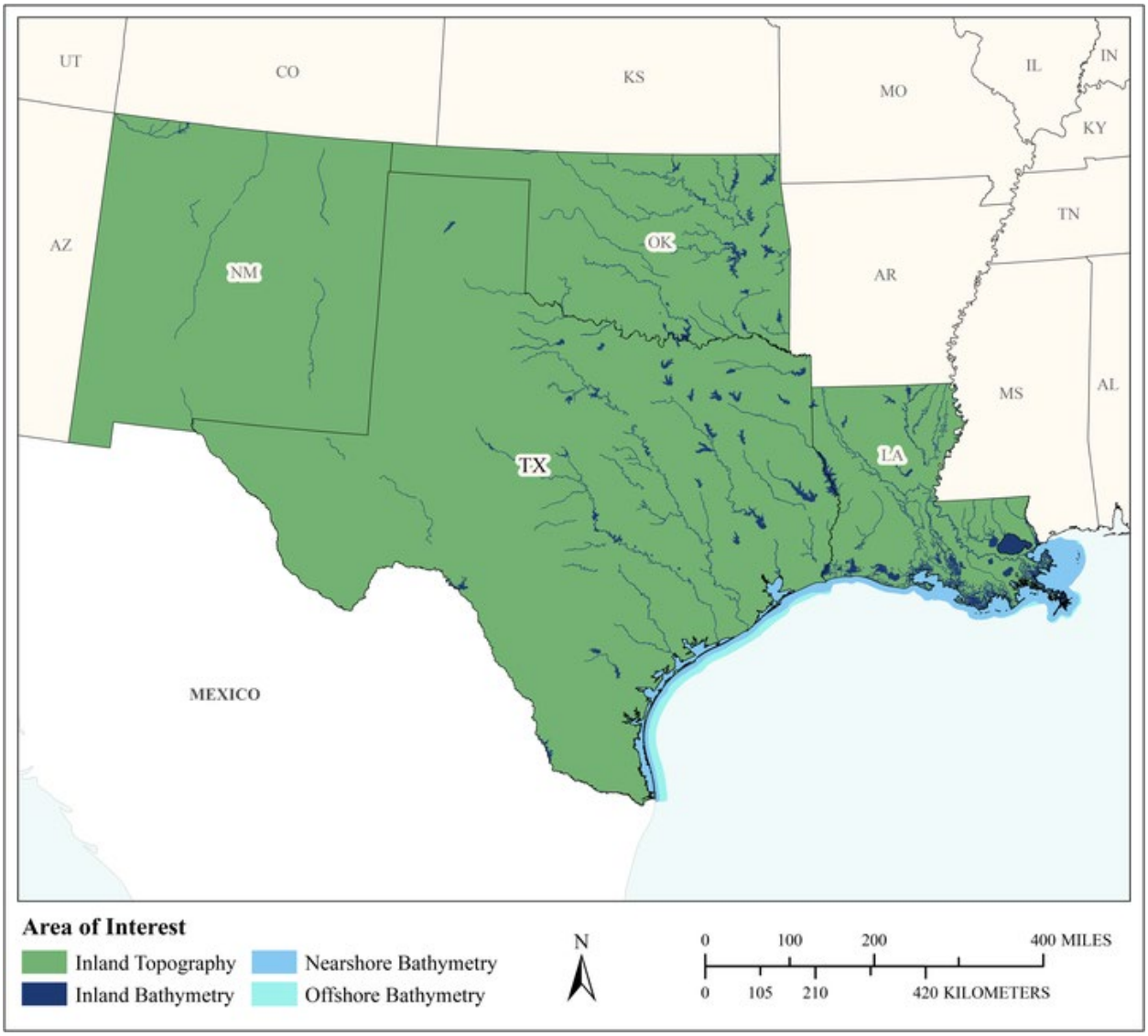
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Time savings description	Source data resolution and specifications vary...consistent data could assist in streamlining the most efficient process to produce the best possible products in future analysis.			As data is collected on a project-by-project basis, this would assist in streamlining the most efficient process to produce the best possible products in future analysis. Travel time due to the extended geographical reach of target locations.			Travel time due to the extended geographical reach of target locations. As data is collected on a project-by-project basis, this would assist in streamlining the most efficient process to produce the best possible products in future analysis.					
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction description	Site development planning projects require high resolution topographic elevation data for site development...these dollars could be spent on other efforts such as construction efforts, material upgrades, etc.			The human hours spent on collecting/processing/post-processing data to incorporate into further analysis efforts could be applied to other program efforts.			The human hours spent on collecting/processing/post-processing data to incorporate into further analysis efforts could be applied to other program efforts.					
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost avoidance description	Consistent high resolution data provided at a guaranteed level of accuracy to each level of product could increase confidence in all future derivatives from this source.			Consistent high resolution data provided at a guaranteed level of accuracy to each level of product could increase confidence in all future derivatives from this source.			Consistent high resolution data provided at a guaranteed level of accuracy to each level of product could increase confidence in all future derivatives from this source.					
Increased revenues	None			Moderate	Unable to provide		Moderate	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Mission-driven performance improvements description	This would assist with expedited project planning: limited personnel resources to complete additional objectives in a more efficient manner with consistent highly confident source data.			This would assist with expedited habitat modeling and monitoring efforts: limited personnel resources to complete additional objectives in a more efficient manner with consistent highly confident source data.			This would assist with expedited habitat modeling and monitoring efforts: limited personnel resources to complete additional objectives in a more efficient manner with consistent highly confident source data.					
Future annual operational benefits added during validation		Annual dollars saved/ realized	$516		Annual dollars saved/ realized	$36,579		Annual dollars saved/ realized	$514,183			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Value added to products or services description	Current products are at a scale not interpretable by the public as they experience the geographic scale...on the ground. Could be used in future public apps such as providing the public an elevation profile of all trails in a state park.			Could be used for increased accuracy of flood modeling efforts, as depths of streams/rivers/lakes change over time, which impact the velocity of water when traveled over distance. Emergency response could be improved in areas identified for potential flooding based on modeling efforts completed with accurate, and current, data.			Larger geographic region of high resolution data that is repeatable could promote the development of automated monitoring processes, which could influence future coastal development, both on-shore and near-shore. Could be used in sediment deposition monitoring after major flood events, or oppositely, hurricane events.					
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Improved response or timeliness description	Current and accurate data increases confidence in the provider (TPWD) and consumer (contractor, public, TPWD, etc) which improves the decision-making process in a timely manner with more productive results, especially in emergency situations. Applications that deliver derivative products from this data could be available via web/mobile devices, on or off -line.			Current and accurate data increases confidence in the provider (TPWD) and consumer (contractor, public, TPWD, etc) which improves the decision-making process in a timely manner with more productive results, especially in emergency situations.			Current and accurate data increases confidence in the provider (TPWD) and consumer (contractor, public, TPWD, etc) which improves the decision-making process in a timely manner with more productive results, especially in emergency situations.					
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience description	Coining the metadata with a consistent disclaimer for highly accurate and current data would put all TPWD derived products from this source at an integrity level that is compatible with the TPWD mission.			Coining the metadata with a consistent disclaimer for highly accurate and current data would put all TPWD derived products from this source at an integrity level that is compatible with the TPWD mission.			Coining the metadata with a consistent disclaimer for highly accurate and current data would put all TPWD derived products from this source at an integrity level that is compatible with the TPWD mission.					
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major					
Education or outreach description	Public facing applications that consume derivative of this product, or data itself for consumption, research, or information purposes.			Public facing applications that consume derivative of this product, or data itself for consumption, research, or information purposes.			Public facing applications that consume derivative of this product, or data itself for consumption, research, or information purposes.					
Environmental	Major			Major			Major					
Environmental description	Increased confidence in decisions made due to high quality and integrity of data used in analyses for habitat modeling, species monitoring, site development, restoration and conservation efforts			Increased confidence in decisions made due to high quality and integrity of data used in analyses for habitat modeling, species monitoring, site development, restoration and conservation efforts			Increased confidence in decisions made due to high quality and integrity of data used in analyses for habitat modeling, species monitoring, site development, restoration and conservation efforts					
Public safety, including life and property	Major			Major			Major					
Public safety, including life and property description	Highly accurate and current data could increase response time for recovery efforts (life and property) during post-events, but better prepare the public before events happen.			Highly accurate and current data could increase response time for recovery efforts (life and property) during post-events, but better prepare the public before events happen.			Highly accurate and current data could increase response time for recovery efforts (life and property) during post-events, but better prepare the public before events happen.					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes		
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Support for NG9-1-1 Services



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Support the continued development & improvement of 9-1-1 data for NG9-1-1 services and Wireless 9-1-1 call mapping to provide accurate civic addresses. Responsible for emergency response out to 9 nm offshore (not part of USCG responsibilities). Elevation data are needed for location and elevation for call locations, including floor and unit in high rise buildings, elevation of campers, etc.
MCA Title	Support for NG9-1-1 Services
MCA ID	21755
Organization Type	State or U.S. Territorial government
Organization Name	TX Commission on State Emergency Communications
Sub-Agency or Division	
Organization Mission	The mission of the Commission on State Emergency Communications (CSEC) is to preserve and enhance public safety and health in Texas through reliable access to emergency communications services.
Program Name	NG9-1-1 Program
Total Annual Program Budget	
Primary Business Use	BU 28 - Telecommunications
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Buildings, offshore oil rigs, offshore obstructions

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B	QL2B	Cross sections and/or transects meet needs
Update Frequency	4-5 years	4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 30 cm	Up to 2 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 10 cm	Up to 20 cm	Up to 1 meter	I don't know
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed	To MLLW		To MHW	
Tide correction requirement			I don't know	I don't know
Cross sections and/or transects meet needs				Yes
Cross section/transect requirement				I don't know

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Highly desirable

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required	Highly desirable	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Not required	Highly desirable	Nice to have	Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Not required	Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Not required	Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have	Highly desirable	Nice to have
DTM	Highly desirable	Nice to have	Highly desirable	Nice to have
DEM	Highly desirable	Nice to have	Highly desirable	Nice to have
Raw point cloud data	Highly desirable	Nice to have	Highly desirable	Nice to have
Classified point cloud	Required	Nice to have	Highly desirable	
Edited/cube XYZ		Nice to have	Highly desirable	Required
Full waveform	Highly desirable	Nice to have	Highly desirable	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Nice to have
Tide Predictions			Highly desirable	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Nice to have
Intensity imagery/sidescan imagery	Highly desirable	Not required	Highly desirable	Nice to have
Ground control/ground truthing	Highly desirable	Nice to have	Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Nice to have
Nautical and/or navigation charts			Highly desirable	Nice to have
Acoustic imagery of the seafloor			Highly desirable	Nice to have
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Nice to have
Underwater videography			Highly desirable	Not required
Bottom texture			Highly desirable	Nice to have
Bottom type			Highly desirable	Nice to have
Submerged features			Highly desirable	Not required
Subbottom characteristics			Highly desirable	Not required
Geologic and seismic data	Nice to have	Highly desirable	Nice to have	Nice to have
Water column properties - Physical			Highly desirable	Nice to have
Water column properties - Chemical			Highly desirable	Nice to have
Water column properties - Biological			Highly desirable	Nice to have
Currents			Highly desirable	Not required
Tide/wave heights			Highly desirable	Not required
Sea ice conditions			Highly desirable	Not required
Habitat distribution and classification			Highly desirable	Not required
Boundaries			Highly desirable	Not required
Routes			Highly desirable	Not required
Offshore cadastral			Highly desirable	Not required
Lease areas			Highly desirable	Nice to have
Fixed obstructions			Highly desirable	Nice to have
Floating observation/navigation systems			Highly desirable	Nice to have
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Required	Highly desirable	Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Nice to have
Inland surface water features	Required	Highly desirable	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Required	Highly desirable	Highly desirable	
Cultural resources	Required	Highly desirable	Highly desirable	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	StratMap Specification is preferred. 4ppsm 10cm RMSEz classification of ground, building, high/med/low vegetation, bridges, culverts There have been over 50 lidar collections in Texas. Non-StratMap projects have specifications that vary widely.	TWDB collected bathymetry, NOAA DEMS, USGS Hypsography	Don't know, best available	Don't know, best available
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI		Yes		
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	TNRIS	TNRIS		

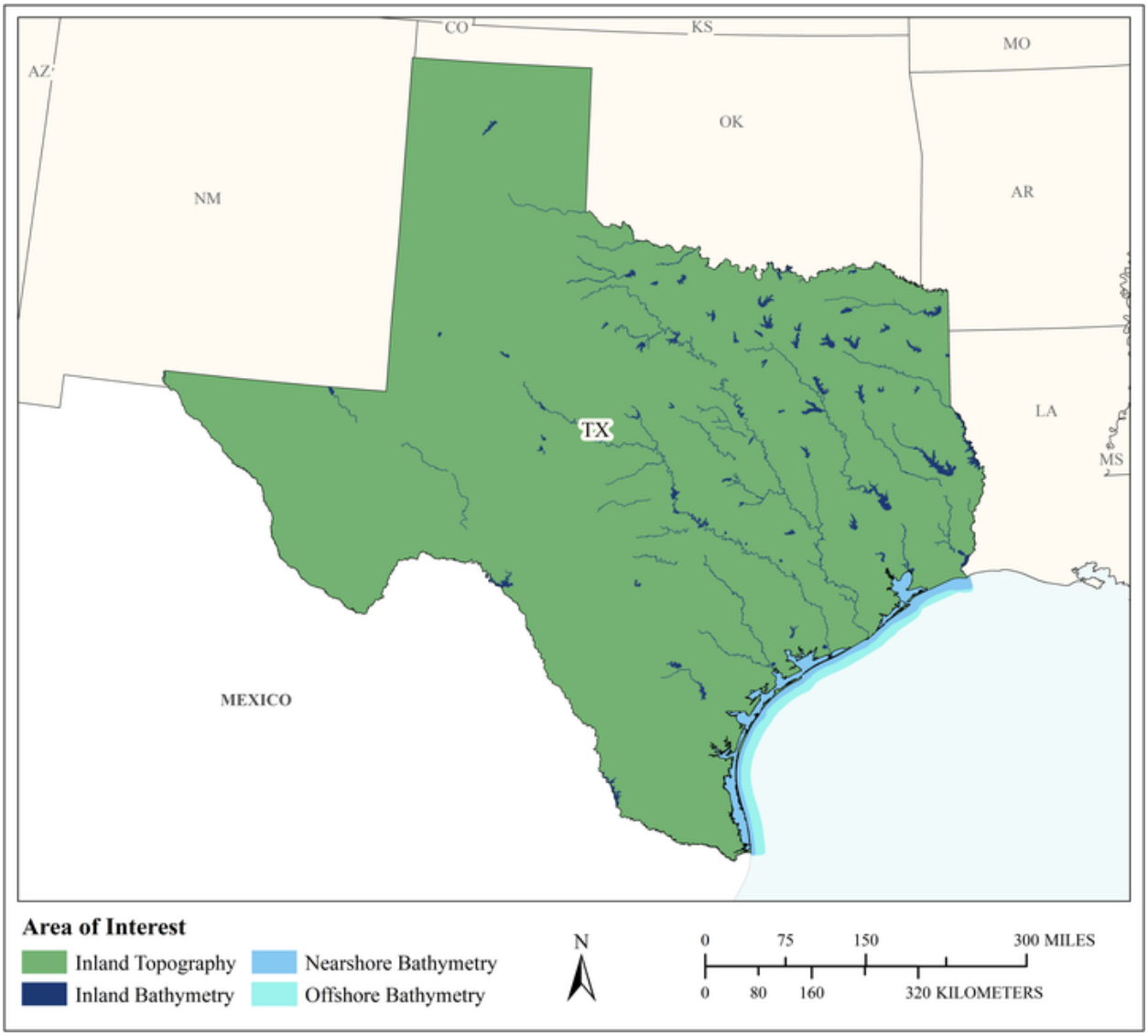
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other			Yes	Yes
Other description			I don't know	I don't know
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	I don't know	I don't know
Cost savings/cost reduction	Major	Major	I don't know	I don't know
Cost avoidance	Major	Major	I don't know	I don't know
Increased revenues	None	None	I don't know	I don't know
Mission-driven performance improvements	Major	Major	I don't know	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	I don't know	I don't know
Improved response or timeliness	Major	Major	I don't know	I don't know
Improved customer experience	Major	Major	I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	I don't know	I don't know
Environmental	Minor	Minor	I don't know	I don't know
Public safety, including life and property	Major	Major	I don't know	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Other customer service benefits	Major	Unable to provide		Major	Unable to provide							
Other customer service benefits description	For 3D Wireless Accuracy Mapping.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know			I don't know			I don't know		
Environmental	I don't know			I don't know			I don't know			I don't know		
Public safety, including life and property	I don't know			Major			I don't know			I don't know		
Other	3D Wireless Accuracy Mapping											
Other benefits	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Maritime and Land Boundary Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Delimitation of legal and other coastal boundaries, inland boundaries, and ordinary high water lines (OHWL).
MCA Title	Maritime and Land Boundary Management
MCA ID	60449
Organization Type	State or U.S. Territorial government
Organization Name	State of Texas
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 30 - Maritime and Land Boundary Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B	QL0B	I don't know
Update Frequency	6-10 years	6-10 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Highly desirable	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Nice to have	Nice to have	Highly desirable	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable	Highly desirable	Required	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable	Highly desirable	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	Required
DTM	Required	Required	Required	Required
DEM	Highly desirable	Required	Required	Required
Raw point cloud data	Nice to have	Highly desirable	Required	Required
Classified point cloud	Highly desirable	Highly desirable	Required	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Not required	Nice to have
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Not required
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Nice to have	Required	Not required	Not required
Ground control/ground truthing	Highly desirable	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Required	Highly desirable	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Nice to have
Water column properties - Biological			Not required	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Highly desirable	Nice to have
Routes			Nice to have	Highly desirable
Offshore cadastral			Highly desirable	Nice to have
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Required	Required
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Nice to have
Wetlands	Required	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Highly desirable	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Minor	None	I don't know
Cost savings/cost reduction	Moderate	None	Minor	Moderate
Cost avoidance	Moderate	None	Minor	Moderate
Increased revenues	Minor	None	None	I don't know
Mission-driven performance improvements	Major	None	Moderate	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None	None	I don't know

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	None	Minor	Moderate
Improved customer experience	Major	None	Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	Moderate
Environmental	Major	Minor	Minor	Moderate
Public safety, including life and property	Moderate	None	Minor	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	Minor	Unable to provide		None			None			I don't know	Unable to provide	
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$297,871		Annual dollars saved/ realized	$223,542		Annual dollars saved/ realized	$912,639			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,142,055									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Moderate			Moderate		
Environmental	Minor			Major			Major			Major		
Public safety, including life and property	None			Moderate			Moderate			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps		Yes		
Cross sections		Yes		
Height-Above-Ground maps		Yes		
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

U.S. Virgin Islands

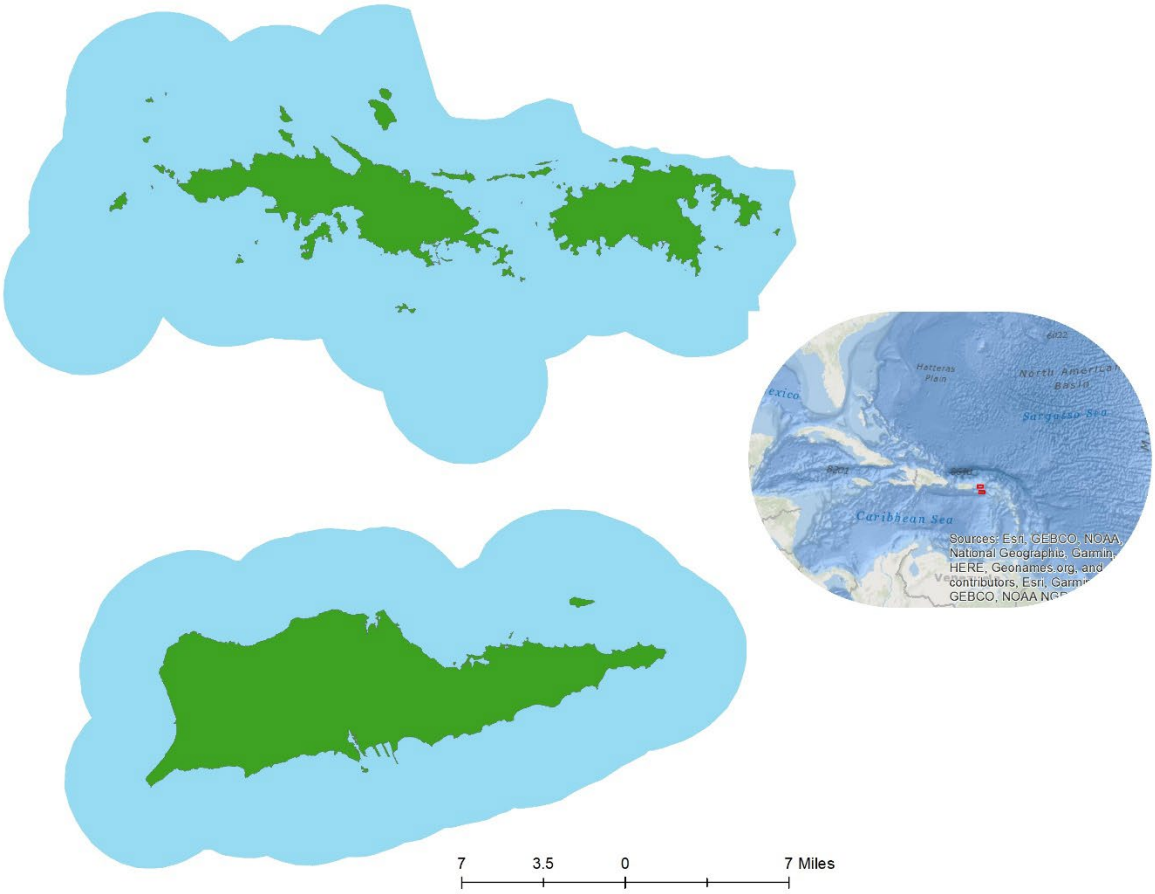


Figure 1. Location and political jurisdiction of the U.S. Virgin Islands. Location of islands relative to each other is not to scale.

The U.S. Virgin Islands are a group of small islands located around -64.813926 W and 18.066428 N. The islands are on the border where the Caribbean Sea greets the Atlantic Ocean. This region is given the name "Hurricane Valley" due to its seasonal hurricanes. The islands are surrounded by rocky out-crops, cays, and other small habitable land. It is visited by hundreds of thousands of tourists each year for marine recreation along its white sandy beaches and crystal clear waters, its tropical weather, and its paradise picturesque ocean views. The tourism industry accounts for 70% of the total gross domestic product (pre-COVID). Its territorial waters are about 599.5 square miles while the total land is about 134 square miles.

The coastlines of the islands are rapidly changing, and capturing these changes is critical to long-term planning. Seasonal hurricanes drastically impact the coastline and landscapes, and human development has compounded its effects. The risk of storm water runoff and storm surge inundation is present even when not associated with a major storm, both these affect the ecosystem as well as the economy.

The high terrain of the islands of St. Thomas and St. John merit the need to understand the interactions between slope, weather, and human development. The island of St. Croix has one of the world's largest oil refineries, Hovensa, located on the south shores deep port. Despite its aging infrastructure and several

hurricane impacts, it has already sprung back with modernized refurbishing construction. Maintaining the refinery relies on bathymetric and upland landscape data. Outside the oil refinery, agriculture is the predominate land use of St. Croix for livestock and crops.

The islands of St. Thomas and St. John's tourism industry rely on the natural resources of the beaches, coral reefs, mangroves lagoons, lush green mountainous landscape, as well as the local culture making a balancing act for resource manager. St. John is the least populated of the islands. More than half of the island is managed by the National Park Service which helps to mitigate development on most of the tropical forested land and its associated impacts to the surrounding beaches. Most St. Johnians commute by ferry.

Status of elevation data for the U.S. Virgin Islands

The status of elevation data for the USVI has continued to evolve comprising from federal to local partners:

- The 1994 U.S. Army Corps of Engineers orthographic dataset which includes black and white aerial georeferenced photographs at a 1-foot resolution, breakline, contours at 2 foot intervals, digital terrain models, tile images, MICL, MOSAICS, and SPOT_ELV for most of the USVI major islands and some of the surrounding cays.
- The 2007 USACE Lidar dataset includes georeferenced aerials at 1-foot resolution, unclassified lidar and DTM of USVI.
- The 2013 NOAA-CSC Lidar dataset includes classified LAS and breaklines of the coast and inland ponds, digital elevation models at 1-meter resolution.
- The 2018-2019 3D Elevation Program Supplemental terrestrial lidar data were collected as the result of disaster supplemental funding provided by Congress. The dataset includes classified LAS and digital elevation models at a 1-m resolution.
- https://gis.ngdc.noaa.gov/arcgis/services/DEM_mosaics/DEM_tiles_mosaic/ImageServer
- https://www.arcgis.com/apps/opsdashboard/index.html#/4b8f2ba307684cf597617bf1b6d2f85d
- https://coast.noaa.gov/inventory/index.html?layers=2,4&zoom=10&center=-75.95947265625,34.827332061981586&basemap=esrigray
- ftp://rockyftp.cr.usgs.gov/vdelivery/Datasets/Staged/Elevation/1m/Projects/PR_PRVI_VI_B1_2018/
- ftp://rockyftp.cr.usgs.gov/vdelivery/Datasets/Staged/Elevation/1m/Projects/PR_PRVI_VI_B2_2018/
- ftp://rockyftp.cr.usgs.gov/vdelivery/Datasets/Staged/Elevation/LPC/Projects/USGS_LPC_PR_PRVI_VI_B1_2018/
- ftp://rockyftp.cr.usgs.gov/vdelivery/Datasets/Staged/Elevation/LPC/Projects/USGS_LPC_PR_PRVI_VI_B2_2018/

Importance of elevation data to the U.S. Virgin Islands

The importance of elevation data to the territory is critical in protecting life and preserving crucial terrestrial and marine habitats. Topographic elevation data can be used to create accurate hydrological models that demonstrate how polluted runoff waters impact coastal marine life. Bathymetric data is needed for the narrow and shallow navigational channels such as the mangrove lagoon in St. Thomas, which are also heavily impacted by marinas and marine debris. Bathymetric data is also important for navigating the coral reefs and sensitive habitats around the oil refinery south of St. Croix. The information is paramount to engineers, environmental planners, government, and non-profit organizations that help support the preservation of our natural resources. Understanding the effects of rapid coastal changes

requires accurate elevation data for developing and communicating holistic plans that address the problems the community is facing.

High-level summary of elevation data requirements

Detailed elevation data that captures geomorphological changes in coastal areas are critical for floodplain management and coastal community resilience policies. The Virgin Islands Department of Planning and Natural Resources, partnering with the University of the Virgin Islands, are studying coastal dynamics of development and natural disturbance regarding a changing shoreline. Some of the main shipping ports and coastal highways, including newly constructed coastal federal highways in St. Thomas, serve as critical infrastructures that are the first to feel impacts from rising ocean levels and hurricane storm surges. In addition, ecological research on the much smaller surrounding cays (e.g., Flat Cay in St. Thomas) and salt ponds (e.g., the Great Pond in St. Croix) slated for development are important for the sustainability of wildlife diversity and ecological services. The QL1B data will be crucial in maintaining adequate ancillary data suitable for high resolution monitoring and planning for our natural resource.

Additional comments

This exercise was very thorough and as such, much if not all the themes and topics related to the acquisition of elevation data was covered. The data capturing with present technology is adequate for the territory's needs.

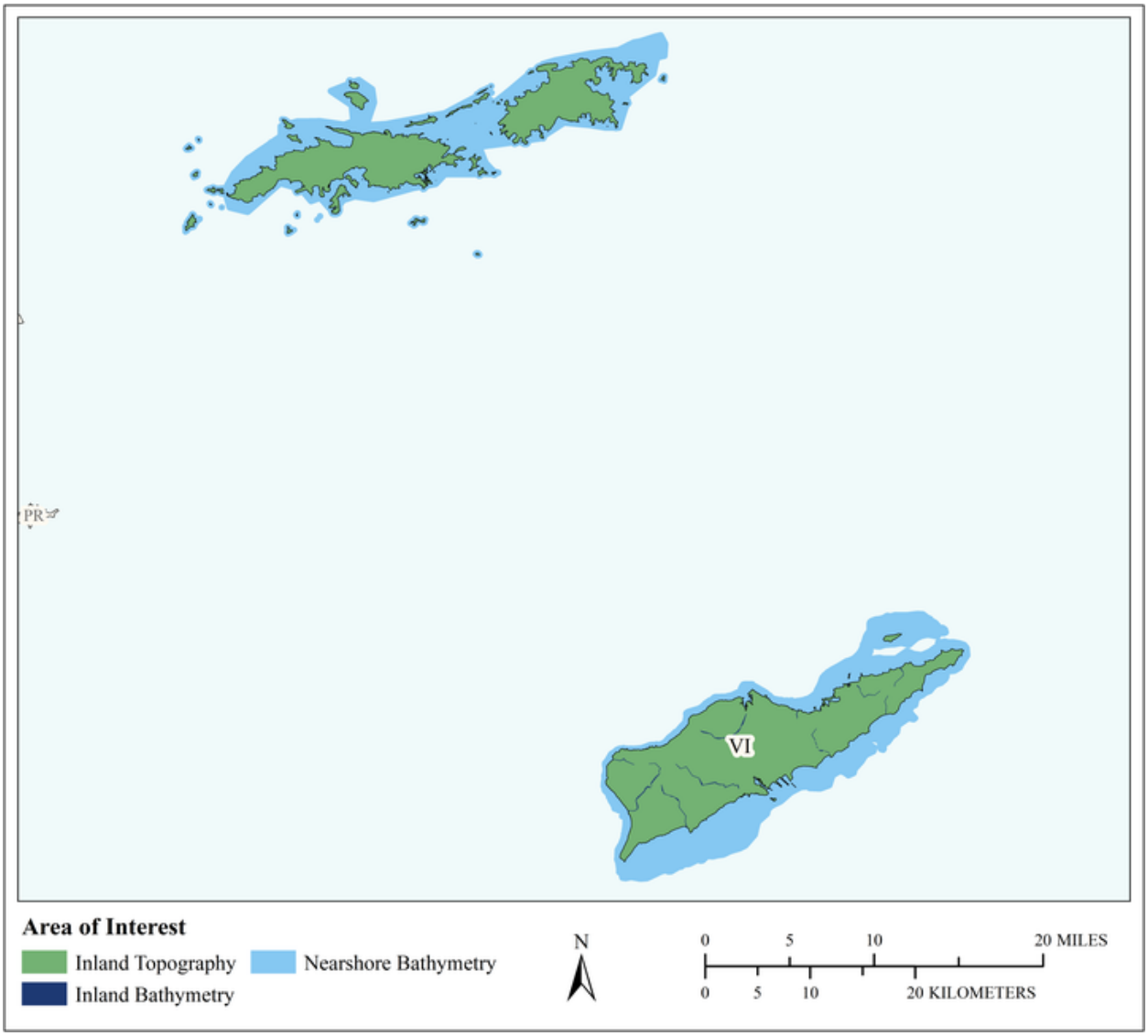
The Territory of the U.S. Virgin Islands has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	Territory of U.S. Virgin Islands	60450	Water Supply and Quality	Inland Topo	QL2	4-5 years	$742	$198	Moderate	Major	Moderate
				Inland Bathy	QL1B	6-10 years	$3,210	$335	Moderate	Major	Moderate
				Nearshore Bathy	QL1B	4-5 years	$3,919	$6,457	Moderate	Moderate	Moderate
BU 02 – Riverine Ecosystem Management	Territory of U.S. Virgin Islands	60451	Riverine Ecosystem Management	Inland Topo	QL1 HD	6-10 years	$204	$20	Major	Major	Major
				Nearshore Bathy	QL0B	2-3 years	$11,887	$9,083	Moderate	Moderate	Moderate
BU 03 – Coastal Zone Management	Dept. of Planning and Natural Resources-Div. of CZMP	1394	Spatial Planning, Coastal Hazard Mitigation, Land and Water-use Planning, and Environmental Planning	Inland Topo	QL1 HD	2-3 years	$1,085	Unable to quantify	Major	Moderate	Moderate
				Inland Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
				Nearshore Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Major
				Offshore Bathy	Order 1	4-5 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
BU 06 – Natural Resource Management	Territory of U.S. Virgin Islands	60452	Natural Resources Conservation	Inland Topo	QL1 HD	4-5 years	$5,249	$19,276	Major	Major	Major
BU 07 – Wildlife and Habitat Management	Virgin Islands National Park	21679	Marine and Terrestrial Protection	Inland Topo	QL2	6-10 years	$31	$92	Moderate	Moderate	Moderate
				Nearshore Bathy	Cross sections and/or transects meet needs	6-10 years	$57	$2	Moderate	Major	Moderate
				Offshore Bathy	Special Order	6-10 years	$458	$31	Moderate	Major	Major
BU 08 – Agriculture	Territory of U.S. Virgin Islands	60453	Agriculture and Precision Farming	Inland Bathy	QL4B	4-5 years	$271	$122	Moderate	Major	Major
BU 09 – Fisheries Management and Aquaculture	Territory of U.S. Virgin Islands	60454	Fisheries Management and Aquaculture	Nearshore Bathy	QL0B	6-10 years	$18,670	$1,371	Moderate	Major	Minor
				Offshore Bathy	Special Order	6-10 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Minor
BU 12 – Renewable Energy Resources	Territory of U.S. Virgin Islands	60455	Renewable Energy Resources	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	None
BU 14 – Cultural Resource Management	Territory of U.S. Virgin Islands	60456	Cultural Resources Preservation and Management	Inland Topo	QL1	4-5 years	$24	$21	Minor	Minor	Minor
				Nearshore Bathy	QL0B	4-5 years	$340	Unable to quantify	Minor	Moderate	Minor

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 15 – Flood Risk Management	Territory of U.S. Virgin Islands	60457	Flood Risk Management	Inland Topo	QL2	4-5 years	$18,790	$3,287	Major	Moderate	Major
BU 16 – Sea Level Rise and Subsidence	Territory of U.S. Virgin Islands	60458	Sea Level Rise and Subsidence	Inland Topo	QL1 HD	4-5 years	$7,045	Unable to quantify	Moderate	Moderate	Moderate
				Nearshore Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Minor
BU 20 – Marine and Riverine Navigation	Territory of U.S. Virgin Islands	60459	Marine and Riverine Navigation and Safety	Nearshore Bathy	QL0B	2-3 years	$91,104	$3,084	Minor	Major	Major
BU 22 – Infrastructure Management	Territory of U.S. Virgin Islands	60460	Infrastructure and Construction Management	Inland Topo	QL0 HD	4-5 years	$6,014	$17,699	Minor	Moderate	Major
				Inland Bathy	QL0B	4-5 years	$2,026	$210	Minor	Moderate	Moderate
				Nearshore Bathy	QL1B	4-5 years	$2,483	$341	Minor	Moderate	Major
BU 23 – Urban and Regional Planning	GIS Division - US Virgin Islands	1395	Land Use Planning and Development	Inland Topo	QL0 HD	2-3 years	$36,008	$4,157	I don't know	I don't know	I don't know
				Nearshore Bathy	QL1B	2-3 years	$21,752	$22,947	None	None	None
BU 26 – Education and Basic Research	University of the Virgin Islands	21602	Coastal Zone Research and Management	Nearshore Bathy	Cross sections and/or transects meet needs	6-10 years	$125,417	$69,194	Minor	I don't know	Minor
				Offshore Bathy	Cross sections and/or transects meet needs	>10 years	$163,914	$70,822	Moderate	Minor	Minor

MCA Title: Water Supply and Quality



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Elevation data are needed for downhill tracing of point source and non-point source pollution. Fate and transport of contaminants. Pollution risk mitigation. Runoff and sedimentation analyses. Point- or non-point source pollution modeling. Management of contaminants and marine debris - point, non-point, vessel, and atmospheric pollution; spills; trash.
MCA Title	Water Supply and Quality
MCA ID	60450
Organization Type	State or U.S. Territorial government
Organization Name	Territory of U.S. Virgin Islands
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL1B	
Update Frequency	4-5 years	6-10 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Nice to have		Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Nice to have	
DTM	Required	Highly desirable	Nice to have	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Nice to have	Nice to have	
Classified point cloud	Highly desirable	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Not required	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Moderate	
Cost savings/cost reduction	Major	Minor	Moderate	
Cost avoidance	Major	Minor	Minor	
Increased revenues	Minor	None	Minor	
Mission-driven performance improvements	Major	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Moderate	

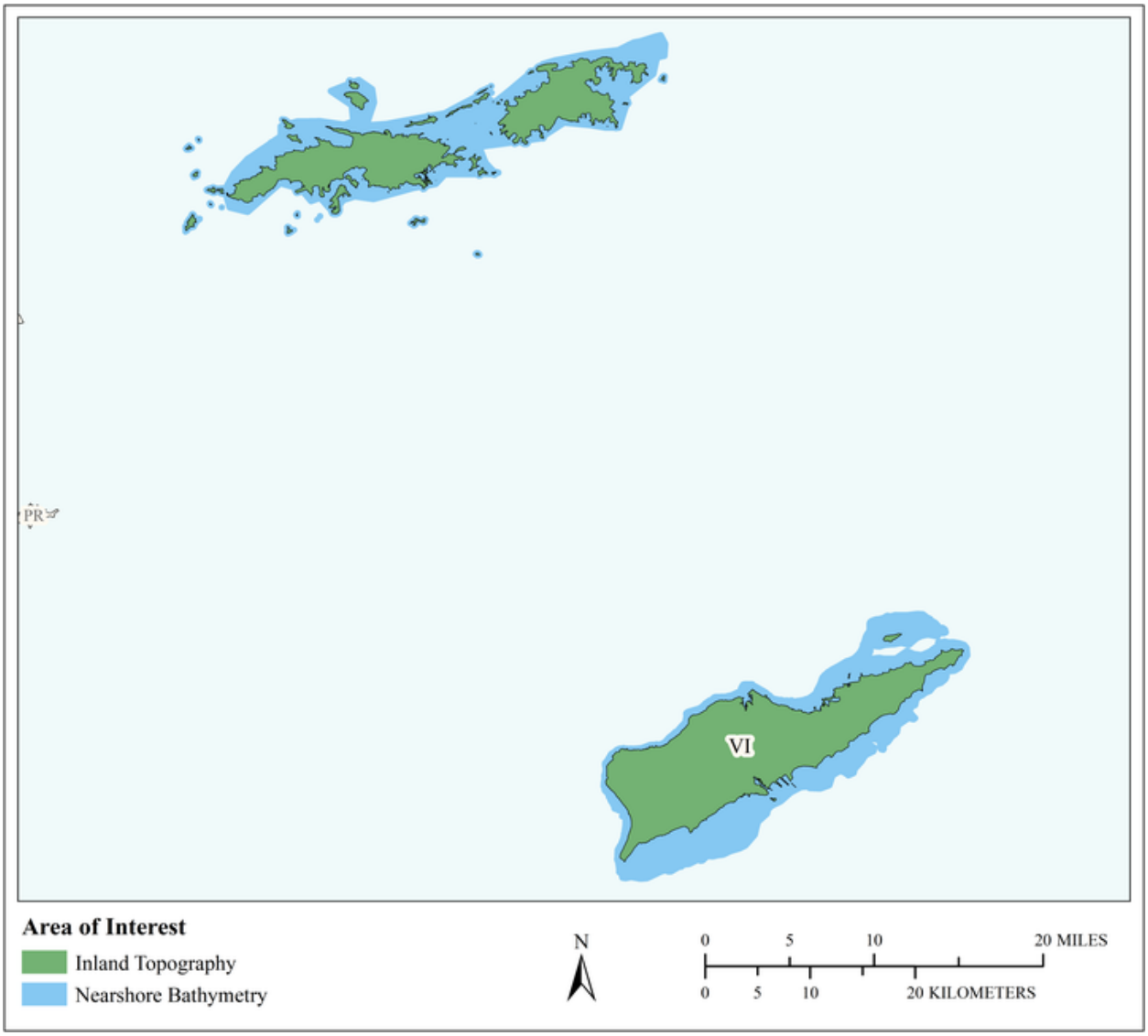
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	Moderate	
Improved customer experience	Major	Minor	Moderate	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	
Environmental	Major	Moderate	Moderate	
Public safety, including life and property	Major	Minor	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$742		Annual dollars saved/ realized	$3,210		Annual dollars saved/ realized	$3,919			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$198		Annual dollars saved/ realized	$335		Annual dollars saved/ realized	$6,457			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate					
Environmental	Major			Major			Moderate					
Public safety, including life and property	Moderate			Moderate			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes	Yes	
Hydrologic Flow Accumulation Grids	Yes	Yes	Yes	
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Riverine Ecosystem Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Stream channel analysis and mapping. Stream bank erosion analysis. Aquatic and terrestrial species habitat management. Environmental management.
MCA Title	Riverine Ecosystem Management
MCA ID	60451
Organization Type	State or U.S. Territorial government
Organization Name	Territory of U.S. Virgin Islands
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD		QL0B	
Update Frequency	6-10 years		2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter		Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm		Up to 30 cm	
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have		Highly desirable			Highly desirable
Entire AOI under same environmental conditions	Highly desirable		Required			Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable		Highly desirable			Nice to have
DEM for entire AOI needs to be seamless	Highly desirable		Required			Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		I don't know			I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required		Highly desirable	
DTM	Required		Required	
DEM	Required		Required	
Raw point cloud data	Nice to have		Nice to have	
Classified point cloud	Required		Highly desirable	
Edited/cube XYZ			Nice to have	
Full waveform	Nice to have		Highly desirable	
Bathymetric Attributed Grid (BAG)			Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Highly desirable		Nice to have	
Ground control/ground truthing	Highly desirable		Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required		Required	
Underwater videography			Not required	
Bottom texture			Highly desirable	
Bottom type			Required	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Nice to have		Not required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates	Nice to have		Highly desirable	
Land use/land cover	Highly desirable		Required	
Wetlands	Highly desirable		Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required		Required	
Bridges/culverts	Required			
Landmark features	Highly desirable		Not required	
Cultural resources	Nice to have		Not required	
Coastal and riverine structures	Highly desirable		Highly desirable	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Moderate	
Cost savings/cost reduction	Moderate		Moderate	
Cost avoidance	Moderate		None	
Increased revenues	None		None	
Mission-driven performance improvements	Major		Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		Minor	

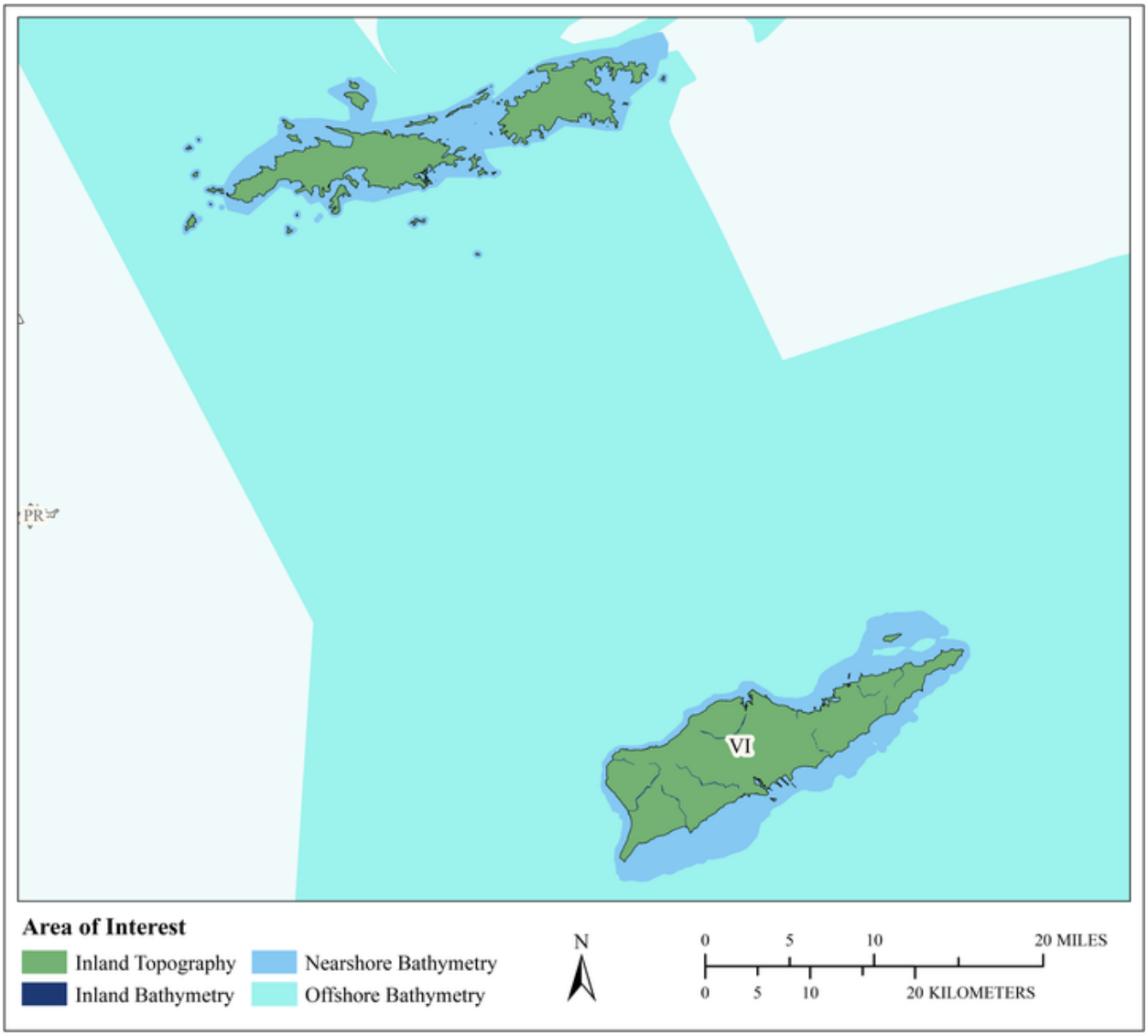
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate		Minor	
Improved customer experience	Major		Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major		Minor	
Environmental	Major		Moderate	
Public safety, including life and property	Major		Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide					Moderate	Unable to provide				
Cost savings/cost reduction	Moderate	Unable to provide					Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide					Moderate	Unable to provide				
Increased revenues	Minor	Unable to provide					Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide					Moderate	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$204					Annual dollars saved/ realized	$11,887			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide					Moderate	Unable to provide				
Improved customer experience	Major	Unable to provide					Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$20					Annual dollars saved/ realized	$9,083			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major						Moderate					
Environmental	Major						Moderate					
Public safety, including life and property	Major						Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	
Contours	Yes		Yes	
Hillshades	Yes		Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps			Yes	
Cross sections	Yes		Yes	
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints			Yes	
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Spatial Planning, Coastal Hazard Mitigation, Land and Water-use Planning, and Environmental Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Custom description
Sub Area Requirements				U.S. Virgin Islands, out to the EEZ

MCA Description	Response
Mission Critical Activity	Spatial planning, coastal hazard mitigation, land and water-use planning, environmental planning. Elevation data are needed for planning and management of marinas, especially on the south shore where the gradual slopes are impacted by sea level rise. Elevation data are also used for evaluation of development impacts, monitoring changes to shorelines and elevation, planning fill for roadways, creating sea level rise animations to communicate future impacts, analysis of storm surge impacts, stormwater runoff modeling, and as input to storm surge and sea level rise models from NOAA and others. Data on buoys and waves and currents are also needed, although not much is currently available. Elevation data are used in the environmental group for inland water quality monitoring. Inland bathymetry could be used for evaluating retention pond systems, mapping waterways for stormwater, and improving stormwater models. Near infra-red, 4band imagery is also highly desirable for the processing of NDVI in considering monitoring coastal vegetation species.
MCA Title	Spatial Planning, Coastal Hazard Mitigation, Land and Water-use Planning, and Environmental Planning
MCA ID	1394
Organization Type	State or U.S. Territorial government
Organization Name	Dept. of Planning and Natural Resources-Div. of CZMP
Sub-Agency or Division	
Organization Mission	"The mission of the Department of Planning and Natural Resources is to protect, maintain and manage the natural and cultural resources of the Virgin Islands through proper coordination of economic and structural development in collaboration with other local, federal, and non-government organizations, for the benefit of present and future generations so they will live safer, fuller, lives in harmony with their environment and cultural heritage."
Program Name	"The U.S. Virgin Islands Coastal Zone Management Program was established to manage, enhance, protect, and preserve our coastal resources, while reducing conflict between competing land and water uses. It represents a comprehensive approach to minimizing the impacts of activities on our coastal resources. Our program is strongly committed to the overall management of the coastlines to ensure environmental and economic sustainability for future generations"
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	USVI territory wide,~2,100sq mi (equivalent to large county)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Roadside drainage/culvert, rocks, marine debris, utility poles, underwater boulders. Marine Debris if possible.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Not required
51 - 100 ft	Not required
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Not required
2.1 – 5 acres	Not required
5.1 – 10 acres	Not required
Greater than 10 acres	Not required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B	QL0B	Order 1
Update Frequency	2-3 years	2-3 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Up to 1 meter	Less than 50 cm	Less than 50 cm
Acceptable Vertical Error	Up to 10 cm	Less than 10 cm	Less than 10 cm	Less than 1 meter
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed	Below MLLW		To MLLW	
Tide correction requirement			MSL	MSL
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required

Hydrologic Processing Required	Response
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable		Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Nice to have	Not required		Nice to have	Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Nice to have		Nice to have	Required
DEM for entire AOI needs to be seamless	Required	Highly desirable	Nice to have		Nice to have	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Nice to have	Nice to have	Nice to have
DTM	Required	Required	Required	Required
DEM	Required	Nice to have	Nice to have	Nice to have
Raw point cloud data	Nice to have	Nice to have	Nice to have	Nice to have
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Not required	Not required	Not required
Full waveform	Nice to have	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Not required	Not required
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Highly desirable	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Required	Required
Submerged features			Required	Required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Highly desirable	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Highly desirable	Highly desirable
Water column properties - Chemical			Highly desirable	Highly desirable
Water column properties - Biological			Highly desirable	Highly desirable
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Required	Required
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Required	Required	Required	Required
Wetlands	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Highly desirable	Highly desirable	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Nice to have	Highly desirable	
Coastal and riverine structures	Nice to have	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy

Current dataset used	2013-The United States Virgin Islands Topographic LiDAR Task Order involved collecting and delivering topographic elevation point data derived from multiple return light detection and ranging (LiDAR) measurements on the islands of St. Thomas, St. John, St. Croix and numerous smaller islands and islets in the United States Virgin Islands. The data collected for the project area will exhibit Hydro Flattened DEMs (1m resolution) for inclusion into the NED. The purpose of the data is for use in coastal management decision making, including applications such as flood plain mapping and water rights management. LiDAR was collected at an average of 0.7 meter point spacing for all acquired project areas.	We currently do not have any inland bathymetry.	"Publication_Date: 2011 Title: STT_STJ_Bathy_3m.tif NOAA's National Ocean Service (NOS), National Centers for Coastal Ocean Science (NCCOS) http://ccma.nos.noaa.gov/products/biogeography/usvi_nps/data/ Description: Abstract: LiDAR 3x3 meter resolution bathymetric surface for an area of shallow seabed surrounding St. Thomas and St. John (STT/STJ) in the U.S. Virgin Islands (USVI). Bathymetry, relative seafloor reflectivity and hyperspectral imagery in STT/STJ collected on thirteen different sorties from 1/29/2011 to 2/28/2011. Hyperspectral data were acquired using a Hyspex VNIR-1600 sensor. Bathymetry and reflectivity data were acquired using a LADS (Laser Airborne Depth Sounder) Mark II Airborne System from altitudes between 1,200 and 2,200 feet at ground speeds between 140 and 210 knots. The 900 Hertz Nd: YAG (neodymium-doped yttrium aluminum garnet) laser (1064 nm) acquired	"Publication_Date: 2011 Title: STT_STJ_Bathy_3m.tif Edition: 1st Geospatial_Data_Presentation_Form: remote-sensing image Publication_Information: Publication_Place: Silver Spring, MD Publisher: NOAA's National Ocean Service (NOS), National Centers for Coastal Ocean Science (NCCOS) Online_Linkage: http://ccma.nos.noaa.gov/products/biogeography/usvi_nps/data/ Description: Abstract: This image represents a LiDAR (Light Detection & Ranging) 3x3 meter resolution bathymetric surface for an area of shallow seabed surrounding St. Thomas and St. John (STT/STJ) in the U.S. Virgin Islands (USVI). Bathymetry, relative seafloor reflectivity and hyperspectral imagery in STT/STJ collected on thirteen different sorties from 1/29/2011 to 2/28/2011. Bathymetry and reflectivity data were acquired using a LADS (Laser Airborne Depth Sounder) Mark II Airborne System from altitudes

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
			3x3 meter spot spacing and 200% seabed coverage. In total, 168.1 square kilometers of LiDAR were collected between 0 m and 40 m in depth.	between 1,200 and 2,200 feet at ground speeds between 140 and 210 knots. The 900 Hertz Nd: YAG (neodymium-doped yttrium aluminum garnet) laser (1064 nm) acquired 3x3 meter spot spacing and 200% seabed coverage. In total, 168.1 square kilometers of LiDAR were collected between 0 m and 40 m in depth.
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes		Yes	Yes
NCEI			Yes	Yes
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available	Major	Major
Cost savings/cost reduction	Moderate	Inland bathy data not available	Major	Major
Cost avoidance	Major	Inland bathy data not available	Major	Major
Increased revenues	Major	Inland bathy data not available	I don't know	I don't know

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Mission-driven performance improvements	Major	Inland bathy data not available	Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available	Major	Major
Improved response or timeliness	Major	Inland bathy data not available	Major	Major
Improved customer experience	Major	Inland bathy data not available	Major	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Inland bathy data not available	Major	Major
Environmental	Major	Inland bathy data not available	Major	Major
Public safety, including life and property	Major	Inland bathy data not available	Major	Major

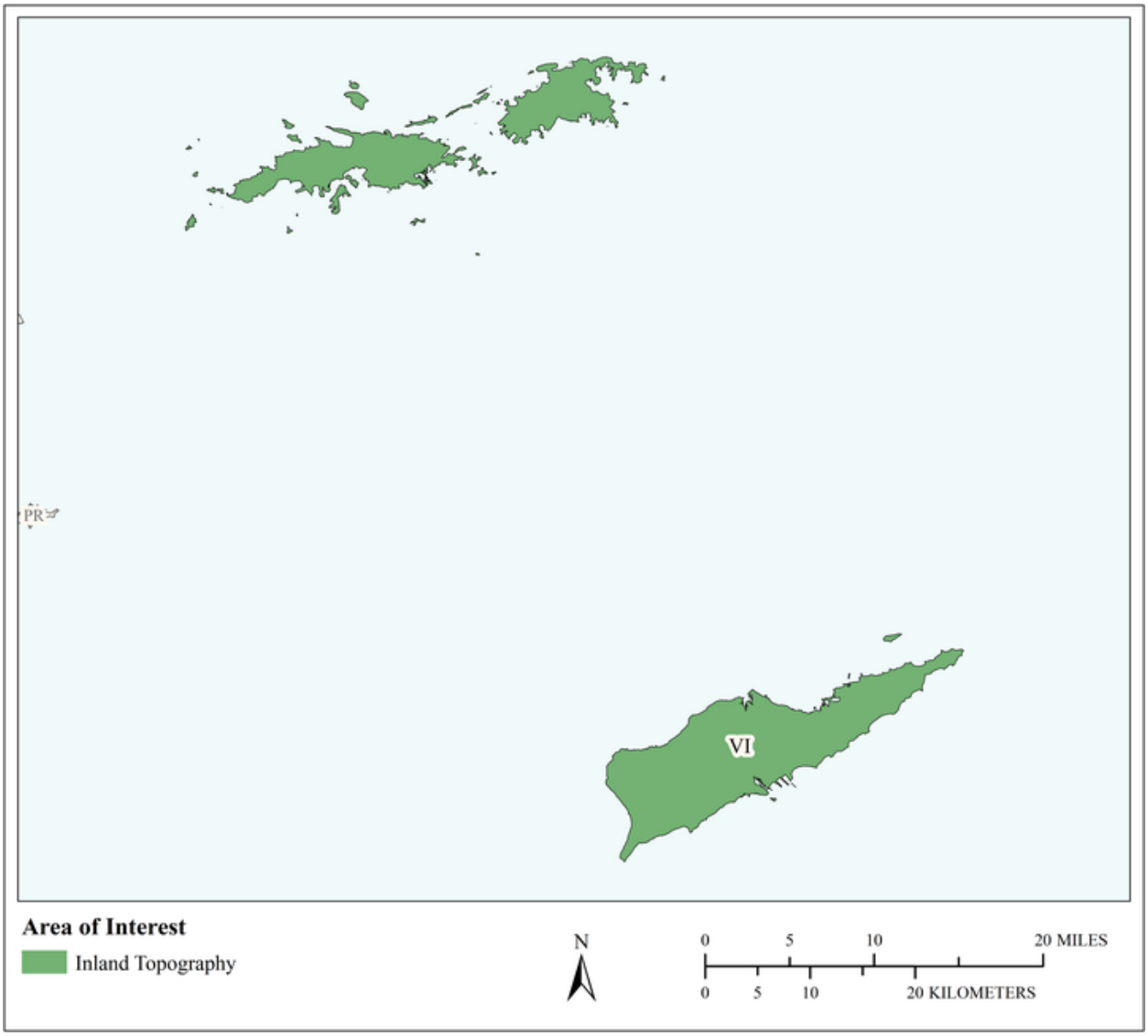
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$1,085	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Time savings description	Rapid development is changing the landscape.			Marinas are taking advantage of limited staff and remote areas to assess shoreline change. The sites were never inland bathymetrically mapped. The sites are usually hard to access.			Considering one data set for all areas rather than having different products for different areas. Mooring field inspections could further be assisted. Actually depends on the computational capacity of the computer,. If project site is within data tile. Less out-sourcing will save time and money, for spatial planning projects.			Actually depends on the computational capacity of the computer. Less out-sourcing will save time and money, for spatial planning projects. Mooring field inspections could further be assisted. If project site is within data tile. Considering one data set for all areas rather than having different products for different areas.		
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction description	Usually a multi-agency effort that takes a lot of time to develop.			Sites were never remote sensory mapped.			But it should be significant when it comes to floodplain planning. As I understand it, it takes a multi-agency fund to acquire 3D data.			But it should be significant when it comes to floodplain planning. As I understand it, it takes a multi-agency fund to acquire 3D data.		
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost avoidance description							Currently can't collect quality control stations and such. However, refuge for boaters during a hurricane could benefit from this data. Cost from planning errors related to data errors could be expensive if assessing a reef impact from grounding.			Currently can't collect quality control stations and such. However, refuge for boaters during a hurricane could benefit from this data. Cost from planning errors related to data errors could be expensive if assessing a reef impact from grounding.		
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Annual percent improvement	60%	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Mission-driven performance improvements description	Looking at the department as a whole. Better quality, more confidence in precision mission execution. Better quality, more confidence the model represents current conditions and predictions.			Anticipate increased effectiveness of land use planning. Same as above. Anticipate increased effectiveness from.			Enhancement in every way possible. Site selection for ecological restoration.			Enhancement in every way possible. Site selection for ecological restoration.		
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Value added to products or services description	Not sure; to map all the ghuts in the VI and update the inventory would be time consuming.											
Improved response or timeliness	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness description	More confidence in our assessment. Should help with issuance of hurricane rebuild waivers. More confidence in our assessment with higher quality remote sensing products. Department should also be updating website functionality to better integrate and share new data.						Assessment of marine debris would be enhanced.			Assessment of marine debris would be enhanced.		
Improved customer experience	Moderate	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate			Moderate			Moderate		
Education or outreach description	Public seems more interested in current on-site situation			It's been a while since different kinds of outreach and education were developed from inland bathy								
Environmental	Moderate			Moderate			Moderate			Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Environmental description		It's been a while since different kinds of outreach and education were developed from inland bathy		
Public safety, including life and property	Moderate	Moderate	Major	Moderate
Public safety, including life and property description		It's been a while since different kinds of outreach and education were developed from inland bathy		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes		Yes	Yes
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness			Yes	Yes
Other (please specify)		Yes		
Other description	Shoreline changes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Natural Resources Conservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation engineering. Soils and wetlands mapping and characterization. Modeling of biological and ecological systems. Erosion control. Rainfall penetration studies, impervious surfaces. Assessment of blue carbon stocks.
MCA Title	Natural Resources Conservation
MCA ID	60452
Organization Type	State or U.S. Territorial government
Organization Name	Territory of U.S. Virgin Islands
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

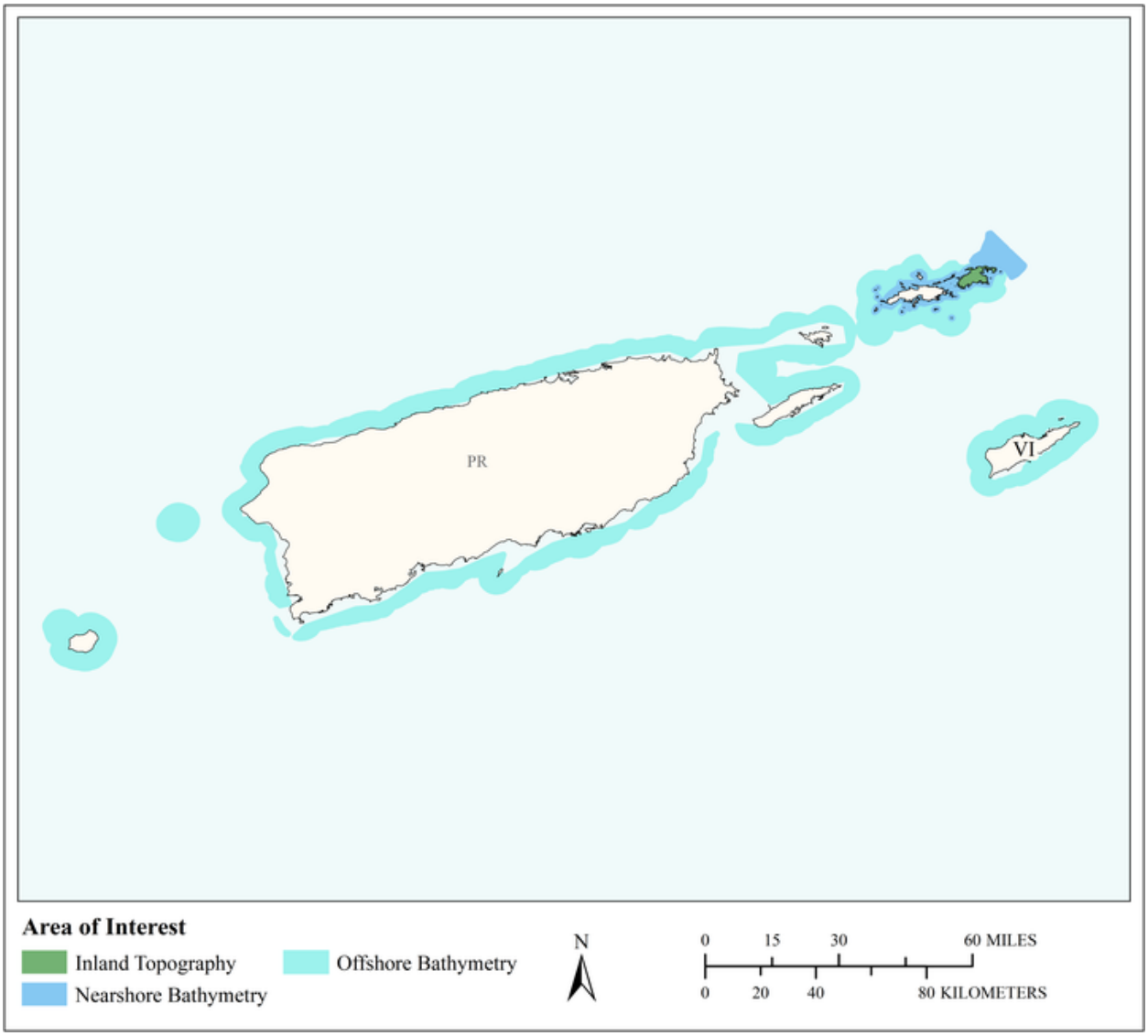
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$5,249									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$19,276									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Marine and Terrestrial Protection



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	Required
Geographic Area Requirements	Custom description		Custom description	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements	St. John		St. John and St. Thomas Islands	

MCA Description	Response
Mission Critical Activity	Marine and terrestrial protection.
MCA Title	Marine and Terrestrial Protection
MCA ID	21679
Organization Type	Federal Agencies and Commissions
Organization Name	Virgin Islands National Park
Sub-Agency or Division	Virgin Islands National Park
Organization Mission	Preserve and protect for future generations.
Program Name	Virgin Islands National Park
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	BU 14 - Cultural Resources Preservation and Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Road line and curbs

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2		Cross sections and/or transects meet needs	Special Order
Update Frequency	6-10 years		6-10 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	I don't know		I don't know	I don't know
Acceptable Vertical Error	I don't know		I don't know	I don't know
How far onshore needed			To cover the beach slope	
How far down the beach profile needed	To MLLW		Below MLLW	
Tide correction requirement			MHW	MHW

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross sections and/or transects meet needs			Yes	
Cross section/transect requirement			I don't know.	

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable		Required	Highly desirable		Highly desirable
Entire AOI under same environmental conditions	Highly desirable		Required	Required		Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Required	Required		Required
DEM for entire AOI needs to be seamless	Required		Required	Required		Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know		I don't know	I don't know		I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable		Highly desirable	Highly desirable
DTM	Highly desirable		Highly desirable	Highly desirable
DEM	Required		Highly desirable	Highly desirable
Raw point cloud data	Not required		Not required	Nice to have
Classified point cloud	Not required		Not required	
Edited/cube XYZ			Not required	Not required
Full waveform	Not required		Not required	Not required
Bathymetric Attributed Grid (BAG)			Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Not required	Not required
Tide Predictions			Highly desirable	Required
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery	Not required		Highly desirable	Required
Ground control/ground truthing	Not required		Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Nice to have
Nautical and/or navigation charts				Highly desirable
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required		Highly desirable	Required
Underwater videography			Highly desirable	Highly desirable
Bottom texture			Highly desirable	Highly desirable
Bottom type				Required
Submerged features			Required	Required
Subbottom characteristics			Required	Required
Geologic and seismic data	Nice to have		Highly desirable	Highly desirable
Water column properties - Physical			Highly desirable	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Highly desirable	Required
Tide/wave heights			Highly desirable	Required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Required
Boundaries			Highly desirable	Required
Routes			Nice to have	Nice to have
Offshore cadastral				Nice to have
Lease areas			Not required	Nice to have
Fixed obstructions			Highly desirable	Required
Floating observation/navigation systems			Highly desirable	Required
Shorelines – current, historic, change rates	Required		Highly desirable	
Land use/land cover	Highly desirable		Highly desirable	Highly desirable
Wetlands	Highly desirable		Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Highly desirable		Highly desirable	
Bridges/culverts	Nice to have			
Landmark features	Highly desirable		Highly desirable	
Cultural resources	Highly desirable			
Coastal and riverine structures	Nice to have		Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	1985 Army Corps contours		NOAA bathymetric data that does not lineup with the imagery I have for land mass. I find it unusable.	NOAA Bathymetry
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI			Yes	Yes
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	USACE			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know		None	Minor
Cost savings/cost reduction	I don't know		None	Minor
Cost avoidance	I don't know		None	Minor

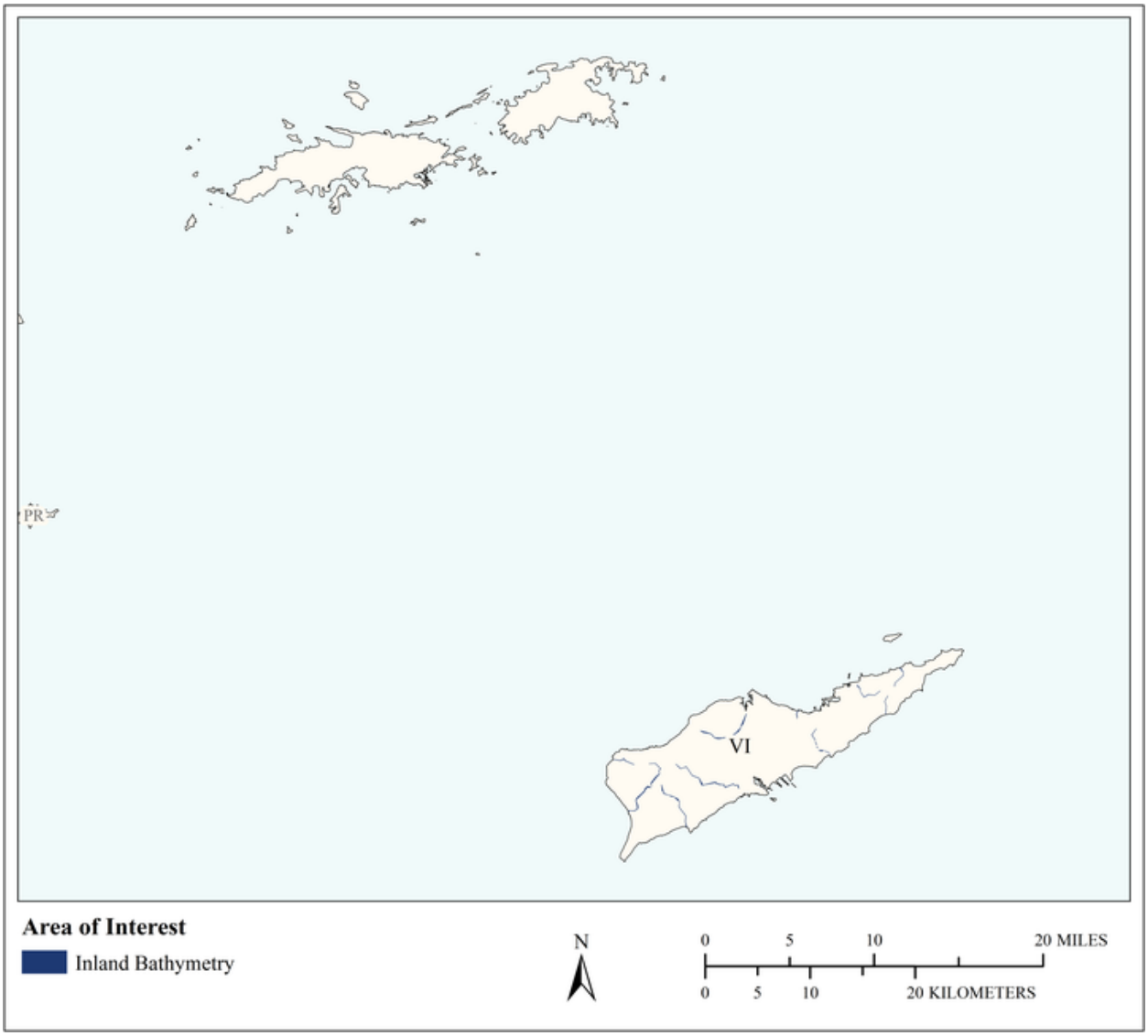
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	None		None	None
Mission-driven performance improvements	I don't know		None	None
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know		None	None
Improved response or timeliness	I don't know		None	None
Improved customer experience	I don't know		None	None
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know		None	None
Environmental	I don't know		None	Minor
Public safety, including life and property	I don't know		None	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Cost avoidance	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Increased revenues	None						None			I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$31					Annual dollars saved/ realized	$57		Annual dollars saved/ realized	$458
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	None						I don't know	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Moderate	Unable to provide					Major	Unable to provide		Moderate	Unable to provide	
Other customer service benefits							Major	Unable to provide				
Other customer service benefits description							Improved map products.					
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$92					Annual dollars saved/ realized	$2		Annual dollars saved/ realized	$31
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate						Moderate			Moderate		
Environmental	Moderate						Major			Major		
Public safety, including life and property	Moderate						Moderate			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Agriculture and Precision Farming



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type		Required		
Geographic Area Requirements		One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Inland bathymetry is needed for small retention ponds. Farm pond design. Irrigation system design. Detailed site analysis to support precision farming. Analysis of farm sedimentation and runoff. Calibration of fertilizer application, fertilizer management, and irrigation planning. Optimized terraforming.
MCA Title	Agriculture and Precision Farming
MCA ID	60453
Organization Type	State or U.S. Territorial government
Organization Name	Territory of U.S. Virgin Islands
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 08 - Agriculture and Precision Farming
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Nice to have
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order		QL4B		
Update Frequency		4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error		Up to 10 meters		
Acceptable Vertical Error		Up to 50 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season		Not required				
Entire AOI under same environmental conditions		Highly desirable				
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless		Highly desirable				
DEM for entire AOI needs to be seamless		Highly desirable				
Amount of acceptable vertical manipulation to achieve spatial seamlessness		Up to double the required TVU at the 95% confidence level				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM		Required		
DTM		Required		
DEM		Required		
Raw point cloud data		Nice to have		
Classified point cloud		Nice to have		
Edited/cube XYZ		Highly desirable		
Full waveform		Highly desirable		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening		Nice to have		
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery		Nice to have		
Ground control/ground truthing		Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery		Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data		Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates		Highly desirable		
Land use/land cover		Required		
Wetlands		Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features		Required		
Bridges/culverts		Required		
Landmark features		Required		
Cultural resources		Highly desirable		
Coastal and riverine structures		Required		
Overhead structures				
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings		None		
Cost savings/cost reduction		I don't know		
Cost avoidance		Moderate		
Increased revenues		I don't know		
Mission-driven performance improvements		None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services		None		

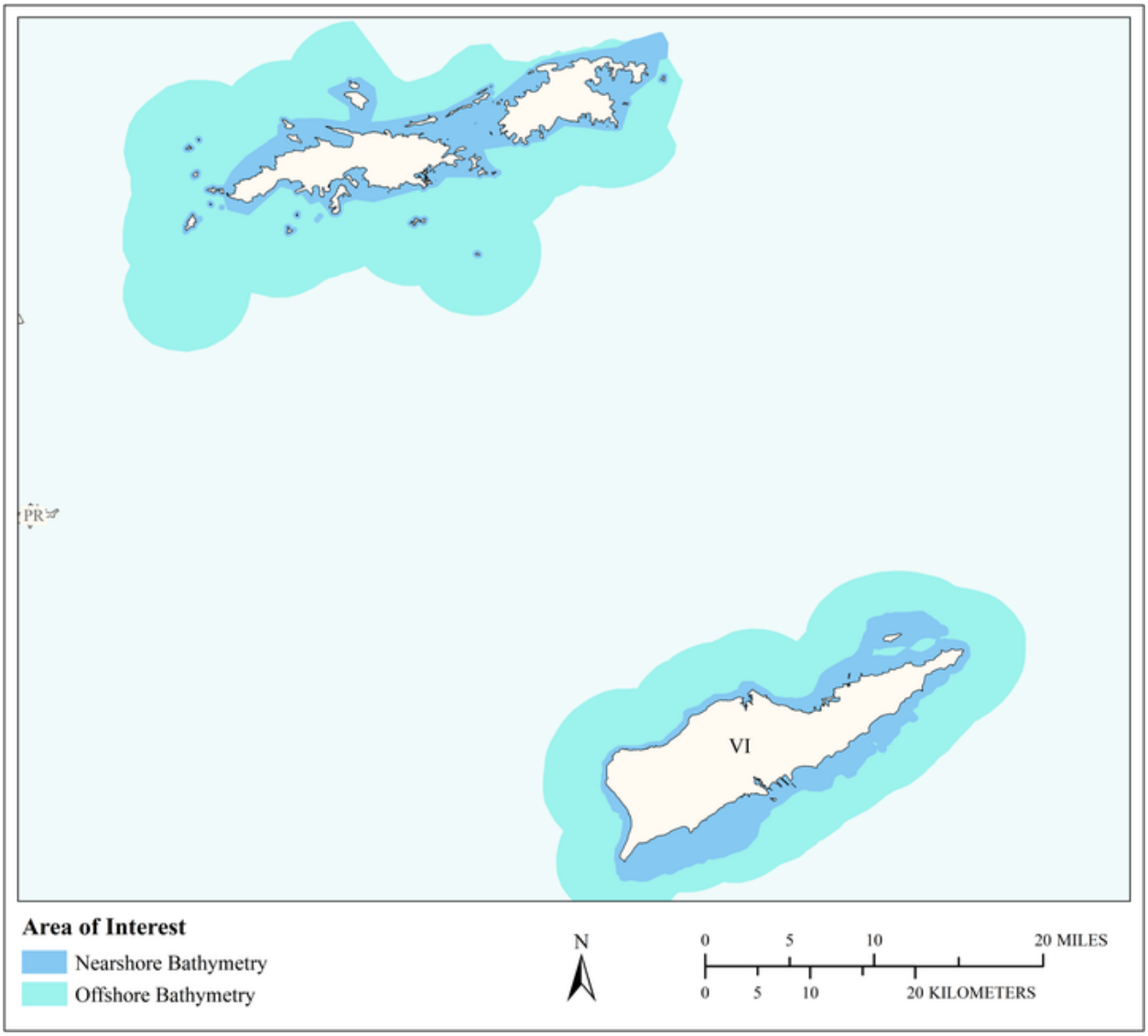
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness		None		
Improved customer experience		None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach		None		
Environmental		I don't know		
Public safety, including life and property		I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings				Major	Unable to provide							
Cost savings/cost reduction				Moderate	Unable to provide							
Cost avoidance				Major	Unable to provide							
Increased revenues				Major	Unable to provide							
Mission-driven performance improvements				Major	Unable to provide							
Future annual operational benefits added during validation					Annual dollars saved/ realized	$271						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services				Major	Unable to provide							
Improved response or timeliness				Major	Unable to provide							
Improved customer experience				Major	Unable to provide							
Future annual customer service benefits added during validation					Annual dollars saved/ realized	$122						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach				Moderate								
Environmental				Major								
Public safety, including life and property				Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes		
Contours		Yes		
Hillshades		Yes		
Slope maps		Yes		
Aspect maps				
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps		Yes		
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes		
Building footprints				
Breaklines for road edge-of-pavement		Yes		
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Fisheries Management and Aquaculture



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type			Required	Required
Geographic Area Requirements			Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Bathymetry is needed for possible benthic habitat rugosity assessment for coastal barrier and resilience. Management of fisheries. Sustainable aquaculture.
MCA Title	Fisheries Management and Aquaculture
MCA ID	60454
Organization Type	State or U.S. Territorial government
Organization Name	Territory of U.S. Virgin Islands
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Nice to have
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order			QL0B	Special Order
Update Frequency			6-10 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error			Up to 2 meters	Up to 2 meters
Acceptable Vertical Error			Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season			Nice to have	Nice to have		Nice to have
Entire AOI under same environmental conditions			Highly desirable	Highly desirable		Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless			Highly desirable	Highly desirable		Highly desirable
DEM for entire AOI needs to be seamless			Highly desirable	Highly desirable		Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM			Highly desirable	Required
DTM			Highly desirable	Nice to have
DEM			Required	Required
Raw point cloud data			Highly desirable	Nice to have
Classified point cloud			Highly desirable	
Edited/cube XYZ			Nice to have	Nice to have
Full waveform			Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)			Highly desirable	Nice to have
Breaklines required for standard hydro-flattening				
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Nice to have
Tide Predictions			Not required	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery			Highly desirable	Required
Ground control/ground truthing			Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Nice to have	Required
Acoustic imagery of the seafloor			Highly desirable	Required
Aerial and/or satellite imagery			Highly desirable	Required
Underwater videography			Nice to have	Highly desirable
Bottom texture			Nice to have	Required
Bottom type			Highly desirable	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data			Nice to have	Nice to have
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Required
Floating observation/navigation systems			Nice to have	Required
Shorelines – current, historic, change rates			Highly desirable	
Land use/land cover			Nice to have	Nice to have
Wetlands			Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Highly desirable
Inland surface water features			Nice to have	
Bridges/culverts				
Landmark features			Nice to have	
Cultural resources			Not required	
Coastal and riverine structures			Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings			Moderate	Moderate
Cost savings/cost reduction			Major	Minor
Cost avoidance			Minor	Minor
Increased revenues			Minor	None
Mission-driven performance improvements			Moderate	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services			Minor	Moderate

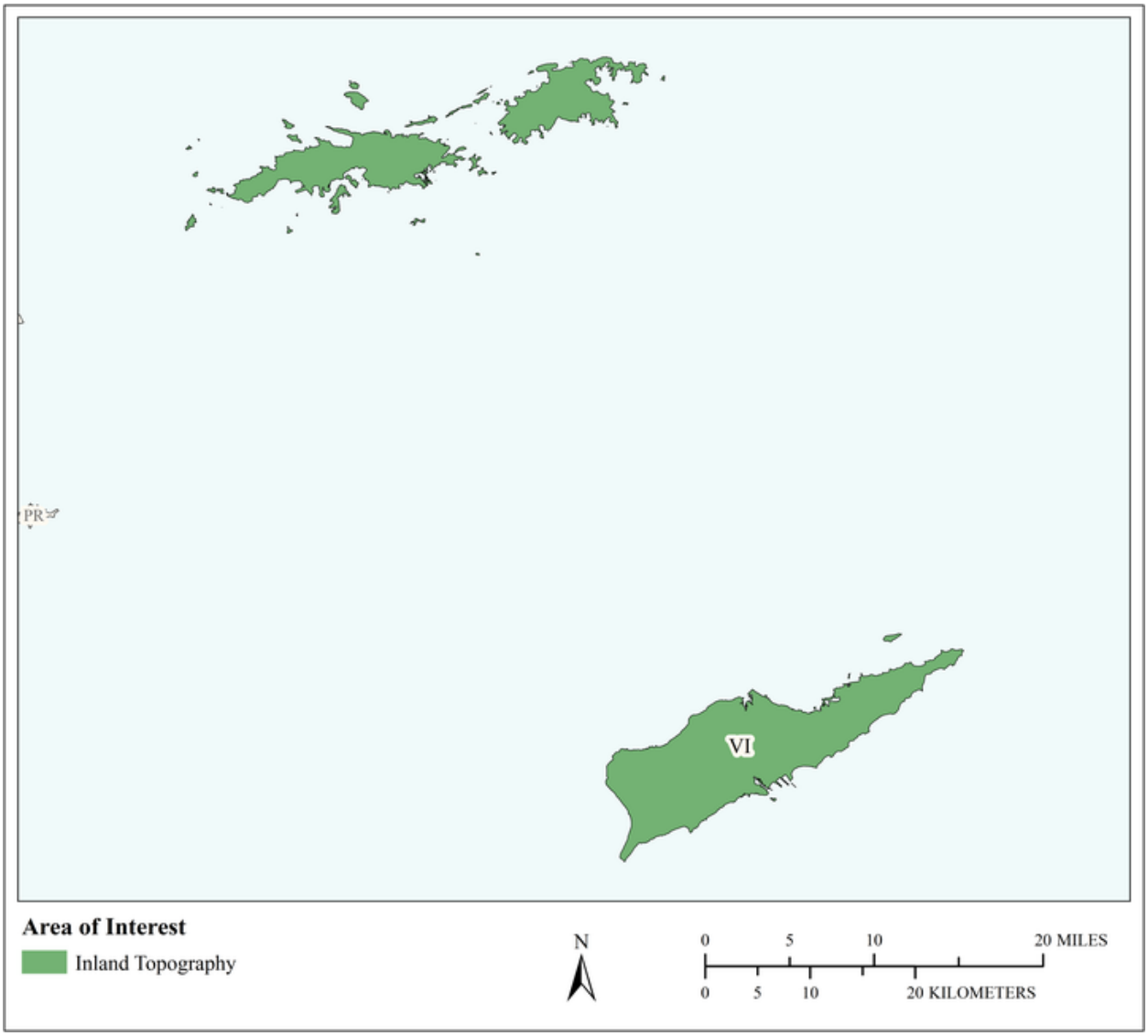
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness			Moderate	Minor
Improved customer experience			Minor	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach			Moderate	Moderate
Environmental			Moderate	Minor
Public safety, including life and property			Minor	None

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings							Major	Unable to provide		Minor	Unable to provide	
Cost savings/cost reduction							Moderate	Unable to provide		None		
Cost avoidance							Moderate	Unable to provide		None		
Increased revenues							Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements							Major	Unable to provide		Minor	Unable to provide	
Future annual operational benefits added during validation								Annual dollars saved/ realized	$18,670			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services							Minor	Unable to provide		Minor	Unable to provide	
Improved response or timeliness							Major	Unable to provide		Minor	Unable to provide	
Improved customer experience							Moderate	Unable to provide		Minor	Unable to provide	
Future annual customer service benefits added during validation								Annual dollars saved/ realized	$1,371			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach							Moderate			Moderate		
Environmental							Major			Moderate		
Public safety, including life and property							Minor			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours			Yes	Yes
Hillshades			Yes	Yes
Slope maps			Yes	Yes
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Renewable Energy Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Alternate energy development – solar, tidal, wind, wave, and ocean current. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Low head power potential for hydropower.
MCA Title	Renewable Energy Resources
MCA ID	60455
Organization Type	State or U.S. Territorial government
Organization Name	Territory of U.S. Virgin Islands
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Not required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Minor			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor			

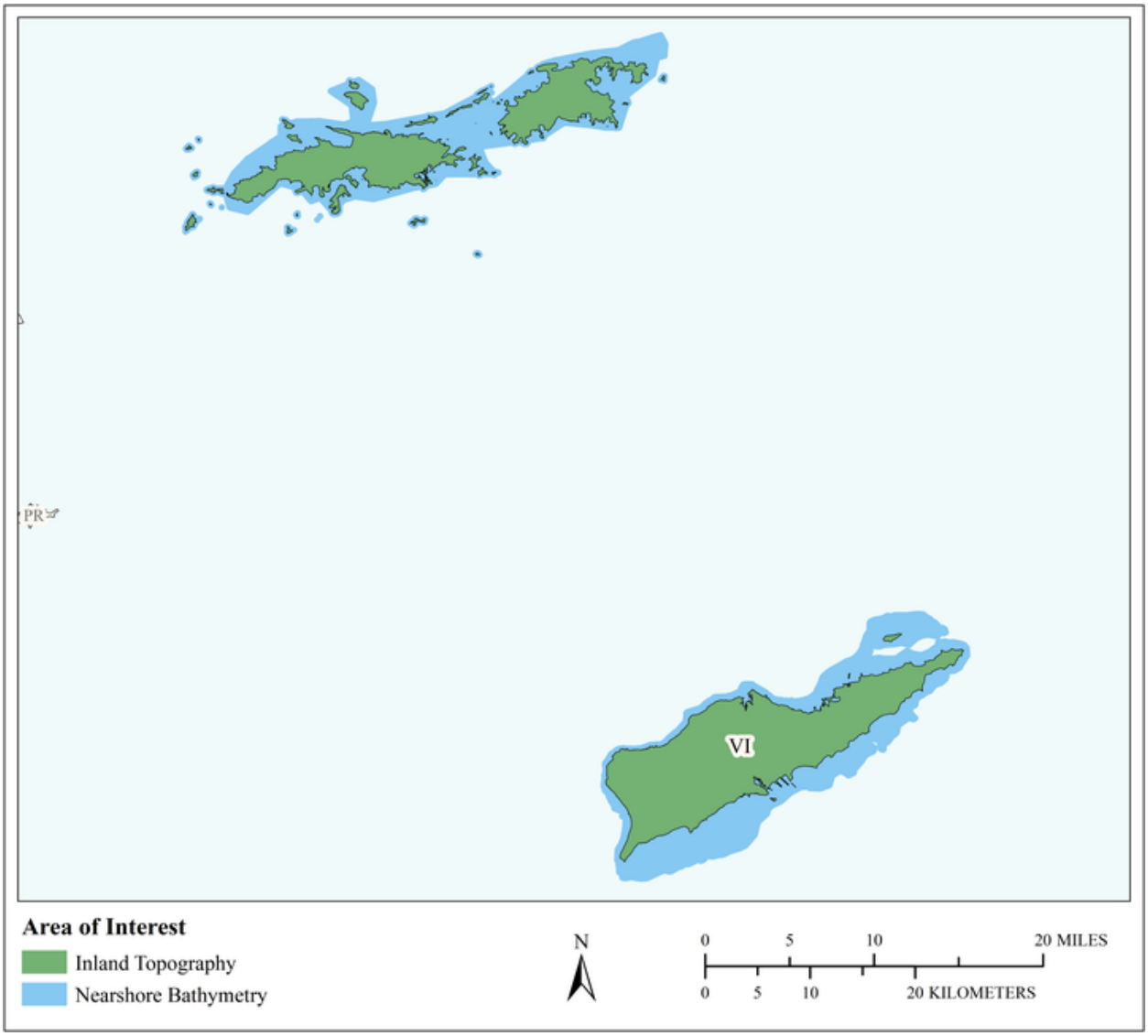
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	None											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Cultural Resources Preservation and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Identification of historical shorelines and cultural sites. Discovery and analysis of underwater archaeological and historical cultural sites. Site protection and preservation planning. Discovery and analysis of Native American and other historical cultural sites and subsistence activities.
MCA Title	Cultural Resources Preservation and Management
MCA ID	60456
Organization Type	State or U.S. Territorial government
Organization Name	Territory of U.S. Virgin Islands
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1		QL0B	
Update Frequency	4-5 years		4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter		Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm		Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have		Nice to have			Nice to have
Entire AOI under same environmental conditions	Nice to have		Nice to have			Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have		Nice to have			Nice to have
DEM for entire AOI needs to be seamless	Nice to have		Nice to have			Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable		Required	
DTM	Required		Nice to have	
DEM	Required		Required	
Raw point cloud data	Not required		Not required	
Classified point cloud	Nice to have		Nice to have	
Edited/cube XYZ			Not required	
Full waveform	Not required		Not required	
Bathymetric Attributed Grid (BAG)			Nice to have	
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have		Highly desirable	
Ground control/ground truthing	Nice to have		Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required		Highly desirable	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Required	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have		Highly desirable	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Highly desirable	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Highly desirable	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Required	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Nice to have		Required	
Land use/land cover	Nice to have		Nice to have	
Wetlands	Nice to have		Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Nice to have		Nice to have	
Bridges/culverts	Nice to have			
Landmark features	Nice to have		Highly desirable	
Cultural resources	Required		Required	
Coastal and riverine structures	Nice to have		Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Minor	
Cost savings/cost reduction	Moderate		Minor	
Cost avoidance	Minor		Minor	
Increased revenues	None		None	
Mission-driven performance improvements	Moderate		Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate		None	

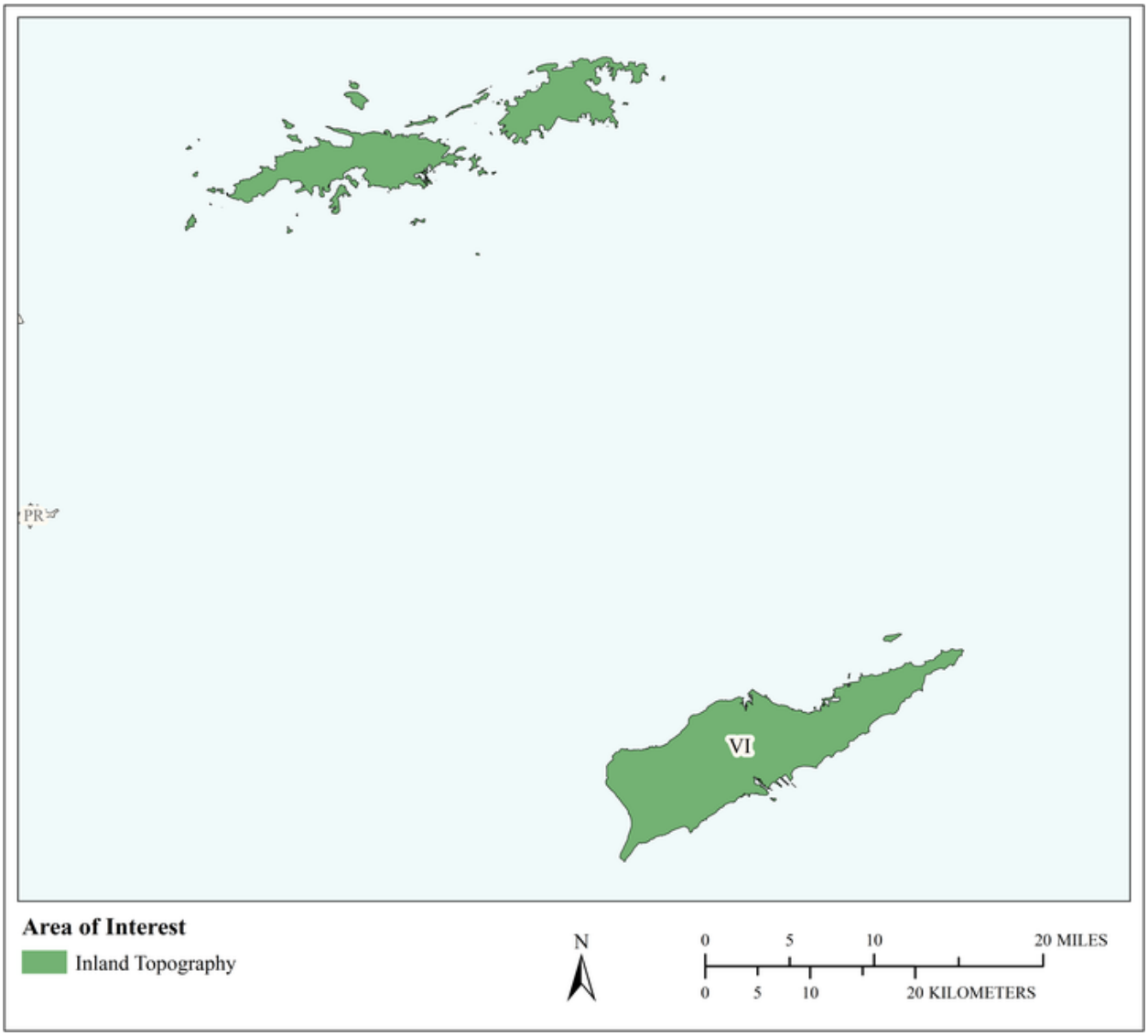
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate		Minor	
Improved customer experience	Moderate		Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor		Minor	
Environmental	Minor		Minor	
Public safety, including life and property	Minor		None	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide					Major	Unable to provide				
Cost savings/cost reduction	Minor	Unable to provide					Moderate	Unable to provide				
Cost avoidance	Moderate	Unable to provide					Moderate	Unable to provide				
Increased revenues	None						None					
Mission-driven performance improvements	Moderate	Unable to provide					Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$24					Annual dollars saved/ realized	$340			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide					Moderate	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide					Moderate	Unable to provide				
Improved customer experience	Moderate	Unable to provide					Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$21									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor						Minor					
Environmental	Minor						Moderate					
Public safety, including life and property	Minor						Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes		Yes	
Hillshades	Yes		Yes	
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Flood Risk Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Flood risk modeling and mapping of riverine and coastal areas. Dam/dike/levee safety analysis. Emergency management. Flood forecasts.
MCA Title	Flood Risk Management
MCA ID	60457
Organization Type	State or U.S. Territorial government
Organization Name	Territory of U.S. Virgin Islands
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

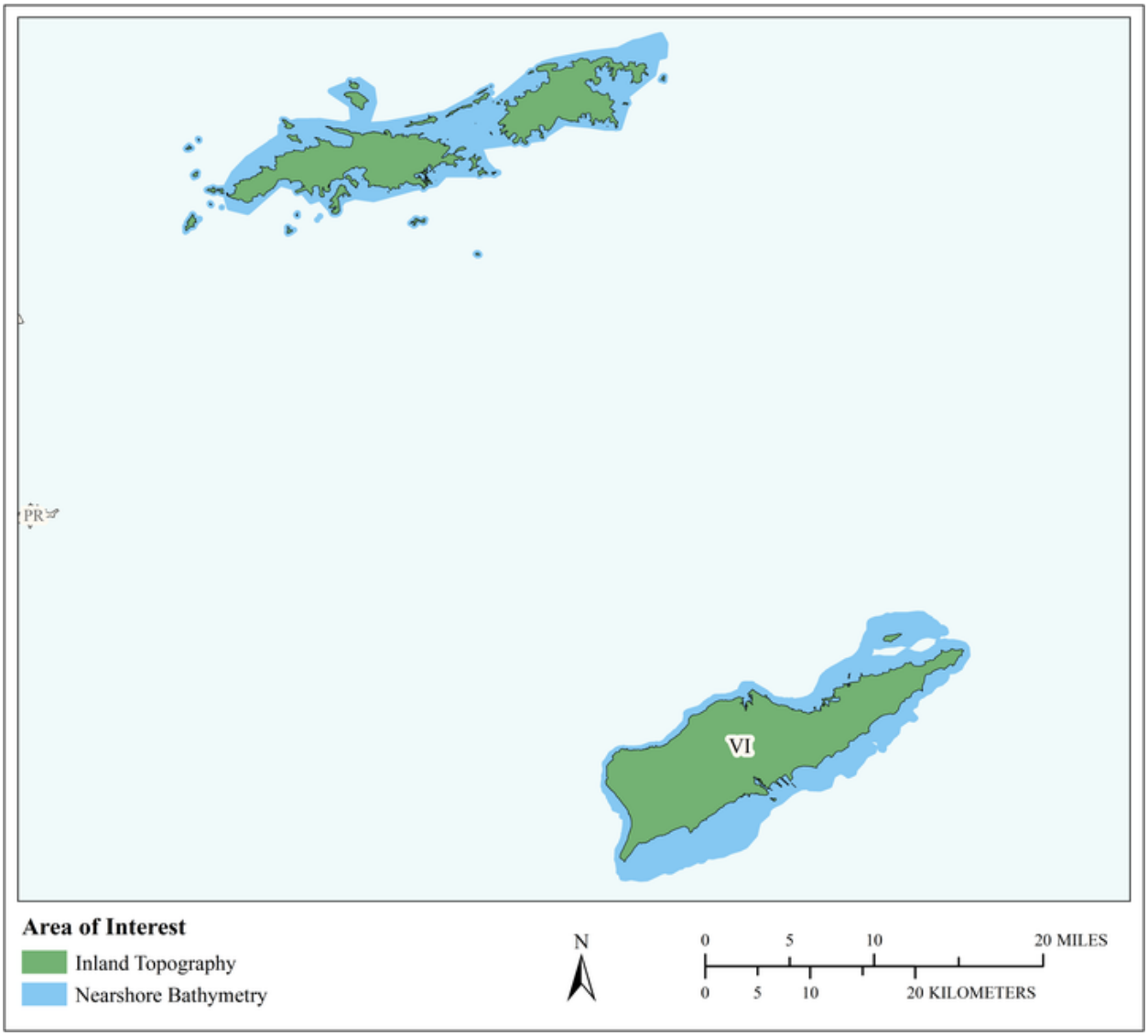
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$18,790									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$3,287									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Moderate											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Sea Level Rise and Subsidence



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Major coastal infrastructure exists in the U.S. Virgin Islands with the potential for damage from sea level rise. Modeling and mapping the effects of sea level rise or subsidence. Population and economic vulnerability assessments. Coastal inundation and infrastructure assessment.
MCA Title	Sea Level Rise and Subsidence
MCA ID	60458
Organization Type	State or U.S. Territorial government
Organization Name	Territory of U.S. Virgin Islands
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 16 - Sea Level Rise and Subsidence
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD		QL2B	
Update Frequency	4-5 years		2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter		Up to 5 meters	
Acceptable Vertical Error	Up to 20 cm		Up to 40 cm	
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have		Required			Required
Entire AOI under same environmental conditions	Highly desirable		Required			Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Required			Required
DEM for entire AOI needs to be seamless	Required		Required			Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable		Highly desirable	
DTM	Required		Highly desirable	
DEM	Required		Required	
Raw point cloud data	Highly desirable		Nice to have	
Classified point cloud	Required		Highly desirable	
Edited/cube XYZ			Not required	
Full waveform	Not required		Not required	
Bathymetric Attributed Grid (BAG)			Not required	
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable		Highly desirable	
Ground control/ground truthing	Required		Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required		Required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have		Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Required	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Required		Highly desirable	
Land use/land cover	Required		Highly desirable	
Wetlands	Required		Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required		Required	
Bridges/culverts	Required			
Landmark features	Highly desirable		Nice to have	
Cultural resources	Nice to have		Nice to have	
Coastal and riverine structures	Required		Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes		Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Major	
Cost savings/cost reduction	Major		Major	
Cost avoidance	Major		Major	
Increased revenues	None		Minor	
Mission-driven performance improvements	Major		Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		Major	

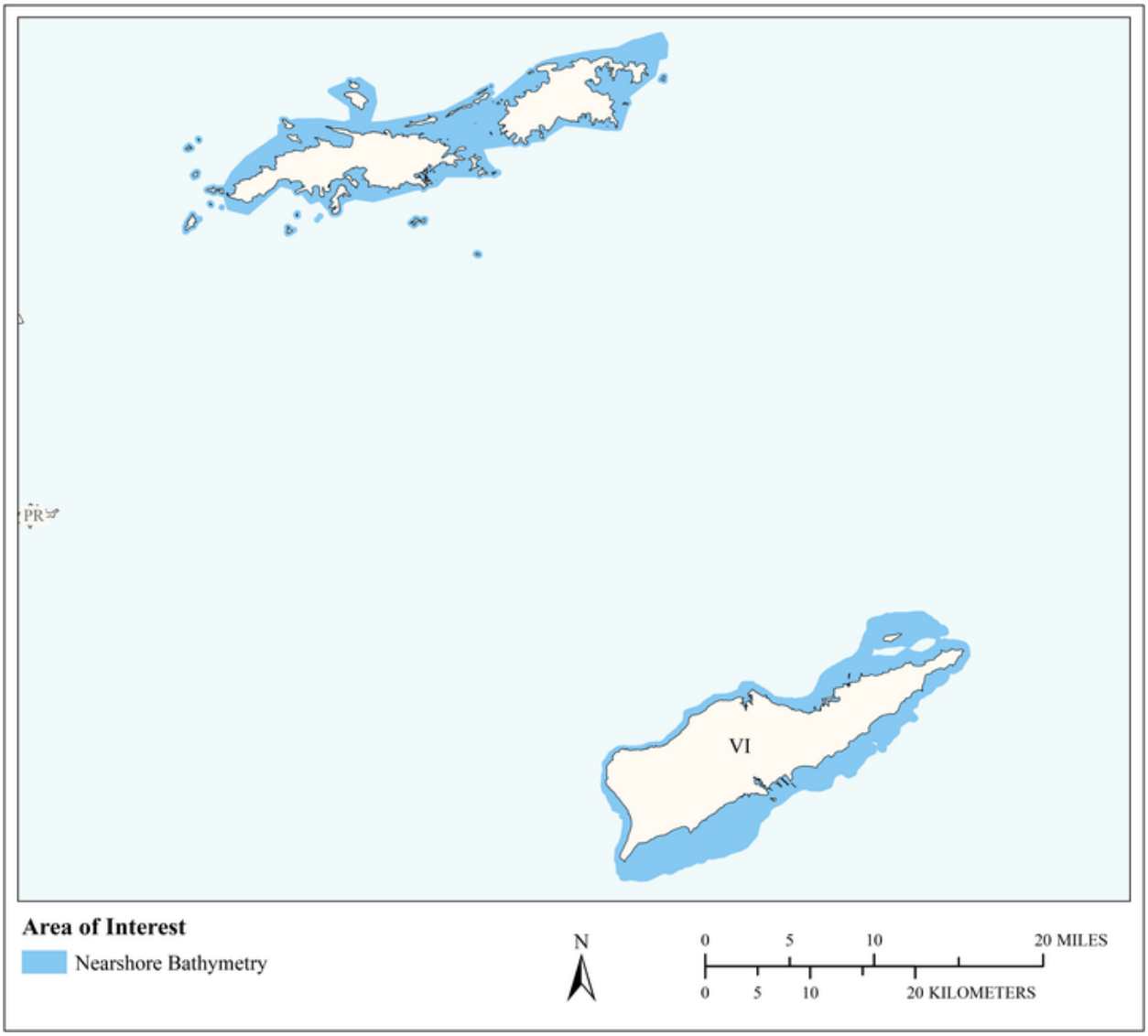
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate		Major	
Improved customer experience	Moderate		Major	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major		Major	
Environmental	Moderate		Major	
Public safety, including life and property	Major		Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide					Major	Unable to provide				
Cost avoidance	Major	Unable to provide					Moderate	Unable to provide				
Increased revenues	Moderate	Unable to provide					Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide					Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$7,045									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide					Major	Unable to provide				
Improved customer experience	Major	Unable to provide					Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate						Major					
Environmental	Moderate						Major					
Public safety, including life and property	Moderate						Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	
Contours	Yes		Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections			Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Marine and Riverine Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type			Required	
Geographic Area Requirements			Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Future plans for the use of hydro drone for bathymetric mapping of estuarine navigation channels. Nautical charting. Bathymetric measurements of nearshore submerged coastal topography. Identification of hazards to navigation. Sediment management at coastal navigation projects. Precision marine navigation. Movement of goods and fishing vessels.
MCA Title	Marine and Riverine Navigation and Safety
MCA ID	60459
Organization Type	State or U.S. Territorial government
Organization Name	Territory of U.S. Virgin Islands
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order			QL0B	
Update Frequency			2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error			Up to 2 meters	
Acceptable Vertical Error			Up to 30 cm	
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season			Nice to have			
Entire AOI under same environmental conditions			Nice to have			
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless			Required			
DEM for entire AOI needs to be seamless			Required			
Amount of acceptable vertical manipulation to achieve spatial seamlessness			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM			Required	
DTM			Required	
DEM			Required	
Raw point cloud data			Required	
Classified point cloud			Nice to have	
Edited/cube XYZ			Highly desirable	
Full waveform			Not required	
Bathymetric Attributed Grid (BAG)			Highly desirable	
Breaklines required for standard hydro-flattening				
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery			Highly desirable	
Ground control/ground truthing			Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery			Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data			Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Highly desirable	
Boundaries			Nice to have	
Routes			Required	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Required	
Floating observation/navigation systems			Required	
Shorelines – current, historic, change rates			Required	
Land use/land cover			Nice to have	
Wetlands			Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features			Highly desirable	
Bridges/culverts				
Landmark features			Nice to have	
Cultural resources			Nice to have	
Coastal and riverine structures			Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings			Minor	
Cost savings/cost reduction			Minor	
Cost avoidance			Minor	
Increased revenues			Minor	
Mission-driven performance improvements			Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services			Minor	

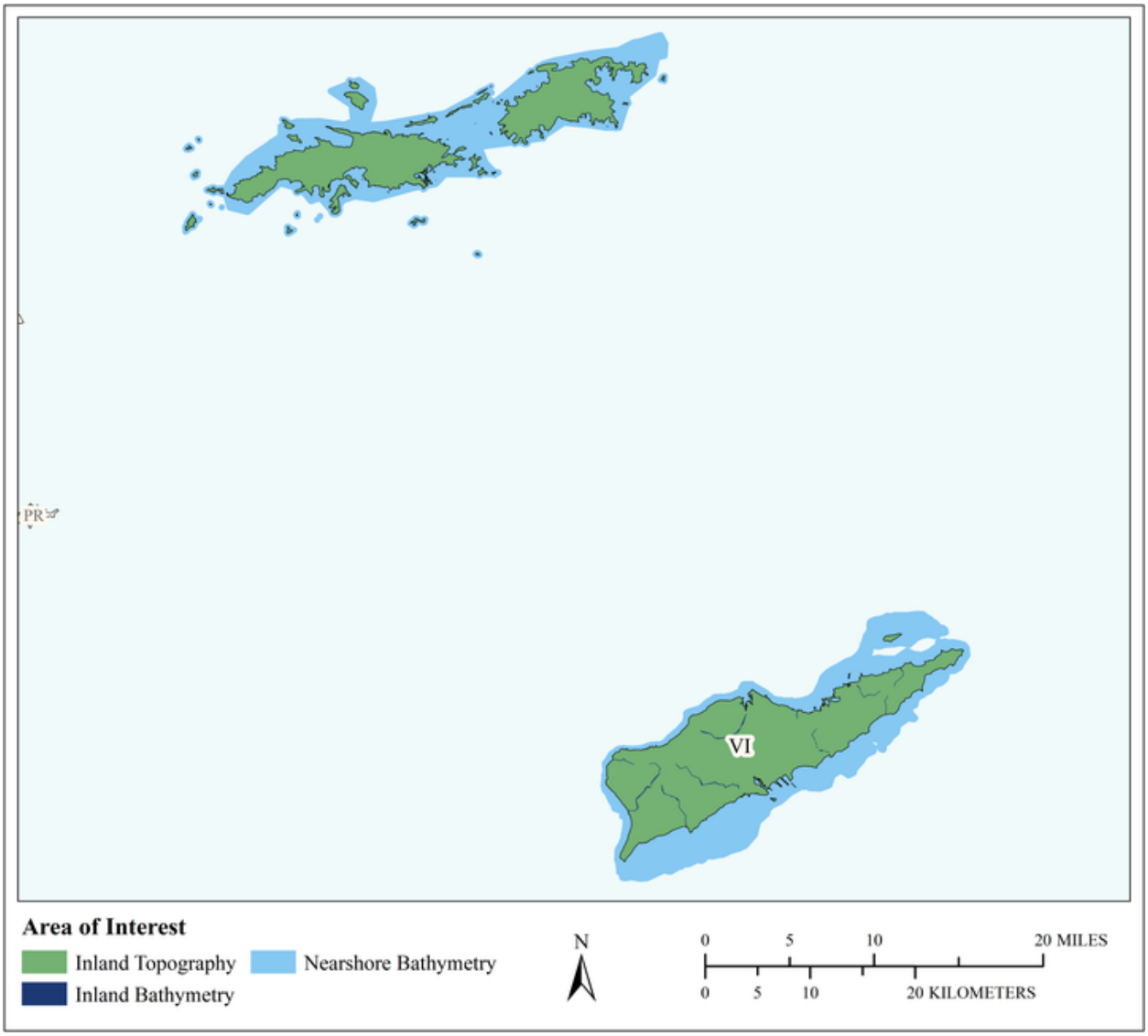
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness			Minor	
Improved customer experience			Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach			Minor	
Environmental			Minor	
Public safety, including life and property			Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings							Moderate	Unable to provide				
Cost savings/cost reduction							Moderate	Unable to provide				
Cost avoidance							Major	Unable to provide				
Increased revenues							Major	Unable to provide				
Mission-driven performance improvements							Major	Unable to provide				
Future annual operational benefits added during validation								Annual dollars saved/ realized	$91,104			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services							Moderate	Unable to provide				
Improved response or timeliness							Major	Unable to provide				
Improved customer experience							Major	Unable to provide				
Future annual customer service benefits added during validation								Annual dollars saved/ realized	$3,084			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach							Minor					
Environmental							Major					
Public safety, including life and property							Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	
Contours			Yes	
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections			Yes	
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)			Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Infrastructure and Construction Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	A continuous topobathy dataset would facilitate coastal planning and infrastructure work along the shoreline. Marine construction. Bridge design and construction. Engineering and construction of dams, levees, dikes, reservoirs, and coastal structures. Shipyard and port construction. Water, sewer, or power line planning and vegetation analysis. Pump, drain, and well placement. Stormwater modeling. Cut and fill analysis for earth-moving. Building site analysis. Road infrastructure. Infrastructure hardening or mitigation for climate change effects, e.g. sea level change.
MCA Title	Infrastructure and Construction Management
MCA ID	60460
Organization Type	State or U.S. Territorial government
Organization Name	Territory of U.S. Virgin Islands
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have

Inland Bathy Feature Size Requirements	Response
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B	QL1B	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Highly desirable	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Nice to have	Nice to have	
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	
Ground control/ground truthing	Required	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Highly desirable	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Nice to have	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Highly desirable	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Required	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	
Cost savings/cost reduction	Major	Major	Minor	
Cost avoidance	Major	Moderate	Minor	
Increased revenues	Minor	None	None	
Mission-driven performance improvements	Moderate	Moderate	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate	Minor	

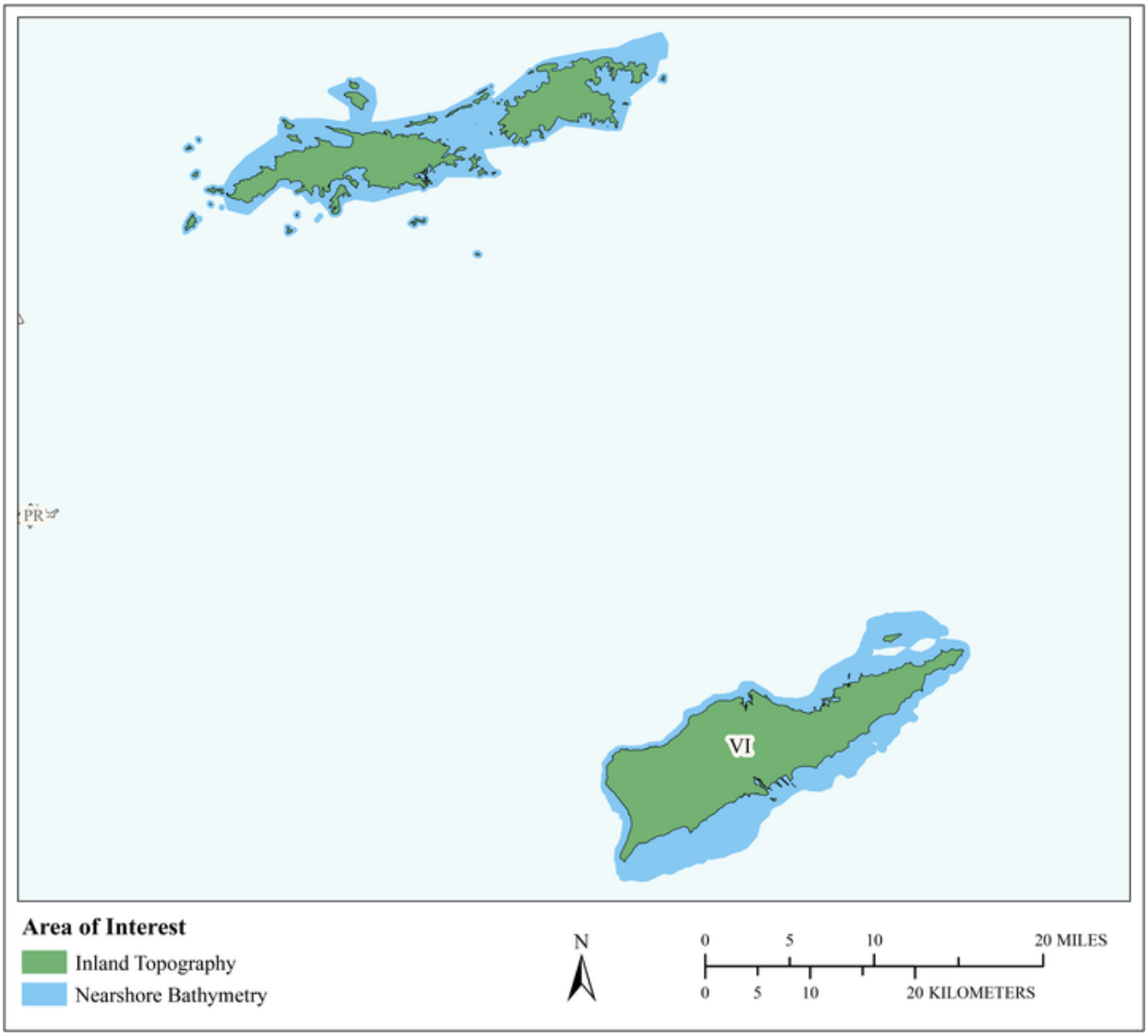
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major	Minor	
Improved customer experience	Moderate	Minor	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	Minor	
Environmental	Moderate	Minor	Minor	
Public safety, including life and property	Moderate	Moderate	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Increased revenues	None			None			Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$6,014		Annual dollars saved/ realized	$2,026		Annual dollars saved/ realized	$2,483			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$17,699		Annual dollars saved/ realized	$210		Annual dollars saved/ realized	$341			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			Minor					
Environmental	Moderate			Moderate			Moderate					
Public safety, including life and property	Major			Moderate			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Land Use Planning and Development



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Building footprints are needed for structure cost per area analysis. Land development and zoning. Municipal mapping of building footprints and elevations. Port resilience planning. Parks and transportation planning. Virtual city creation. Urban ecology planning.
MCA Title	Land Use Planning and Development
MCA ID	1395
Organization Type	State or U.S. Territorial government
Organization Name	GIS Division - US Virgin Islands
Sub-Agency or Division	
Organization Mission	The Geospatial Information Systems Division (GISD) of the Office of the Lieutenant Governor is responsible for providing the critical geospatial backbone for the entire Territory of the United States Virgin Islands. The goal of the GISD is to use the power of modern mapping technologies to improve the Territory's functions and achieve cost savings through increased efficiency, better informed decision making, and enhanced communication. These capabilities have positioned the Office of the Lieutenant Governor as a Caribbean Region leader in the field of GIS in Government Infrastructure.
Program Name	BU 30 - Maritime and Land Boundary Management Delimitation of legal and other coastal boundaries, inland boundaries, and ordinary high water lines (OHWL).
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 30 - Maritime and Land Boundary Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Walls, corals, seagrass, sandy bottom (benthic habitat types)

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD		QL1B	
Update Frequency	2-3 years		2-3 years	
Event type(s)				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm		Less than 50 cm	
Acceptable Vertical Error	Less than 5 cm		Less than 10 cm	
How far onshore needed			To MHW	
How far down the beach profile needed	To MHW		To MHW	
Tide correction requirement			No requirement for tide correction	
Cross sections and/or transects meet needs			Partial	
Cross section/transect requirement			Less than 10 cm Spacing ~100-150 m	

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable		Required			Required
Entire AOI under same environmental conditions	Highly desirable		Not required			Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable		Required			Required
DEM for entire AOI needs to be seamless	Highly desirable		Required			Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required		Required	
DTM	Required		Required	
DEM	Required		Required	
Raw point cloud data	Required		Highly desirable	
Classified point cloud	Nice to have		Nice to have	
Edited/cube XYZ			Nice to have	
Full waveform	Nice to have		Nice to have	
Bathymetric Attributed Grid (BAG)			Nice to have	
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have		Nice to have	
Ground control/ground truthing	Required		Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Not required	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required		Required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Not required	
Submerged features			Not required	
Subbottom characteristics			Not required	
Geologic and seismic data	Highly desirable		Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Not required	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Highly desirable		Highly desirable	
Land use/land cover	Required		Highly desirable	
Wetlands	Highly desirable		Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Highly desirable		Highly desirable	
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable		Highly desirable	
Cultural resources	Highly desirable		Nice to have	
Coastal and riverine structures	Highly desirable		Nice to have	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	NOAA 2014 DEM, older 2010 topo data plus FEMA elevation data. Note that lack of good ground control impacts the ability to reference any elevation data set.		NOAA 2014 DEM out to 50' offshore	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts			Yes	
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes		Yes	
State repositories used	USVI Office of Lt Governor GIS Platform		USVI Office of Lt Governor GIS Platform	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate		None	

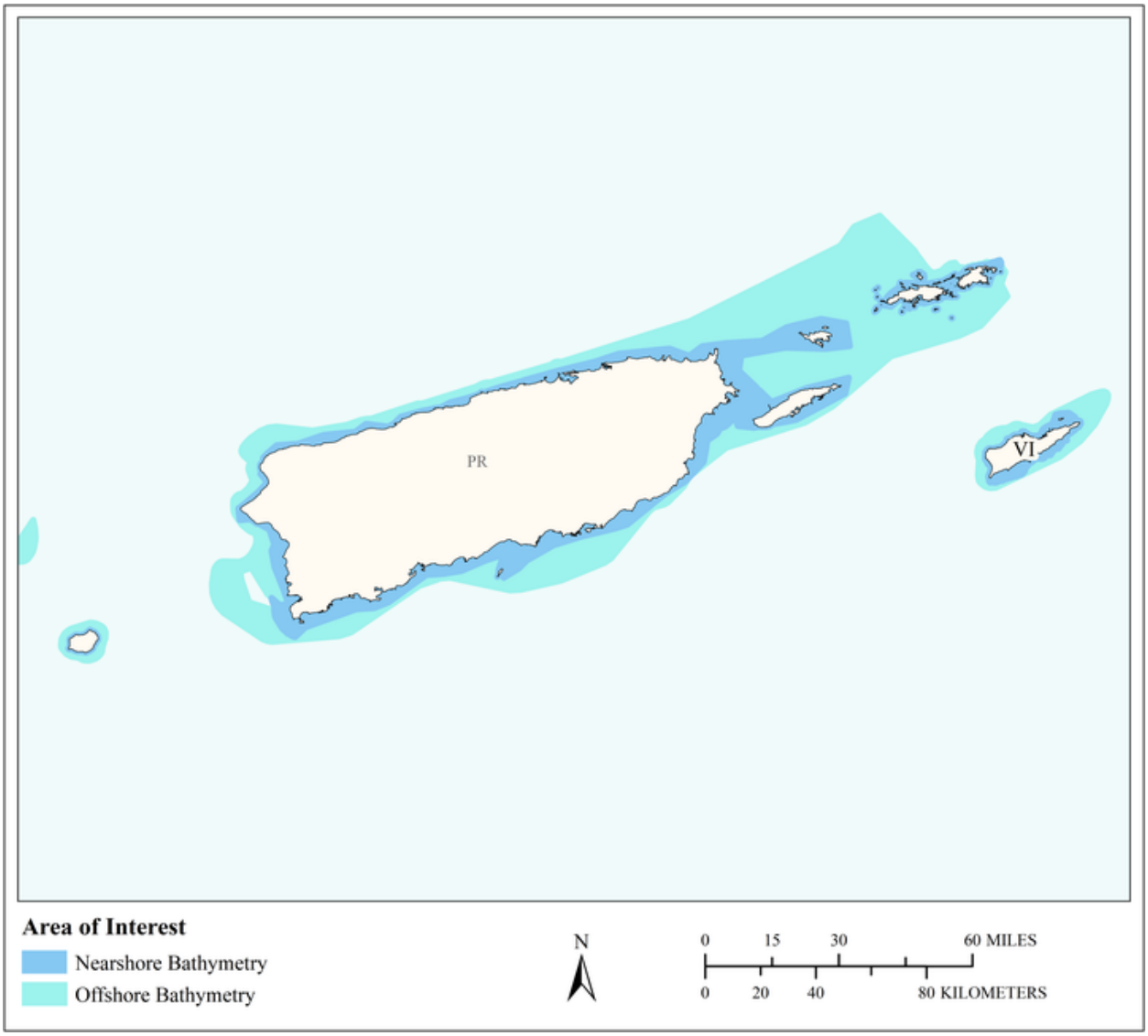
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Cost savings/cost reduction	Moderate		None	
Cost avoidance	Moderate		None	
Increased revenues	Moderate		None	
Mission-driven performance improvements	Moderate		None	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate		None	
Improved response or timeliness	Moderate		None	
Improved customer experience	Moderate		None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate		None	
Environmental	Moderate		None	
Public safety, including life and property	Moderate		None	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					None					
Time savings description	The more data the better, the state makes data available to other users who would benefit as well.											
Cost savings/cost reduction	None						None					
Cost savings/cost reduction description	For dock in Sapphire, had to acquire data.											
Cost avoidance	Moderate	Unable to provide					None					
Increased revenues	None						None					
Mission-driven performance improvements	Major	Unable to provide					None					
Future annual operational benefits added during validation		Annual dollars saved/ realized	$36,008					Annual dollars saved/ realized	$21,752			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Moderate	Unable to provide				
Value added to products or services description	Surveyors, architects, contractors could all benefit from better data.											
Improved response or timeliness	Major	Unable to provide					Major	Unable to provide				
Improved customer experience	Major	Unable to provide					None					
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$4,157					Annual dollars saved/ realized	$22,947			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know						None					
Environmental	I don't know						None					
Public safety, including life and property	I don't know						None					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	
Contours	Yes		Yes	
Hillshades	Yes		Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes		Yes	
Curvature maps	Yes		Yes	
Cross sections	Yes		Yes	
Height-Above-Ground maps	Yes		Yes	
Viewshed maps	Yes		Yes	
Hydrologic Flow Direction Grids	Yes		Yes	
Hydrologic Flow Accumulation Grids	Yes		Yes	
Hydrologic networks (e.g. streams, lakes)	Yes		Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes		Yes	
Building footprints	Yes		Yes	
Breaklines for road edge-of-pavement	Yes		Yes	
Rugosity/Surface Roughness	Yes		Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Coastal Zone Research and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type			Required	Required
Geographic Area Requirements			Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Custom description
Sub Area Requirements				U.S. Virgin Islands out to 200m shelf breakoff

MCA Description	Response
Mission Critical Activity	Ocean circulation modeling to be used in helping students better understand the world's oceans and for use in oceanographic research related to fisheries, and coral reef conservation and management. Data are used for fish habitat modeling and circulation modeling, Given the limited availability of higher resolution bathymetric data, and the bottom substrate characterization in the region, this is a priority for our program due to the difficulty of developing data products and ocean models with Global gridded bathymetry data.
MCA Title	Coastal Zone Research and Management
MCA ID	21602
Organization Type	Academic or Not-for-Profit
Organization Name	University of the Virgin Islands
Sub-Agency or Division	
Organization Mission	The University of the Virgin Islands is a learner-centered institution dedicated to the success of its students and committed to enhancing the lives of the people of the U.S. Virgin Islands and the wider Caribbean through excellent teaching, innovative research, and responsive community service. The University of the Virgin Islands will be an exceptional U.S. institution of higher education in the Caribbean dedicated to student success, committed to excellence, and pledged to enhancing the social and economic transformation of the U.S. Virgin Islands.
Program Name	University of the Virgin Islands - Center for Marine and Environmental Studies
Total Annual Program Budget	
Primary Business Use	BU 26 - Education K12 and Beyond, Basic Research
Secondary Business Use	BU 09 - Fisheries Management and Aquaculture
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Not required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	Aggregated features in nearshore areas out to the continental shelf, including but not limited to bottom topography of coral reefs, seagrass patches, seamounts, mesopelagic reef systems, complex bottom topography in coastal waters, and the continental shelf. Especially out to the first 50 m offshore.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order			Cross sections and/or transects meet needs	Cross sections and/or transects meet needs
Update Frequency			6-10 years	>10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				There would be special order for Shipping Ports and Channels in the region, as well as for sanctuary and marine protected areas which would likely require 5m horizontal accuracy and vertical accuracy w/ event driven updates to data. Out to the 50m dropoff is most important.
Acceptable Horizontal Error			Greater than 20 meters	Greater than 20 meters
Acceptable Vertical Error			Greater than 1 meter	Greater than 20 meters
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed			Below MLLW	
Tide correction requirement			MSL	No requirement for tide correction
Cross sections and/or transects meet needs			Yes	Yes
Cross section/transect requirement			Shorelines within the region are often <1km. Transects 50-100km in a subset of shorelines in the regions would suffice. In nearshore regions > 50m MBES full coverage at the highest spatial extent available would be most preferable.	10-20m vertical accuracy over a with the accuracy to develop any level of sub-1km bathymetric grid to ~200 m would be acceptable. Full bottom coverage is costly and not so feasible.

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season			Not required	Not required		Not required
Entire AOI under same environmental conditions			Not required	Not required		Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless			Highly desirable	Highly desirable		Nice to have
DEM for entire AOI needs to be seamless			Required	Required		Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM			Required	Required
DTM			Required	Highly desirable
DEM			Required	Required
Raw point cloud data			Not required	Nice to have
Classified point cloud			Not required	
Edited/cube XYZ			Nice to have	Nice to have
Full waveform			Nice to have	Not required
Bathymetric Attributed Grid (BAG)			Nice to have	Nice to have

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening				
Additional breaklines for hydro-enforcement of culverts				
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Not required
Intensity imagery/sidescan imagery			Nice to have	Nice to have
Ground control/ground truthing			Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery			Required	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Nice to have	Nice to have
Submerged features			Required	Highly desirable
Subbottom characteristics			Nice to have	Not required
Geologic and seismic data			Highly desirable	Nice to have
Water column properties - Physical			Required	Highly desirable
Water column properties - Chemical			Required	Highly desirable
Water column properties - Biological			Required	Highly desirable
Currents			Required	Required
Tide/wave heights			Required	Required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Nice to have
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Not required	Not required
Lease areas			Not required	Not required
Fixed obstructions			Required	Required
Floating observation/navigation systems			Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates			Highly desirable	
Land use/land cover			Highly desirable	Nice to have
Wetlands			Required	Highly desirable
Estuaries			Highly desirable	Highly desirable
Inland surface water features			Nice to have	
Bridges/culverts				
Landmark features			Nice to have	
Cultural resources			Nice to have	
Coastal and riverine structures			Not required	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used			https://www.ngdc.noaa.gov/mgg/global/etopo2.html	https://www.ngdc.noaa.gov/docucomp/page?xml=NOAA/NESDIS/NGDC/MGG/DEM/iso/xml/301.xml&view=getDataView&header=none
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI			Yes	Yes
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				Yes
State Repositories				
State repositories used				
Data that meet my needs are not available				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings			Minor	Moderate
Cost savings/cost reduction			None	Minor
Cost avoidance			None	Major
Increased revenues			Minor	Minor
Mission-driven performance improvements			Major	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services			Major	Major
Improved response or timeliness			None	Minor
Improved customer experience			Minor	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach			Moderate	Moderate
Environmental			Moderate	I don't know
Public safety, including life and property			I don't know	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings							Major	Annual dollars saved/realized	$101,417	Major	Annual dollars saved/realized	$49,940
Time savings description							Generally we use the best available data and don't spend time on combining bathymetric data unless absolutely necessary. Developing an accurate and useable bathymetric grid for modeling activities would greatly reduce the time in iteratively testing/tuning our ocean circulation models. And save time in identifying Essential Fish Habitat (EFH) used in fisheries management and conservation activities. There is only a limited impact on project management as much of these decisions are made by researchers developing the model. We currently do not have many resources to do field inspections/validations. Improved bathymetric resolution is a major limiting factor on the tuning of the ocean circulation model we use. And would save time in efforts of having to recompile and develop the models.			Time would be saved by reducing the need to do visual inspections/surveys in the permitting process. Much of the limitation in data development would be reduced through saving time in data product development. We use the best data freely available for the region. Improved data would save time in smoothing and compiling the data for our research and outreach products. Accurate bathymetric data for the continental shelf and complicated bathymetry surrounding the islands make successful model development difficult. Some time would be saved in making determinations regarding model development and in developing research plans/hypothesis regarding fisheries management given improved bathymetric data. We very rarely can afford to do offshore field/visual validation.		
Cost savings/cost reduction							I don't know	Unable to provide		None	Annual dollars saved/realized	$60,000
Cost savings/cost reduction description							We currently do not have funding for acquisition of improved bathymetric data, and only use freely available data due to the limited data available in this region.			Costs associated with data validation and field data collection can be reduced.		
Cost avoidance							Moderate	Annual dollars saved/realized	$24,000	Minor	Annual dollars saved/realized	$10,000
Cost avoidance description							Reduced computing costs on cluster computing systems due to lower data processing needs. Although I am unable to quantify this. There are fairly common accidents in nearshore areas due to the high amount of marine boating activities, and common accidents that occur. However it is unclear how much of it would be reduced by improved nearshore 3D bathymetric data. Reduced human work hours used in iterative testing and model development. Because this information has not been studied or quantified for this region after disasters it is hard to quantify.			Time associated with researchers calibrating and developing a model would be reduced.		
Increased revenues							I don't know	Unable to provide		Major	Annual dollars saved/realized	$40,000
Increased revenues description										This would lead to improved data products given an operational model, which could lead to increased research funding which is difficult to quantify and the use of researchers' time to other projects.		
Mission-driven performance improvements							Moderate	Annual percent improvement	20%	Moderate	Annual percent improvement	18%

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Mission-driven performance improvements description							This would reduce much of the time in model development. Circulation modeling is used in several other aspects of our research agenda and improved modeling will increase our ability to conduct successful research. This would increase our ability to conduct ocean circulation modeling, which is a large focus of our research program.			Would aid in education and research programs. Improved understanding of the offshore bathymetry can lead to improved fisheries management and research, as well as circulation modeling research. This could greatly reduce development time for an operational ocean circulation model, a major focus of research, and could improve other research.		
Other operational benefits							Moderate	Unable to provide				
Other operational benefits description							This can improve our models and lead to increased funding opportunities if successfully funded.					
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services							Major	Annual dollars saved/realized	$28,492	Moderate	Annual dollars saved/realized	$56,984
Value added to products or services description							See above answer. Improved bathymetric data could lead to a fully operational circulation model for the USVI, aiding in the success of other research and management applications. And possibly a product to be used by stakeholders in the region.			Lack of high resolution bathymetric data is a major limiting factor towards improved data products made by our research program, for coastal and offshore waters surrounding the region. Better/improved satellite data products, improved ocean circulation products. And use of researcher time toward other projects.		
Improved response or timeliness							Major	Annual dollars saved/realized	$12,211	Minor	Annual dollars saved/realized	$9,769
Improved response or timeliness description							This would aid in the development of more accurate and useful data products for stakeholders in the region. Including wave and current predictive data products, and ocean circulation models used in research.			Not much of a limiting factor in time for permits from local and federal agencies. But would likely reduce requirements like visual inspections. Improved operational products would be available to stakeholders.		
Improved customer experience							Moderate	Annual dollars saved/realized	$28,492	Major	Annual dollars saved/realized	$4,070
Improved customer experience description							Most stakeholders are not aware of the limitations of the data/accuracy and used the best provided. However the research usage would greatly improve for our data products and services. An improved ocean circulation model.			Development of an operational model for the region would improve and help develop a lot of new products. Due to a limited number of products available to stakeholders for this region, data accuracy would only have a minor increase in customer confidence/use.		
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach							Minor			Moderate		
Education or outreach description							Improved tools for teaching students and stakeholders about oceanographic processes, and for stakeholder decision making regarding operational decision.			Improved ability to teach students and stakeholders using more accurate data visualizations and products. Improved management uses.		
Environmental							I don't know			Minor		
Public safety, including life and property							Minor			Minor		
Public safety, including life and property description							Improved maps and predictive tools would likely become available in the region for disaster mitigation and recovery					
Other												
Other benefits							Minor					
Other description							Improved stakeholder support and possibly local funding due to improved data products/services.					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours			Yes	Yes
Hillshades			Yes	Yes
Slope maps			Yes	Yes
Aspect maps			Yes	Yes
Curvature maps			Yes	Yes
Cross sections			Yes	Yes
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

Utah

Current status of elevation data for Utah

Data and funding are limited within Utah as state funds are not available for lidar acquisition necessary to improve the quality of various datasets. However, the Utah Automated Geographic Reference Center (AGRC) and the Utah Geological Survey completed a Statewide Lidar Plan (https://gis.utah.gov/statewide-lidar-plan-for-utah/) in 2015, with input from other federal, state, and local agencies; Utah universities; and non-governmental organizations within the state with "the overall goal of our efforts is to have LiDAR data, in varying levels of quality, covering every foot of this Great State of Utah."

Utah's total land area is approximately 84,869 square miles. Various lidar datasets date back to 2001. With no direct state funds dedicated to the regular acquisition of lidar, data coverage is limited and is dependent on independent program or agency funding. Currently there are about 24,692 square miles of *USGS Lidar Base Specifications* Quality Level 1 (QL1) and QL2 lidar from previous years that were acquired through USGS 3DEP Program Cooperative Agreements with the State of Utah. In 2020, approximately 38,300 square miles of new lidar data are being collected, leaving about 21,877 square miles remaining to be acquired statewide.

Utah is comprised of 64% federal land, of which 42% is BLM and 15% is USFS-administered land. After the 2020 acquisitions are completed, 83% (~18,233 square miles) of the remaining area to acquire are federal lands and only 4% (~927 square miles) are non-federal/privately-owned land. The remaining 12% to acquire are state (~1,677 square miles) and tribal (~1,040 square miles) lands. The disproportionate difference between federal and private lands in Utah creates significant difficulty in creating additional local funding partnerships. As a result, additional funding from federal agencies is critical in completing lidar coverage of Utah.

Major funding partners include:

- National Park Service
- Natural Resources Conservation Service
- U.S. Environmental Protection Agency
- U.S. Forest Service, Intermountain Region
- U.S. Geological Survey, Earthquake Hazards and 3DEP Programs
- Utah Department of Natural Resources, Forestry, Fire and State Lands
- Utah Department of Natural Resources, Utah Division of Water Resources
- Utah Department of Natural Resources, Utah Geological Survey
- Utah Department of Public Safety, Division of Emergency Management
- Utah Department of Workforce Services, Housing & Community Development Division, Utah Community Development Office
- Various cities, counties, non-governmental organizations, and private companies

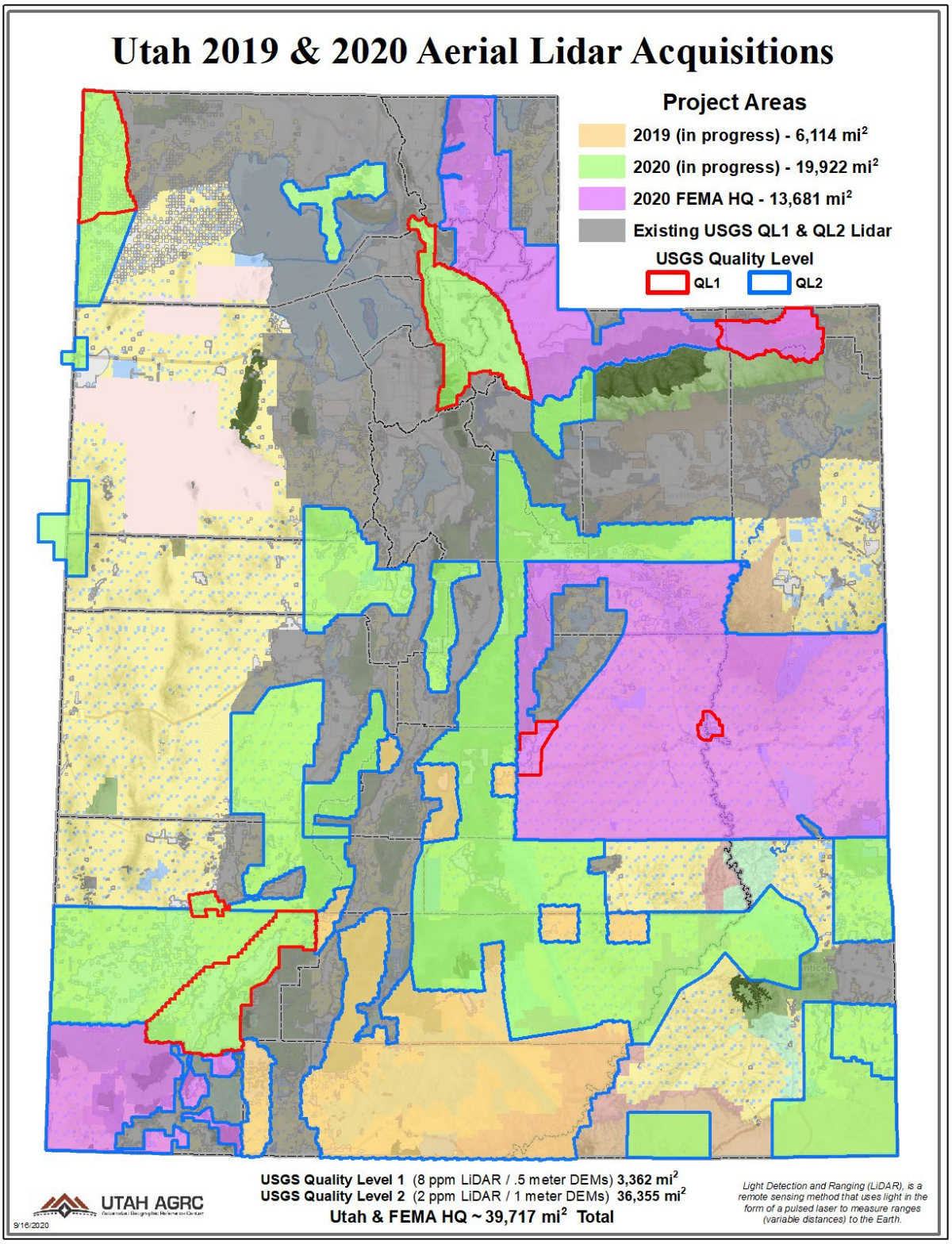


Figure 1. Utah 2019 and 2020 Aerial Lidar Acquisitions

Importance of elevation data to Utah

Elevation data are used by various entities throughout the state as detailed below:

Department of Public Safety, Division of Emergency Management: Emergency Management, Hazard Mitigation, FEMA Risk MAP, flood risk modeling, and inundation mapping. A significant percentage of Utah's population lives in areas susceptible to flooding, but much of this flood risk is not identified. This is especially true along intermittent streams. Due to Utah's high susceptibility of flash flooding, these areas are becoming increasingly more important to map. High-resolution elevation data will allow Utah's Risk MAP Program to map flood risk areas not yet identified and revise current flood risk information that use outdated elevation data to better define the risk. Other areas that can be improved are areas of increased flood risk and debris flows after wildfires.

Natural Resources Conservation Service: Hydraulic and water quality modeling and planning environmental restoration efforts.

U.S. Forest Service: Support multiple business and resource areas including forest resources management, wildfire planning and response, watersheds, soils, geology, wetlands, vegetation management, restoration, engineering, mapping, wildlife habitat management, and other programs.

Utah Department of Natural Resources, Utah Geological Survey: Geologic, geologic hazard (landslides, rockfall, flooding, surface fault rupture, etc.), and wetland mapping; hazard investigation and mitigation; local government geologic support; geothermal energy resource development; and geologic emergency response statewide.

Utah Department of Natural Resources, Forestry, Fire and State Lands: Wildfire management, boundary delineation, maritime and land boundary management, riverine ecosystem management, coastal zone management, forest resources management, natural resources conservation, wildfire management, planning and response, and marine and riverine navigation and safety.

Utah Department of Natural Resources, Utah Division of Water Resources: Construction design, dam rehabilitation, dam safety, and pipelines.

Utah Community Development Office: Providing communities with the appropriate GIS data, maps, and/or information to aid municipal management and informed decision making. Coordination and facilitation to help rural communities become self-reliant, self-determined, and prepared for the future.

Bear River Association of Governments: Regional and local community planning assistance (in addition to many other non-planning related activities).

National Park Service: Resource inventory and management.

Various cities, counties, non-governmental organizations, and private companies: Urban and development planning and design; regional land use and transportation planning; slope stability ordinances, modeling, and design; telecommunications line-of-sight modeling; feature extraction including building footprints and tree canopies; river resource management, viewshed analysis; mountain resort planning, development, and operation; and flood mitigation.

Higher Education: Land cover mapping and modeling with a primary focus of assessing long-term rangeland/arid lands health in the western U.S., river/channel system monitoring and recovery, wildlife/habitat management with the goal of supporting local management agencies, bioregional/regional planning including urban/wildland interfaces, wildfire fuel mapping, forest health assessment, forest and

rangeland fire severity assessment, firefighter safety zone, escape route mapping, and evacuation planning.

Other uses of elevation data include: water supply and quality, riverine ecosystem management, forestry resources management, rangeland management, natural resources conservation, wildlife and habitat management, agriculture, fisheries management, geologic assessment and hazard mitigation, geologic resource mining, renewable resources management, oil and gas resources, sea level rise and subsidence, aviation navigation, insurance, education, recreation, and telecommunications.

High-level summary of elevation data requirements

Utah has a highly variable landscape with significant relief changes, mountains, forests, deserts, valley floors, and canyonlands. For much of the remaining areas in Utah, QL2 lidar would meet the needs of the state; however, QL1 lidar is highly desired as it provides a more detailed dataset and allows for more uses outside of those originally intended. In the forested areas of the state, the USFS requires QL1 and additional specifications outside of the *USGS Lidar Base Specifications* that include a ≥50% swath overlap and a scan angle ≤±20° of nadir. QL1B topobathy lidar is needed for the Great Salt Lake, Utah Lake, and Bear Lake for mapping of sub-aqueous hazardous faults that may cause tsunamis and/or seiches impacting populated areas, and mapping of other features for land-use and environmental planning, geologic research, etc. Inland topographic data should be updated every 4-5 years and inland bathymetric data requires updates every 6-10 years.

High-level summary of benefits that would come from higher resolution elevation data

Great Salt Lake business potential from brine shrimp, salt extraction, recreation, and wildlife habitat conservation is about $1 billion. Note that lake levels in the Great Salt Lake fluctuate with climate change and understanding shoreline change is important to many activities. Utah is one of the fastest growing states in the nation and higher resolution elevation data would directly support urban development in providing detailed elevation data for site grading plans, etc.

Additional comments

Due to the large difference in size between federally administered and non-federal/private lands in Utah, significant, additional funding from federal agencies is critical in completing lidar elevation data coverage of Utah. As a result, the required 25% non-federal match and ≤50% USGS funding requirements should be waived in these cases.

The State of Utah has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	State of Utah	60461	Water Supply and Quality	Inland Topo	QL2	4-5 years	$463,469	$124,142	Moderate	Major	Moderate
BU 02 – Riverine Ecosystem Management	State of Utah	60462	Riverine Ecosystem Management	Inland Topo	QL1 HD	6-10 years	$127,944	$12,779	Major	Major	Major
BU 04 – Forest Resource Management	State of Utah	60463	Forest Resources Management	Inland Topo	QL1	2-3 years	$330,495	$479,091	Major	Major	Major
BU 05 – Rangeland Management	Utah State University	1159	Land Cover Mapping and Modeling	Inland Topo	QL1	4-5 years	$277,285	$163,315	Major	Major	Major
				Inland Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 05 – Rangeland Management	State of Utah	60464	Rangeland Management	Inland Topo	QL2	Annually	Unable to quantify	Unable to quantify	Minor	Major	I don't know
BU 06 – Natural Resource Management	State of Utah	60465	Natural Resources Conservation	Inland Topo	QL1 HD	4-5 years	$3,278,607	$12,040,046	Major	Major	Major
BU 07 – Wildlife and Habitat Management	State of Utah	60466	Wildlife and Habitat Management	Inland Topo	QL2	4-5 years	$19,911	$57,509	Moderate	Major	Moderate
BU 08 – Agriculture	State of Utah	60467	Agriculture and Precision Farming	Inland Topo	QL2	2-3 years	$96,778	$76,722	Major	Major	Minor
BU 09 – Fisheries Management and Aquaculture	State of Utah	60468	Fisheries Management and Aquaculture	Inland Topo	QL2	2-3 years	$85,444	$185,593	Moderate	Moderate	Moderate
BU 10 – Geologic Assessment	State of Utah	60469	Geologic Assessment and Hazard Mitigation	Inland Topo	QL1	4-5 years	$17,644,815	$309,754	Major	Major	Major
BU 11 – Geologic Resource Extraction	State of Utah	60470	Geologic Resource Mining and Extraction	Inland Topo	QL1 HD	2-3 years	$20,418	$13,544	Minor	Major	Major

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 12 – Renewable Energy Resources	State of Utah	60471	Renewable Energy Resources	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	None
BU 13 – Oil and Gas Resources	State of Utah	60472	Oil and Gas Resources	Inland Topo	QL1	Annually	$36,688	Unable to quantify	Minor	Major	Major
BU 15 – Flood Risk Management	Utah Department of Public Safety, Division of Emergency Management	1172	Flood Risk Modeling and Mapping	Inland Topo	QL2	4-5 years	$3,100,000	Unable to quantify	I don't know	I don't know	I don't know
				Inland Bathy	Cross sections and/or transects meet needs	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 16 – Sea Level Rise and Subsidence	State of Utah	60473	Sea Level Rise and Subsidence	Inland Topo	QL1 HD	4-5 years	$4,400,751	Unable to quantify	Moderate	Moderate	Moderate
BU 17 – Wildfire Management	University of Utah	21555	Wildfire Management, Fire Safety, and Forest Health	Inland Topo	QL1	4-5 years	$1,809	Unable to quantify	Major	Major	Major
BU 18 – Homeland Security	Utah Geological Survey	1126	Geologic Support and Emergency Response	Inland Topo	QL1	4-5 years	$3,779,745	$43,583	Major	Moderate	Major
				Inland Bathy	QL0B	6-10 years	$13,462	$858	Major	Moderate	Major
BU 19 – Land Navigation	Utah Department of Transportation	22429	Transportation Design and Maintenance	Inland Topo	QL0	Annually	$1,082,844	$87,445	Minor	Major	Major
BU 21 – Aviation Navigation	State of Utah	60474	Aviation Navigation and Safety	Inland Topo	QL1 HD	Annually	$282,576	$351,939	Minor	Moderate	Moderate
BU 22 – Infrastructure Management	Utah Division of Water Resources	22103	Water Resources Construction Design	Inland Topo	QL2	6-10 years	$3,756,472	$11,054,540	None	I don't know	I don't know
				Inland Bathy	QL2B	6-10 years	$1,265,615	$131,419	None	None	None
BU 23 – Urban and Regional Planning	Bear River Association of Governments (Utah)	21866	Regional and Local Community Planning Assistance	Inland Topo	QL1	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 23 – Urban and Regional Planning	Utah Department of Workforce Services	32859	Statewide Geospatial Data Provisioning	Inland Topo	QL2	2-3 years	$22,490,572	$2,596,546	Moderate	Minor	Minor
				Inland Bathy	QL1B	6-10 years	$916,001	$1,158,821	Moderate	Moderate	Major

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 25 – Real Estate, Banking, and Insurance	State of Utah	60475	Real Estate, Banking, Mortgage, and Insurance	Inland Topo	QL1 HD	4-5 years	$2,904,336	Unable to quantify	Minor	Minor	Major
BU 26 – Education and Basic Research	State of Utah	60476	Education K12 and Beyond, Basic Research	Inland Topo	QL1 HD	2-3 years	$439,270	$1,049,984	Major	Major	Major
BU 27 – Recreation	State of Utah	60477	Recreation	Inland Topo	QL1	4-5 years	$19,180	Unable to quantify	Moderate	Moderate	Moderate
BU 28 – Telecom-munications	State of Utah	60478	Telecommunications	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 30 – Maritime and Land Boundary Management	Utah Department of Natural Resources, Division of Forestry, Fire, and State Lands	1169	Wildfire, Forestry, and Sovereign Lands Management	Inland Topo	QL1	>10 years	$94,320	$360,854	Major	Moderate	I don't know
				Inland Bathy	QL2B	>10 years	$71,939	Unable to quantify	Major	Major	Moderate

MCA Title: Water Supply and Quality

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Fate and transport of contaminants. Pollution risk mitigation. Runoff and sedimentation analyses. Point- or non-point source pollution modeling. Management of contaminants and marine debris - point, non-point, vessel, and atmospheric pollution; spills; trash.
MCA Title	Water Supply and Quality
MCA ID	60461
Organization Type	State or U.S. Territorial government
Organization Name	State of Utah
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$463,469									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$124,142									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Major											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Riverine Ecosystem Management

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Stream channel analysis and mapping. Stream bank erosion analysis. Aquatic and terrestrial species habitat management. Environmental management.
MCA Title	Riverine Ecosystem Management
MCA ID	60462
Organization Type	State or U.S. Territorial government
Organization Name	State of Utah
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$127,944									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$12,779									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Forest Resources Management

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Forest health assessment. Determination of standing inventory of forest resources. Prescribed burn planning. Analysis of carbon stocks for trade. Harvest systems planning.
MCA Title	Forest Resources Management
MCA ID	60463
Organization Type	State or U.S. Territorial government
Organization Name	State of Utah
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Highly desirable			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

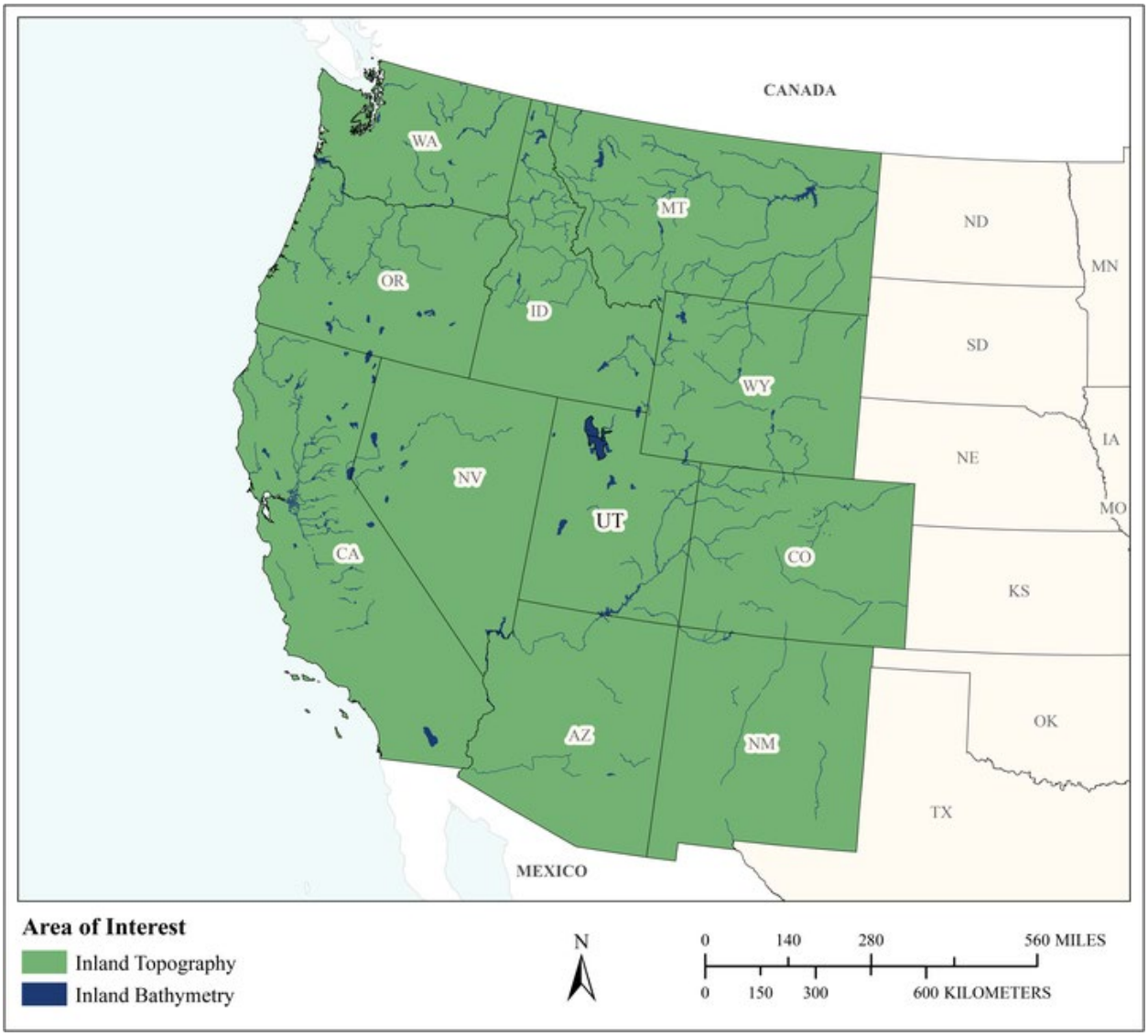
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$330,495									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$479,091									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Land Cover Mapping and Modeling



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	The MCA of Utah State University varies widely between researchers and departments. However, the key MCAs are land cover mapping and modeling with a primary focus of assessing long-term rangeland/arid lands health in the western US. Further, the University would also be keen to identify other MCAs such as river/channel system monitoring and recovery, wildlife/habitat management with the goal of supporting local management agencies, bioregional/regional planning including urban/wildland interfaces.
MCA Title	Land Cover Mapping and Modeling
MCA ID	1159
Organization Type	Academic or Not-for-Profit
Organization Name	Utah State University
Sub-Agency or Division	
Organization Mission	The mission of Utah State University is to be one of the nation's premier student-centered land-grant and space-grant universities by fostering the principle that academics come first, by cultivating diversity of thought and culture, and by serving the public through learning, discovery, and engagement.
Program Name	The primary program supported by the MCAs is the Quinney College of Natural Resources. As an educational institution, the use and application of these data are wide ranging and therefore are not specifically definable by a single program name.
Total Annual Program Budget	
Primary Business Use	BU 05 - Rangeland Management
Secondary Business Use	BU 06 - Natural Resources Conservation
Tertiary Business Use	BU 02 - Riverine Ecosystem Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Small features such as small incised channels in desert systems, <2m in width. Pinch points in small streams to identify backwater areas.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have

Inland Bathy Feature Size Requirements	Response
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Highly desirable
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B		
Update Frequency	4-5 years	2-3 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI	Different use cases require different levels. Small riverine areas may require QL0 w/ updates occurring on a two-year basis; whereas, land cover mapping in arid lands is sufficiently serviced by QL1 data updated every 4-5 years.			
Acceptable Horizontal Error	Less than 20 cm	Up to 1 meter		
Acceptable Vertical Error	Up to 10 cm	Up to 20 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable

Hydrologic Processing Required	Response
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Required	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Required			Required	
DEM for entire AOI needs to be seamless	Highly desirable	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Highly desirable	Highly desirable		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Highly desirable		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Nice to have	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Highly desirable		
Land use/land cover	Required	Required		
Wetlands	Required	Required		
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Large area mapping efforts have relied largely on 10-m DEM products from USGS (NED). However, specific projects with limited AOIs have relied on 3rd-party collected LiDAR data OR data collected by UAS platforms (primarily DSM generated from digital photogrammetry methods). These sources, excluding UAS generated data are better than QL1.	Whatever is available		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography	Yes			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server		Yes		
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	Utah Automated Geographic Reference Center (AGRC) www.gis.utah.gov	Utah Automated Geographic Reference Center		
Other	Yes			
Other description	Project-specific collected data sets (in-house)			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Major		
Cost savings/cost reduction	Moderate	Moderate		
Cost avoidance	Moderate	Moderate		
Increased revenues	Minor	Moderate		
Mission-driven performance improvements	Moderate	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate		
Improved response or timeliness	Major	Major		
Improved customer experience	Major	Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major		
Environmental	Major	Major		
Public safety, including life and property	Minor	Major		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$57,285	Major	Unable to provide							
Time savings description	Analysis ready data is being shown to improve overall efficiency (e.g. Landsat). Effective and available 3d terrain improves model development and reduces excess efforts required to attain such data. Small projects completed in less time (no data processing) will save some time. Not as many hours, but this is an important process that can save critical hours. Time not spent on the ground conducting verification of elevation data.			Effective and available 3d terrain improves model development and reduces excess efforts required to attain such data. Time not spent on the ground conducting verification of elevation data.								
Cost savings/cost reduction	Major	Annual dollars saved/realized	$150,000	Moderate	Unable to provide							
Cost savings/cost reduction description	Depending on data that becomes available, this could be a major savings (e.g. no contracting for these services).											
Cost avoidance	Major	Annual dollars saved/realized	$70,000	Major	Unable to provide							
Cost avoidance description	An estimate based on the number of projects underway in 2017 that required this effort.											
Increased revenues	Moderate	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements	Major	Annual percent improvement	50%	Major	Unable to provide							
Mission-driven performance improvements description	If excellent 3d data was available, a full 50% increase in the ability to carry out our organizational mission would be realized. Improvements will vary by project. We would realize at least a 50% improvement in overall effectiveness. Improvements will vary by project.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$115,075	Major	Unable to provide							
Value added to products or services description	Enhanced completion of projects would result in more projects realized. Reduces post/pre-processing.											
Improved response or timeliness	Major	Annual dollars saved/realized	$40,702	Moderate	Unable to provide							
Improved response or timeliness description	Reduced time spent searching/prepping for data. Data available when needed is important. Improved turn-around for mapping of wildland fire incidents (specifically flash-floods post fire). Analysis ready data is critical in rapid response efforts.											
Improved customer experience	Major	Annual dollars saved/realized	$7,538	Major	Unable to provide							
Improved customer experience description	Data availability (on-demand) and rapid download speeds are critical to time/project cost savings. With new data comes new opportunities. Once the data is proven out, customer confidence will improve.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Education or outreach description	Teaching and outreach to local, state, and regional customers.			
Environmental	Major	Major		
Environmental description	Better topographical data means improved overall environmental decisions with shorter turn-around.			
Public safety, including life and property	Major	Major		
Public safety, including life and property description	Better topographical data means improved overall public safety decisions with shorter turn-around.			

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps	Yes	Yes		
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Rangeland Management

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Assessment of rangeland health. Mapping for soil erosion potential due to grazing.
MCA Title	Rangeland Management
MCA ID	60464
Organization Type	State or U.S. Territorial government
Organization Name	State of Utah
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 05 - Rangeland Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Highly desirable			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Not required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None			
Cost savings/cost reduction	None			
Cost avoidance	None			
Increased revenues	None			
Mission-driven performance improvements	None			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	None			
Improved customer experience	None			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	None			
Public safety, including life and property	None			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	None											
Cost avoidance	Minor	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Natural Resources Conservation

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation engineering. Soils and wetlands mapping and characterization. Modeling of biological and ecological systems. Erosion control. Rainfall penetration studies, impervious surfaces. Assessment of blue carbon stocks.
MCA Title	Natural Resources Conservation
MCA ID	60465
Organization Type	State or U.S. Territorial government
Organization Name	State of Utah
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$3,278,607									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$12,040,046									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Wildlife and Habitat Management

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation planning for wildlife refuges and marine sanctuaries. Conservation of critical habitats. Management of diverse migratory bird habitats, coral reef and coral communities, marine mammals, protected fish species, and trust resources.
MCA Title	Wildlife and Habitat Management
MCA ID	60466
Organization Type	State or U.S. Territorial government
Organization Name	State of Utah
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Moderate			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Minor	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$19,911									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$57,509									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Major											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Agriculture and Precision Farming

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Farm pond design. Irrigation system design. Detailed site analysis to support precision farming. Analysis of farm sedimentation and runoff. Calibration of fertilizer application, fertilizer management, and irrigation planning. Optimized terraforming.
MCA Title	Agriculture and Precision Farming
MCA ID	60467
Organization Type	State or U.S. Territorial government
Organization Name	State of Utah
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 08 - Agriculture and Precision Farming
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$96,778									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$76,722									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Minor											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Fisheries Management and Aquaculture

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Management of fisheries. Sustainable aquaculture.
MCA Title	Fisheries Management and Aquaculture
MCA ID	60468
Organization Type	State or U.S. Territorial government
Organization Name	State of Utah
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Moderate			
Increased revenues	Moderate			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$85,444									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$185,593									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Moderate											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic Assessment and Hazard Mitigation

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Geologic mapping and analysis. Sinkhole and steephead mapping, monitoring, and analysis. Identification of geomorphologic units. Landslide hazard mapping and assessment. Karst mapping, including springs and caves. Aquifer recharge.
MCA Title	Geologic Assessment and Hazard Mitigation
MCA ID	60469
Organization Type	State or U.S. Territorial government
Organization Name	State of Utah
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$17,644,815									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$309,754									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic Resource Mining and Extraction

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Onshore or offshore mineral extraction. Monitoring sand as a local resource. Seabed resources. Open mine volume computations. Stockpile analysis. Environmental impact assessment and site restoration.
MCA Title	Geologic Resource Mining and Extraction
MCA ID	60470
Organization Type	State or U.S. Territorial government
Organization Name	State of Utah
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 11 - Geologic Resource Mining and Extraction
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Minor	Unable to provide										
Cost avoidance	Minor	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$20,418									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$13,544									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Renewable Energy Resources

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Alternate energy development – solar, tidal, wind, wave, and ocean current. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Low head power potential for hydropower.
MCA Title	Renewable Energy Resources
MCA ID	60471
Organization Type	State or U.S. Territorial government
Organization Name	State of Utah
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Not required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Minor			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	None											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Oil and Gas Resources

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Oil and gas exploration and production. Pipeline and route selection. Facility siting to mitigate geologic hazards. Construction planning. Environmental impact assessment and mitigation. Regulatory compliance.
MCA Title	Oil and Gas Resources
MCA ID	60472
Organization Type	State or U.S. Territorial government
Organization Name	State of Utah
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 13 - Oil and Gas Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to triple the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Nice to have			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Minor			
Cost avoidance	Minor			
Increased revenues	None			
Mission-driven performance improvements	Minor			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

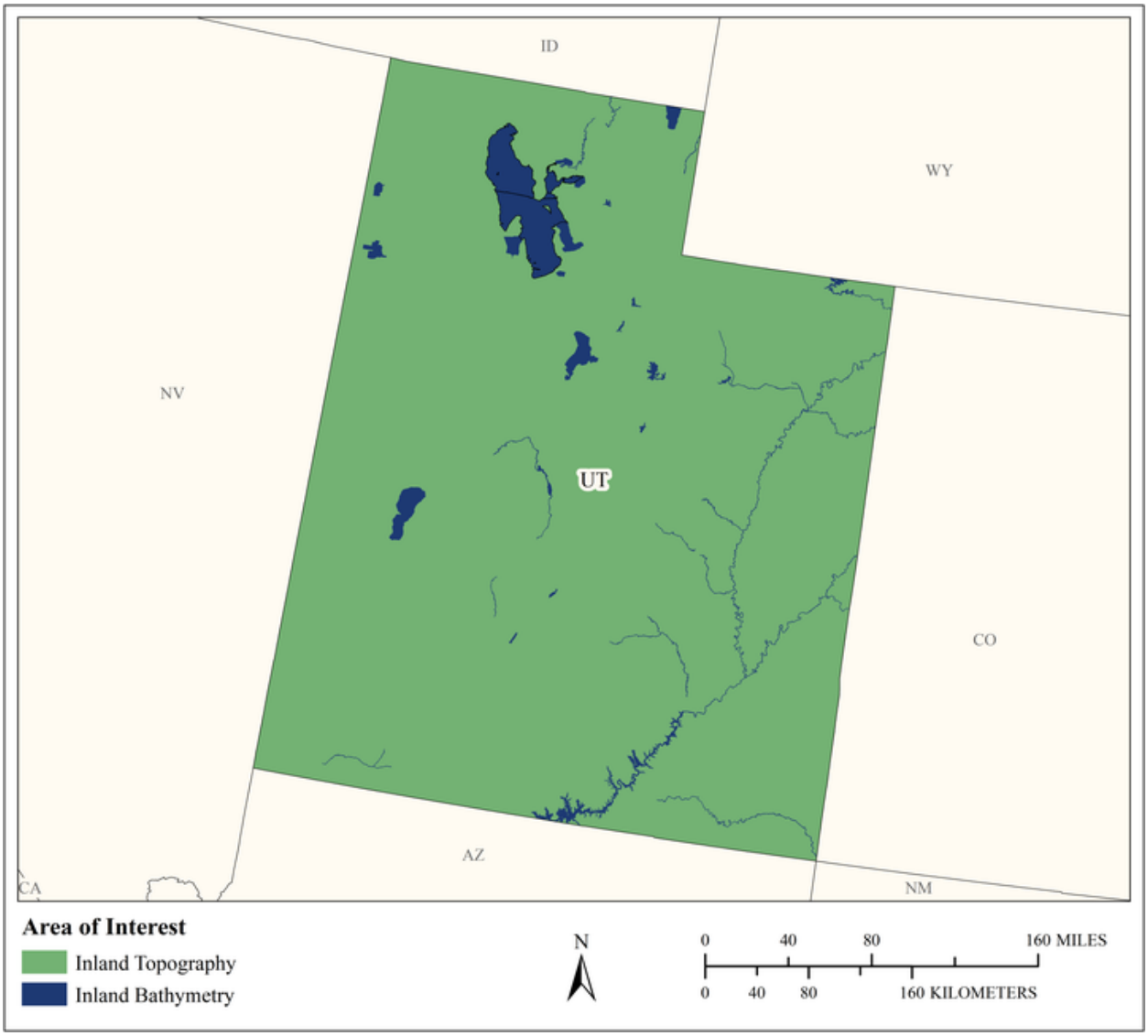
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$36,688									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Flood Risk Modeling and Mapping



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Although there are several Mission Critical Activities within the Utah Division of Emergency Management, the program that I am responsible for includes flood risk modeling and inundation mapping of riverine and lake areas used for floodplain management purposes (BU15). We are in inland state, but to date, have one coastal area identified around the Great Salt Lake due to high wind fetch)
MCA Title	Flood Risk Modeling and Mapping
MCA ID	1172
Organization Type	State or U.S. Territorial government
Organization Name	Utah Department of Public Safety, Division of Emergency Management
Sub-Agency or Division	
Organization Mission	"To unite the emergency management community and to coordinate the efforts necessary to mitigate, prepare for, respond to and recover from emergencies, disasters and catastrophic events."
Program Name	The Utah Risk MAP Program. Our Office is a Cooperating Technical Partner (CTP) with FEMA's Risk Mapping Assessment and Planning (Risk MAP) program.
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Not required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	With flood inundation mapping, we would like to see features that would obstruct the flow of water such as buildings, bridges, culverts, roads, etc. down to the smallest feature possible to obtain more accurate flood inundation models. It was not identified in the responses above, but it is highly desirable to obtain Lowest Adjacent Grade of these large features as well, specifically buildings/ structures. Underwater surface or features that affect H&H modeling.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have

Inland Bathy Feature Size Requirements	Response
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	Cross sections and/or transects meet needs		
Update Frequency	4-5 years	4-5 years		
Event type(s)				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI	The state has acquired LiDAR the last couple of years, but a good portion of the state does not have updated topography information. We also currently do not have a plan to update what was recently collected as there is no state funds available for the update. CNMS review is done every 5 years. Lidar is needed for all flood mapping, especially where none exists. QL1 will be needed in some areas in the future. Also, need pre- and post-event lidar for before/after emergency response comparison, even if not Federally declared. For example, for better debris flow estimation after fires.			
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 30 cm	Up to 50 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs		Yes		

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross section/transect requirement		For floodplain mapping, typically cross section may be 1000 feet apart in open reaches, with additional cross section immediately upstream and downstream of hydraulic structures (culverts, bridges, weirs, etc.)		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Required	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Required	Required		
Classified point cloud	Required	Required		
Edited/cube XYZ		Highly desirable		
Full waveform	Nice to have	Highly desirable		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Highly desirable		
Land use/land cover	Highly desirable	Required		
Wetlands	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Nice to have		
Cultural resources	Not required	Nice to have		
Coastal and riverine structures	Required	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Currently the state is collecting QL2 or better since 2012, but the dates of acquisition vary as funding has become available. However more is needed for other portions of the state.	I am unsure what bathymetric data we are currently using		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	Utah Automated Geographic Reference Center (AGRC).	Utah Automated Geographic Reference Center (AGRC)		
Data that meet my needs are not available		Yes		

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available		
Cost savings/cost reduction	Major	Inland bathy data not available		
Cost avoidance	Major	Inland bathy data not available		
Increased revenues	None	Inland bathy data not available		
Mission-driven performance improvements	Minor	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available		
Improved response or timeliness	Major	Inland bathy data not available		
Improved customer experience	Major	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Inland bathy data not available		
Environmental	Minor	Inland bathy data not available		
Public safety, including life and property	Major	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide							
Time savings description	See above. FEMA had a process called Letters of Map Amendment (LOMA) that each property owner can apply for if they feel the map inadvertently included them into the floodplain. Better topo will create better maps and will reduce the cost to hire a surveyor and apply for the LOMA process. Each Risk MAP project calculates hours spent on topography data capture. Better data will mean more time saved. Data capture costs for existing topo and terrain data are tracked by project. Hours vary by project size. Better topo will provide more accurate map determinations.											
Cost savings/cost reduction	Moderate	Annual dollars saved/realized	$2,600,000	I don't know	Unable to provide							
Cost savings/cost reduction description	This has the potential to save millions state-wide. Per FEMA, Risk MAP (flood mapping project) can no longer begin without better topo data. If there is nation-wide topo available this will reduce my cost to acquire the topo, and will save time as projects can begin earlier. At least $2.6 Million.											
Cost avoidance	Major	Annual dollars saved/realized	$500,000	I don't know	Unable to provide							
Cost avoidance description	Depending on the event, could be millions per event. Better topography will help provide better flood maps, ultimately allowing less or better planned development in floodplains. 9 FEMA disaster declarations for flooding since 1983 = .25 floods per year * $2 million/disaster = $500,000/year.											
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements description	Since topo data is the first data requirement to begin a Risk MAP project, having better topo will help plan future projects. Better topography will help produce better floodplain maps. This will improve the perception for flood risk awareness. Mitigating emergencies, disaster and catastrophic events is part of our mission. Better topo can produce better flood risk maps helping federal, state and local agencies in this effort.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide							
Value added to products or services description	Improved floodplain maps.											
Improved response or timeliness	Major	Unable to provide		I don't know	Unable to provide							

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Improved response or timeliness description	When property owners call our office, we can help make faster and better flood determinations in order to provide guidance on insurance and building requirements. When floodplain reviews are performed, better topo creates better flood risk products making it easier to determine locations of structures within a mapped floodplain. Much of our state is still using paper flood maps; updated topo can provide updated and digital flood hazard maps. We have not used advisory base flood elevations within our state, but if needed, they would be able to be produced faster.											
Improved customer experience	Major	Unable to provide		I don't know	Unable to provide							
Improved customer experience description	Digital information can help us provide future applications for better customer service. Because of the age of the maps in our state, property owners do not have much confidence in them. Updated flood risk maps will increase confidence not only in property owners, but the local officials as well. Faster downloads, data in one place, map viewers, etc.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know								
Environmental	I don't know			I don't know								
Public safety, including life and property	I don't know			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes	Yes		
Aspect maps				
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Sea Level Rise and Subsidence

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Modeling and mapping the effects of sea level rise or subsidence. Population and economic vulnerability assessments. Coastal inundation and infrastructure assessment.
MCA Title	Sea Level Rise and Subsidence
MCA ID	60473
Organization Type	State or U.S. Territorial government
Organization Name	State of Utah
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 16 - Sea Level Rise and Subsidence
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes			
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

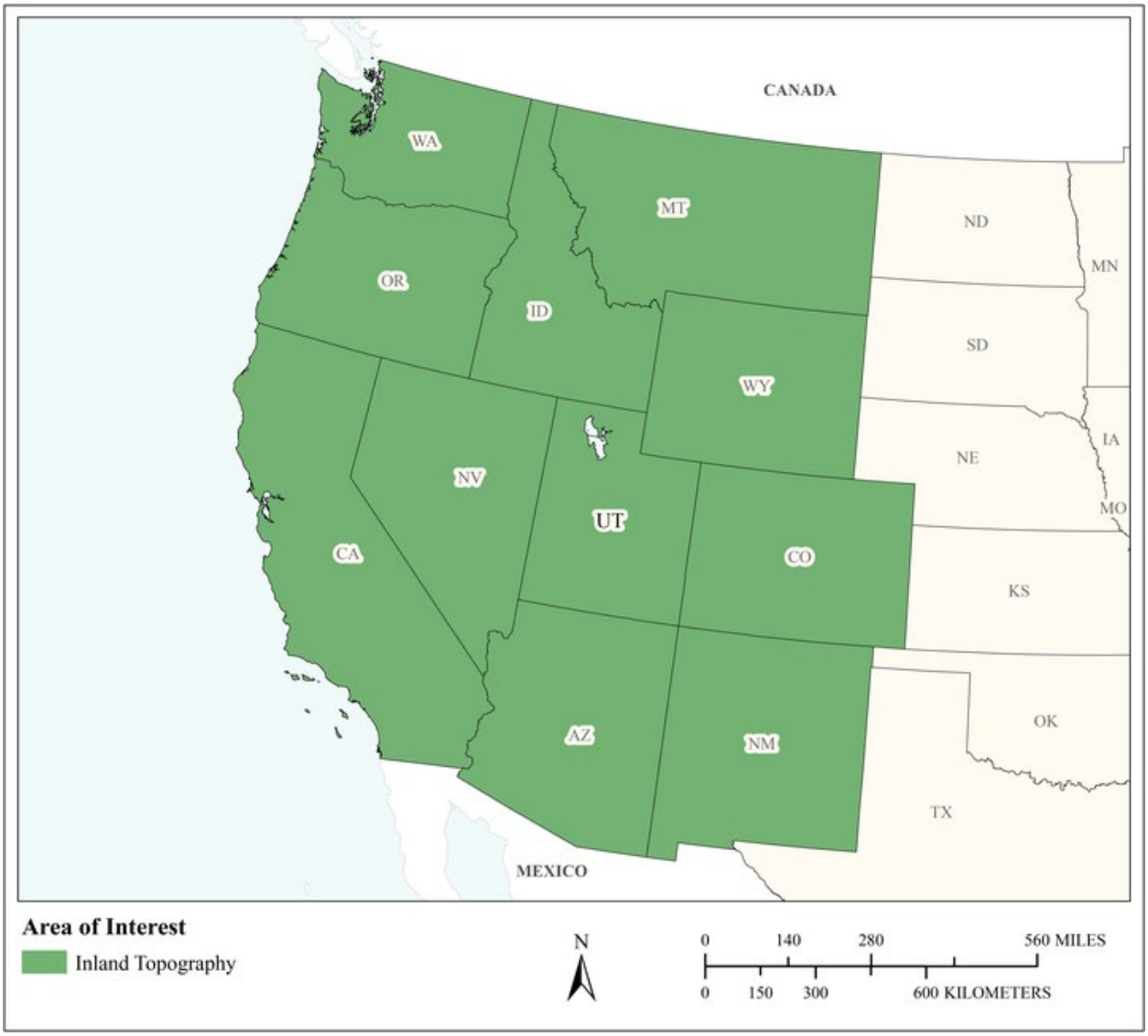
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Moderate			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$4,400,751									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Moderate											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Wildfire Management, Fire Safety, and Forest Health



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Scientific research, skills training, wildfire fuel mapping, forest health assessment, forest and rangeland fire severity assessment, firefighter safety zone and escape route mapping, and evacuation planning.
MCA Title	Wildfire Management, Fire Safety, and Forest Health
MCA ID	21555
Organization Type	Academic or Not-for-Profit
Organization Name	University of Utah
Sub-Agency or Division	
Organization Mission	The University of Utah fosters student success by preparing students from diverse backgrounds for lives of impact as leaders and citizens. We generate and share new knowledge, discoveries, and innovations, and we engage local and global communities to promote education, health, and quality of life. These contributions, in addition to responsible stewardship of our intellectual, physical, and financial resources, ensure the long-term success and viability of the institution.
Program Name	University of Utah Department of Geography research
Total Annual Program Budget	
Primary Business Use	BU 17 - Wildfire Management, Planning, and Response
Secondary Business Use	BU 04 - Forest Resources Management
Tertiary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Individual trees and shrubs

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Horizontal Error	Up to 30 cm			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Not required			
Wetlands	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Not required			
Bridges/culverts	Not required			
Landmark features	Not required			
Cultural resources	Not required			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We are currently using a variety of QL1 and QL1HD data acquired since 2014. The minimum points per square meter that we are currently using for our MCA is approximately 12.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Utah			
Other	Yes			
Other description	Forest Service			
Data that meet my needs are not available				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	I don't know			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Minor			
Improved customer experience	I don't know			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Moderate			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$1,809									
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Annual percent improvement	900%									
Mission-driven performance improvements description	We could produce firefighter safety products over at least ten times the area we currently do with greater data availability.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Value added to products or services description	New firefighter safety products would be enabled by improved data availability.											
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Education or outreach description	Data will enable scientific research and student education through research projects											
Environmental	Major											
Environmental description	Improved mapping of burn severity following wildfires											
Public safety, including life and property	Major											
Public safety, including life and property description	Significant benefits to public safety through safety zone maps, including reduced loss of life											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic Support and Emergency Response

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Custom description	Custom description		
Sub Area Requirements	Utah plus 22KM into adjoining states	Great Salt Lake, Utah Lake, and Bear Lake		

MCA Description	Response
Mission Critical Activity	Local government geologic support and geologic emergency response.
MCA Title	Geologic Support and Emergency Response
MCA ID	1126
Organization Type	State or U.S. Territorial government
Organization Name	Utah Geological Survey
Sub-Agency or Division	
Organization Mission	The Utah Geological Survey provides timely scientific information about Utah's geologic environment, resources, and hazards.
Program Name	Geologic Hazards Program
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Tertiary Business Use	BU 23 - Urban and Regional Planning

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Small displacement Quaternary faults (10s of centimeter offset or less), earth fissures.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Not required
51 - 100 ft	Not required
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B		
Update Frequency	4-5 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Less than 50 cm		
Acceptable Vertical Error	Up to 10 cm	Less than 10 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Not required	
Entire AOI under same environmental conditions	Nice to have	Nice to have			Not required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Highly desirable	Required		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Highly desirable	Not required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required	Highly desirable		
Ground control/ground truthing	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required	Required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Required		
Land use/land cover	Highly desirable	Required		
Wetlands	Highly desirable	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	2011 Northern Utah QL2 (http://opentopo.sdsc.edu/datasetMetadata?otCollectionID=OT.042013.26912.1) 2013-2014 Wasatch Front QL1 (http://opentopo.sdsc.edu/datasetMetadata?otCollectionID=OT.122014.26912.1)	Baskin and others Great Salt Lake data.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes	Yes		

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
State repositories used	Utah Automated Geographic Reference Center: https://gis.utah.gov/data/elevation-and-terrain/ Utah Geological Survey internal datasets	Gis.utah.gov		
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None	Inland bathy data not available		
Cost savings/cost reduction	Major	Inland bathy data not available		
Cost avoidance	Major	Inland bathy data not available		
Increased revenues	None	Inland bathy data not available		
Mission-driven performance improvements	Moderate	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available		
Improved response or timeliness	Moderate	Inland bathy data not available		
Improved customer experience	Moderate	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Inland bathy data not available		
Environmental	Moderate	Inland bathy data not available		
Public safety, including life and property	Major	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide							
Cost savings/cost reduction	Major	Annual dollars saved/realized	$3,779,745	Major	Unable to provide							
Cost savings/cost reduction description	Lidar acquisition cost saved.											
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Moderate	Unable to provide		Moderate	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation					Annual dollars saved/ realized	$13,462						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$43,583		Annual dollars saved/ realized	$858						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Moderate			Moderate								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Transportation Design and Maintenance

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Land Navigation and Safety Activities include, but are not limited to: Roadway Design and Construction, Roadway Maintenance, Traffic & Safety analysis, and Structure Maintenance.
MCA Title	Transportation Design and Maintenance
MCA ID	22429
Organization Type	State or U.S. Territorial government
Organization Name	Utah Department of Transportation
Sub-Agency or Division	
Organization Mission	UDOT's Strategic Goals are: Zero Crashes, Injuries and Fatalities, Preserve Infrastructure, and Optimize Mobility.
Program Name	Utah Department of Transportation
Total Annual Program Budget	
Primary Business Use	BU 19 - Land Navigation and Safety
Secondary Business Use	BU 22 - Infrastructure and Construction Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Roadway assets.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	I don't know			
Acceptable Vertical Error	I don't know			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required			
DTM	Not required			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Not required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Nice to have			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	AGRC 2 and 5 meter DEMs			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	AGRC			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None			
Cost savings/cost reduction	None			
Cost avoidance	None			
Increased revenues	None			
Mission-driven performance improvements	Moderate			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			
Improved response or timeliness	Moderate			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	None			
Public safety, including life and property	None			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Moderate	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,082,844									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$87,445									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades				
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Aviation Navigation and Safety

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of in-flight hazards and path obstructions. Aeronautical charting. Runway construction and repair.
MCA Title	Aviation Navigation and Safety
MCA ID	60474
Organization Type	State or U.S. Territorial government
Organization Name	State of Utah
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 21 - Aviation Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes			
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Major			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

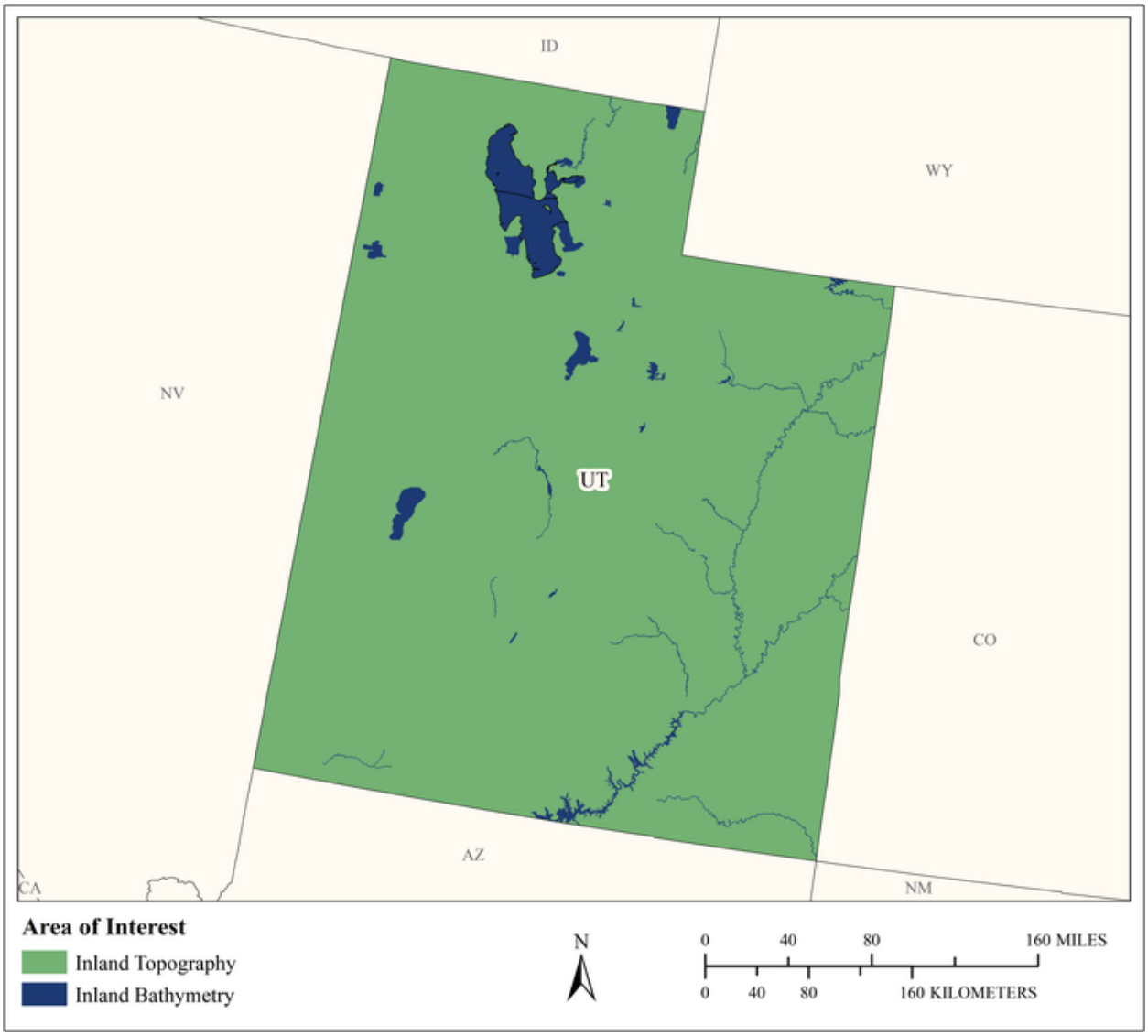
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$282,576									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$351,939									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Moderate											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Water Resources Construction Design



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Construction Design, dam rehabilitation, dam safety, pipelines. Additionally, our division would be very interested in seeing Lidar acquisitions that can aid in producing snow survey/snow volume/snow water equivalent information over a larger area verses the current methods.
MCA Title	Water Resources Construction Design
MCA ID	22103
Organization Type	State or U.S. Territorial government
Organization Name	Utah Division of Water Resources
Sub-Agency or Division	
Organization Mission	To Plan, Conserve, Develop and Protect Utah's Water Resources
Program Name	Development
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 01 - Water Supply and Quality
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Outlet structures and spillways.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Nice to have

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B		
Update Frequency	6-10 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	I don't know	I don't know		
Acceptable Vertical Error	I don't know	I don't know		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required			Nice to have	
Entire AOI under same environmental conditions	Not required	Not required			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Not required	Not required			Not required	
DEM for entire AOI needs to be seamless	Not required	Not required			Not required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have		
DTM	Nice to have	Nice to have		
DEM	Nice to have	Nice to have		
Raw point cloud data	Not required	Not required		
Classified point cloud	Not required	Nice to have		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Nice to have		
Ground control/ground truthing	Nice to have	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Nice to have		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Nice to have	Nice to have		
Wetlands	Nice to have	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Nice to have		
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Nice to have		
Cultural resources	Not required	Not required		
Coastal and riverine structures	Not required	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	30 meter DEM and random Lidar acquisitions, also field survey data.	Inland bathy not available		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	UTAH AGRC			
Other	Yes			
Other description	Project specific lidar acquisition for dam rehabilitation			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know	Inland bathy data not available		

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost savings/cost reduction	I don't know	Inland bathy data not available		
Cost avoidance	I don't know	Inland bathy data not available		
Increased revenues	I don't know	Inland bathy data not available		
Mission-driven performance improvements	I don't know	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know	Inland bathy data not available		
Improved response or timeliness	I don't know	Inland bathy data not available		
Improved customer experience	I don't know	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	Inland bathy data not available		
Environmental	I don't know	Inland bathy data not available		
Public safety, including life and property	I don't know	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Moderate	Unable to provide							
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Unable to provide							
Cost savings/cost reduction description	Drone acquisition could meet some needs.											
Cost avoidance	I don't know	Unable to provide		Moderate	Unable to provide							
Increased revenues	None			None								
Mission-driven performance improvements	Minor	Unable to provide		Moderate	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$3,756,472		Annual dollars saved/ realized	$1,265,615						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	Minor	Unable to provide		Moderate	Unable to provide							
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$11,054,540		Annual dollars saved/ realized	$131,419						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			None								
Environmental	I don't know			None								
Public safety, including life and property	I don't know			None								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Regional and Local Community Planning Assistance

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Regional and local community planning assistance (in addition to many other non-planning related activities). Hazard mitigation planning. Site analysis for planning and zoning.
MCA Title	Regional and Local Community Planning Assistance
MCA ID	21866
Organization Type	Regional, County, City, or other local government
Organization Name	Bear River Association of Governments (Utah)
Sub-Agency or Division	
Organization Mission	Multi-jurisdictional program support, technical assistance, and regional leadership.
Program Name	Community planning, environmental planning, natural hazard mitigation
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Sub-meter objects, elevations, etc. Curbs, trees/shrubs, fences, homes, sidewalks, large rocks, etc.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Required			
Land use/land cover	Required			
Wetlands	Required			
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL1 LiDar 2016 for river corridors and developed areas in our region (Bear River) and Cache County 2016. 5 meter DEM's for the entire region, and 2 meter DEM's for very limited areas in our region (2010 and newer). Older 10 and 30 meter DEM's are also available and are used for regional-level analyses and maps.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				

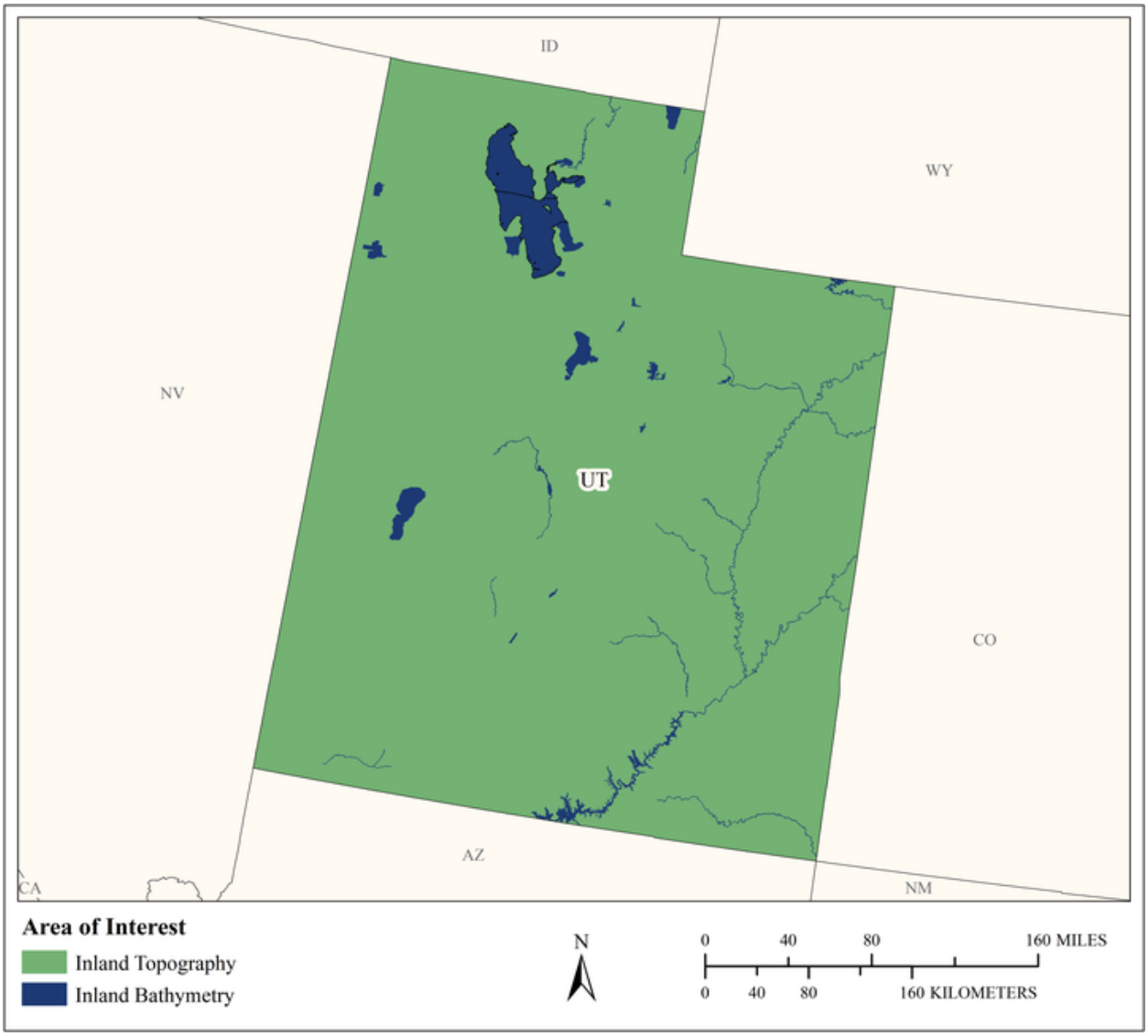
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Utah AGRC			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Cost avoidance description	Better data results in better planning projects.											
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Statewide Geospatial Data Provisioning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Providing communities with the appropriate GIS data, maps, and/or information to aid municipal management and informed decision making.
MCA Title	Statewide Geospatial Data Provisioning
MCA ID	32859
Organization Type	State or U.S. Territorial government
Organization Name	Utah Department of Workforce Services
Sub-Agency or Division	
Organization Mission	To help rural communities become self-reliant, self-determined, and prepared for the future.
Program Name	The Utah Mapping & Technical Assistance Program (M-TAP)
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 06 - Natural Resources Conservation
Tertiary Business Use	BU 14 - Cultural Resources Preservation and Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Buildings

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B		
Update Frequency	2-3 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI	Rural data isn't as accurate or current generally			
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial			
Cross section/transect requirement	It depends			

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Nice to have	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable		
DTM	Nice to have	Required		
DEM	Highly desirable	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Nice to have	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Nice to have	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		
Estuaries				
Inland surface water features	Highly desirable	Required		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Nice to have		
Coastal and riverine structures	Nice to have	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Topographic Lidar	Only USGS bathy contours are available for the Great Salt Lake		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Utah AGRC			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Minor		
Cost savings/cost reduction	Moderate	Minor		

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost avoidance	Moderate	Minor		
Increased revenues	None	Minor		
Mission-driven performance improvements	Moderate	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		
Improved response or timeliness	Moderate	Minor		
Improved customer experience	Moderate	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor		
Environmental	Moderate	Minor		
Public safety, including life and property	Moderate	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Moderate	Unable to provide							
Cost savings/cost reduction	None			Major	Unable to provide							
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide							
Increased revenues	None			Minor	Unable to provide							
Mission-driven performance improvements	Moderate	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$22,490,572		Annual dollars saved/ realized	$916,001						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide							
Improved customer experience	Moderate	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$2,596,546		Annual dollars saved/ realized	$1,158,821						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate								
Environmental	Minor			Moderate								
Public safety, including life and property	Minor			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes	Yes		
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Real Estate, Banking, Mortgage, and Insurance

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Assessment of risk for natural hazards (e.g., sinkholes, flooding) to inform insurance policy rates and the determination of mandatory insurance. Building permit compliance.
MCA Title	Real Estate, Banking, Mortgage, and Insurance
MCA ID	60475
Organization Type	State or U.S. Territorial government
Organization Name	State of Utah
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 25 - Real Estate, Banking, Mortgage, and Insurance
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Moderate			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,904,336									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Education K12 and Beyond, Basic Research

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Development of 3-D visualizations to help students understand the Earth they live on. Understanding of continental-scale climate change impacts. Ocean science. Ocean education. Scientific research. Data dissemination. Development of training simulators.
MCA Title	Education K12 and Beyond, Basic Research
MCA ID	60476
Organization Type	State or U.S. Territorial government
Organization Name	State of Utah
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 26 - Education K12 and Beyond, Basic Research
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$439,270									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,049,984									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Recreation

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Planning and development of recreational facilities such as rafting, boating, swimming, diving, and fishing areas; ski slopes; and golf courses. Location- based products and services such as maps and guides. Tourism. Trail and vista site planning. Orienteering.
MCA Title	Recreation
MCA ID	60477
Organization Type	State or U.S. Territorial government
Organization Name	State of Utah
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 27 - Recreation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Nice to have			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Nice to have			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Nice to have			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Moderate			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$19,180									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Minor	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Moderate											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Telecommunications

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Telecommunication tower site selection. Design of radio and radar systems. Interference analysis. Path profiles. Undersea telecommunication route selection and deployment.
MCA Title	Telecommunications
MCA ID	60478
Organization Type	State or U.S. Territorial government
Organization Name	State of Utah
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 28 - Telecommunications
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Highly desirable			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

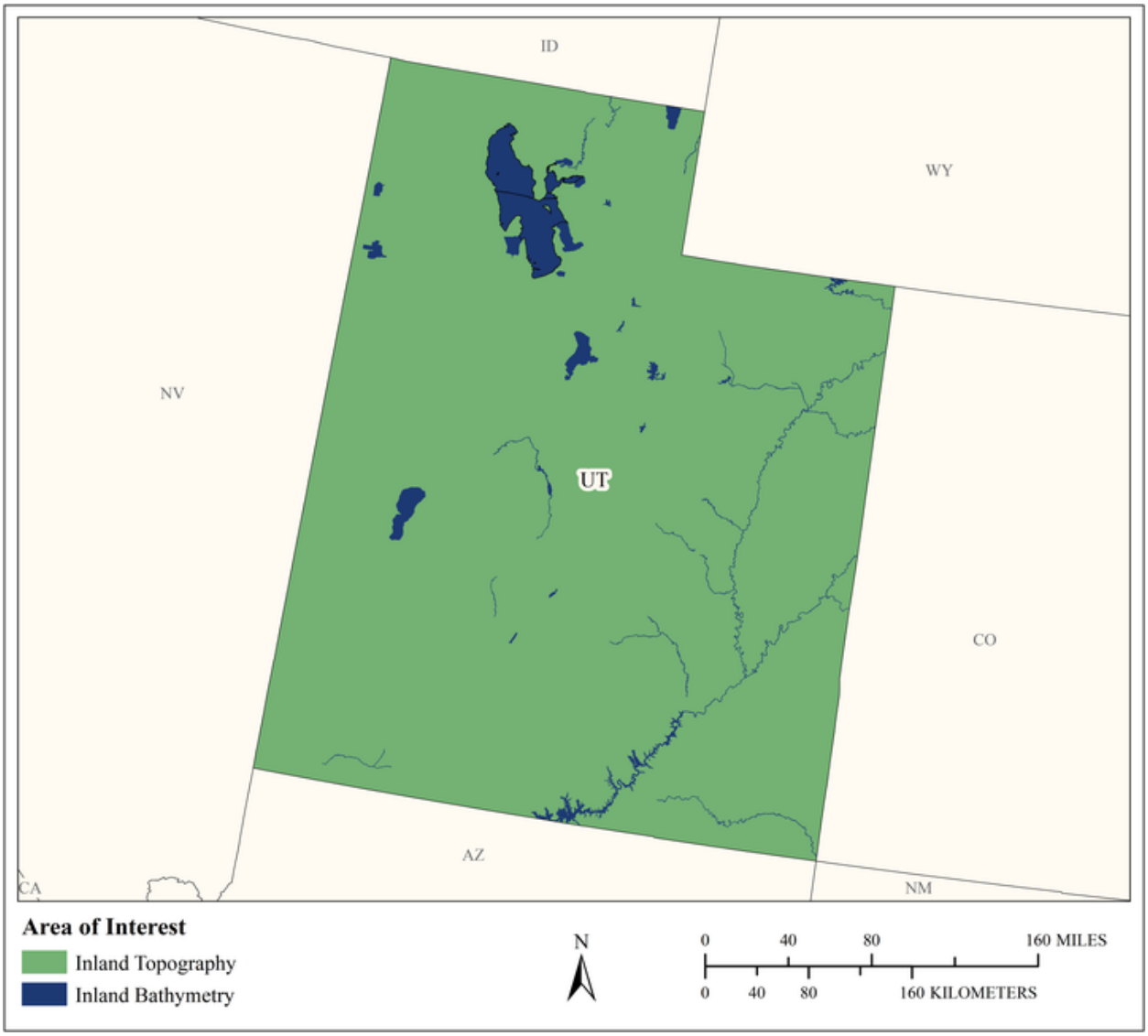
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Wildfire, Forestry, and Sovereign Lands Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	The following Business Uses are important activities for the Department of Natural Resources: BU 30 - Maritime and Land Boundary Management BU 02 - Riverine Ecosystem Management BU 03 - Coastal Zone Management BU 04 - Forest Resources Management BU 06 - Natural Resources Conservation BU 17 - Wildfire Management, Planning and Response BU 20 - Marine and Riverine Navigation and Safety.
MCA Title	Wildfire, Forestry, and Sovereign Lands Management
MCA ID	1169
Organization Type	State or U.S. Territorial government
Organization Name	Utah Department of Natural Resources, Division of Forestry, Fire, and State Lands
Sub-Agency or Division	
Organization Mission	The Division of Forestry, Fire & State Lands manages, sustains and strengthens Utah's forests, rangelands, sovereign lands and watersheds for its citizens and visitors.
Program Name	Sovereign Lands Program
Total Annual Program Budget	
Primary Business Use	BU 30 - Maritime and Land Boundary Management
Secondary Business Use	BU 06 - Natural Resources Conservation
Tertiary Business Use	BU 03 - Coastal Zone Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	A parcel boundary, navigational hazards, fault scarps, and bioherms

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B		
Update Frequency	>10 years	>10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI	Depends on the density of vegetation. I beach areas QL2 is fine but in veg areas, we need QL1			
Acceptable Horizontal Error	Up to 40 cm	Up to 1 meter		
Acceptable Vertical Error	Up to 30 cm	Up to 40 cm		
How far onshore needed				
How far down the beach profile needed	Below MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Nice to have			Nice to have	
DEM for entire AOI needs to be seamless	Highly desirable	Required			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Required		
DTM	Required	Required		
DEM	Highly desirable	Required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Highly desirable	Highly desirable		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Required		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Required	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Required	Highly desirable		
Estuaries				
Inland surface water features	Required	Highly desirable		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Nice to have		
Coastal and riverine structures	Required	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We use existing Lidar data, on the ground surveys and interpretation, or best guess interpretation off of orthophotos.	For the Great Salt Lake and Bear Lake we are using USGS published bathymetric data. Both leave much to be desired as far as completeness, accuracy and resolution. For our other Sovereign Bodies of water, we have no existing bathymetric data.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Utah AGRC (gis.utah.gov)			
Other		Yes		
Other description		USGS reports and studies		
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Moderate		
Cost savings/cost reduction	Moderate	Minor		
Cost avoidance	Moderate	Minor		
Increased revenues	I don't know	I don't know		
Mission-driven performance improvements	Major	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		
Improved response or timeliness	Major	Minor		
Improved customer experience	Major	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate		
Environmental	Major	Moderate		
Public safety, including life and property	I don't know	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$12,663	Major	Annual dollars saved/realized	$11,939						
Time savings description	For boundary settlements and elevation based ordinary high water lines we have to use surveys to determine that elevation. Lidar can help avoid that. Permitting process is more efficient because work can be done in the office. For any work or permits we have to do a site survey to determine the ordinary high water line. With Lidar much of that can be done in the office. Being able to get information in the office saves on site visits.											
Cost savings/cost reduction	Moderate	Unable to provide		Major	Annual dollars saved/realized	$50,000						
Cost savings/cost reduction description	We are trying to eradicate Phragmities on Sovereign Lands in Utah and have been using Lidar to help us target the most problematic areas.											
Cost avoidance	Moderate	Unable to provide		Major	Annual dollars saved/realized	$10,000						
Cost avoidance description	Lidar helps us identify navigation hazards so we can remove them before an accident happens.											
Increased revenues	Major	Unable to provide		I don't know	Unable to provide							
Increased revenues description	We hope to build a lake level calculator to help us understand what areas will be exposed at certain lake levels. This will help us manage more proactively and may give the public a cool tool to estimate Great Salt Lake levels, etc.											
Mission-driven performance improvements	Major	Annual percent improvement	12%	Moderate	Unable to provide							
Mission-driven performance improvements description	Having better information about out boundaries and where we manage as water levels change will improve our ability to carry out our mission. Having better insight into our elevation will help us manage and plan better for changes in lake and river levels. Being able to model current and expected water levels will provide us with better information to make management and treatment decisions.											
Other operational benefits	Major	Unable to provide										
Other operational benefits description	Improved strategic planning. Being able to model different lake and river levels will help with our strategic planning so we can have management triggers at different water levels.											
Future annual operational benefits added during validation		Annual dollars saved/ realized	$81,657									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Annual dollars saved/realized	$350,000	Major	Unable to provide							

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Value added to products or services description	Our lidar has enabled our Division of Emergency Management to redo their FEMA floodplain maps. Had we not acquired this data, they would have had to or paid for on the ground surveys. We contributed $350K for this mapping and now they don't need to. I anticipate new guidebooks and recreation maps being created from new elevation data.											
Improved response or timeliness	Moderate	Annual dollars saved/realized	$3,618	Moderate	Unable to provide							
Improved customer experience	Major	Annual dollars saved/realized	$7,236	Moderate	Unable to provide							
Improved customer experience description	If all the data was in one place, we would save considerable time. Currently we have to load in many different projects and sources to build a model around our water bodies. Having more accurate data that is easier to access will help streamline our processes and reduce field visits.											
Other customer service benefits	Minor	Unable to provide										
Other customer service benefits description												
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Education or outreach description	Our data can be used by researchers and other scientists smarter than us to provide scientific recommendations on resource management, invasive species, endangered species, etc.			If we are able to provide shoreline elevation level mapping this would really improve customer relations.								
Environmental	Moderate			Major								
Environmental description	This data will help us manage our resources better and improve environmental outcomes.			By having more accurate information for exposed lake bed analysis, we will be able to mitigate environmental impacts better.								
Public safety, including life and property	I don't know			Moderate								
Other	Better maps and navigation											
Other benefits	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				
Other (please specify)	Yes	Yes		
Other description	DEM Grids			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

Vermont

The State of Vermont covers 9,616 square miles of land and water combined and is framed by Canada to the north, Massachusetts to the south and by its largest water bodies on the western and eastern borders, Lake Champlain and the Connecticut River, respectively. For a small state, Vermont has a surprising range of biodiversity, climes, and physiographic regions. The broad Lake Champlain Valley abuts its namesake and boasts the same climate as Connecticut while the Green Mountain range running the central spine of the state reflects the full character of Vermont weather. These areas, along with the Northeastern Highlands, Northern Vermont Piedmont, and the Connecticut River Valley, contain approximately 7,100 miles of rivers, over 800 lakes and include many popular tourist destinations throughout the year. Next to services and tourism, agriculture is Vermont's second largest and most historic economic sector centered in the Lake Champlain Valley and the lake's watershed. With a surface area of just over 500 square miles and nearly 600 miles of shoreline in New York, Quebec, and Vermont, Lake Champlain stands out as the most important surface water feature to benefit from higher resolution inland bathymetric data for its tributaries, shoreline and nearshore areas.

Replacing the existing 10-meter resolution bathymetry dataset, created using single beam side scan sonar in the late 1990s, with Quality Level 0B (QL0B) lidar would greatly improve 3D hydrodynamic lake modeling efforts, extend data coverage to lake tributaries and support most major business use categories. These categories include: Water Supply and Quality, Flood Risk, Infrastructure, Riverine Ecosystem, Fisheries and Wildlife and Habitat Management, Marine and Riverine Navigation, Recreation, and Urban and Regional Planning. 3D hydrodynamic models provide a better understanding of circulation, pollutant (e.g., phosphorus) dispersal, sediment movement, algal blooms, effluent movement from wastewater treatment facility discharge pipes, water sources for potential water intake pipes, flooding, and the effects of man-made features that collectively affect the overall water quality and health of the lake. The second largest water body in the state (the Connecticut River) has a NOAA 1969 Hydrographic Survey while most other major rivers have either FEMA Flood Insurance Study Cross-Sections or Fluvial Geomorphic Assessment Cross-Sections. Most water bodies over 20 acres have sounding depth charts of various vintage and methods with some recent updates. Vermont's mountainous terrain has historically guided transportation, housing, and other infrastructure development to be in close proximity to lakes, rivers, and streams. This development pattern combined with more dramatic storm events has lead to increasing impacts from flooding, fluvial erosion, and sediment and nutrient pollution. While elevation requirements vary across activities of similar extents, QL1 inland topography would suffice for most purposes. Nearly half of respondents chose QL0B inland bathymetry with the remainder evenly split between QL1B and QL2B. Acquiring QL2B or better data would support many water quality, infrastructure, and flood mitigation business cases, while simultaneously providing consistent, higher accuracy data for seamless integration with the statewide QL2 inland lidar data. Elevation data should be refreshed every 4-5 years.

Through participation in the 3D Elevation Program (3DEP), the State of Vermont achieved statewide QL2 inland lidar based topography in the fall of 2018. Acquiring a complimentary bathymetric dataset would prove beneficial to the same federal and state partners by completing an enhanced elevation foundation. Federal and international partners included the Federal Emergency Management Agency (FEMA), The International Joint Commission, Natural Resource Conservation Service, U.S. Army Corps of Engineers, USGS, and the U.S. Forest Service (Green Mountain National Forest). State partners included state Regional Planning Commissions, The Lake Champlain Basin Program, and State of Vermont Agencies of Community Development, Natural Resources, Public Service, and Transportation.

An enhanced elevation foundation, complete with bathymetric lidar would finalize the pillars of Vermont's digital infrastructure that now includes statewide: high-resolution (30 centimeters) imagery, parcel data (fully grand-list matched), and the highest resolution (50 centimeters) statewide land cover

data in the country. Every state agency, regional planning commission, municipality, academic institution, federal agency, non-profit institution, and private sector entity benefits from these data with uses too numerous to list.

The Vermont GIS community has a long history of an inter-disciplinary and cooperative ethos that has facilitated the leveraging of geospatial technology on myriad applications across the state. Gaining access to exponentially more accurate data enables GIS professionals to better support and empower decision makers in high importance efforts such as environmental protection, public safety, watershed management, and water quality, to name a few. In addition to providing a common foundation for decision making, developing a consistent and seamless statewide inland bathymetry framework supplants the traditionally time-consuming and costly approach to field data collection with a consistent foundation that enables targeted efforts to the most critical areas requiring hands on analysis.

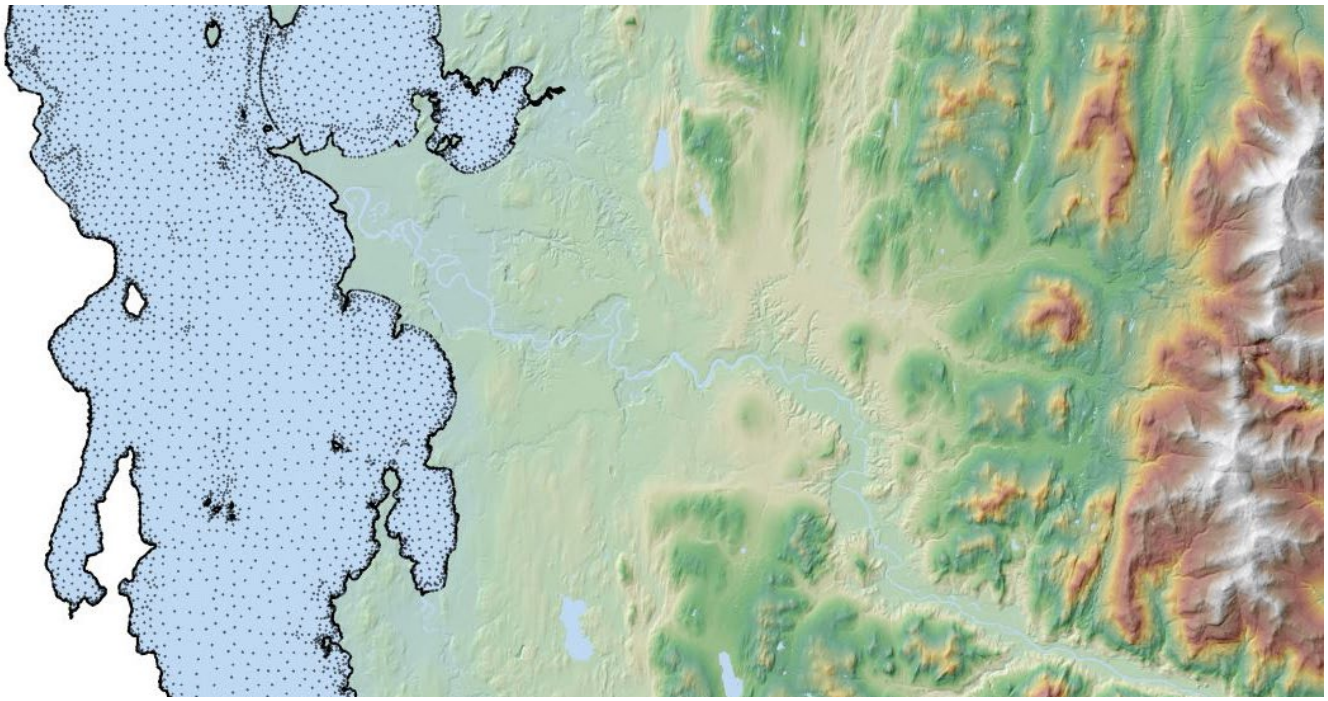


Figure 1. As of January 2019, this image compares a portion of currently available statewide QL2 terrestrial lidar data (shaded relief) with currently available 10-meter resolution bathymetry data for Lake Champlain (black points on blue background).

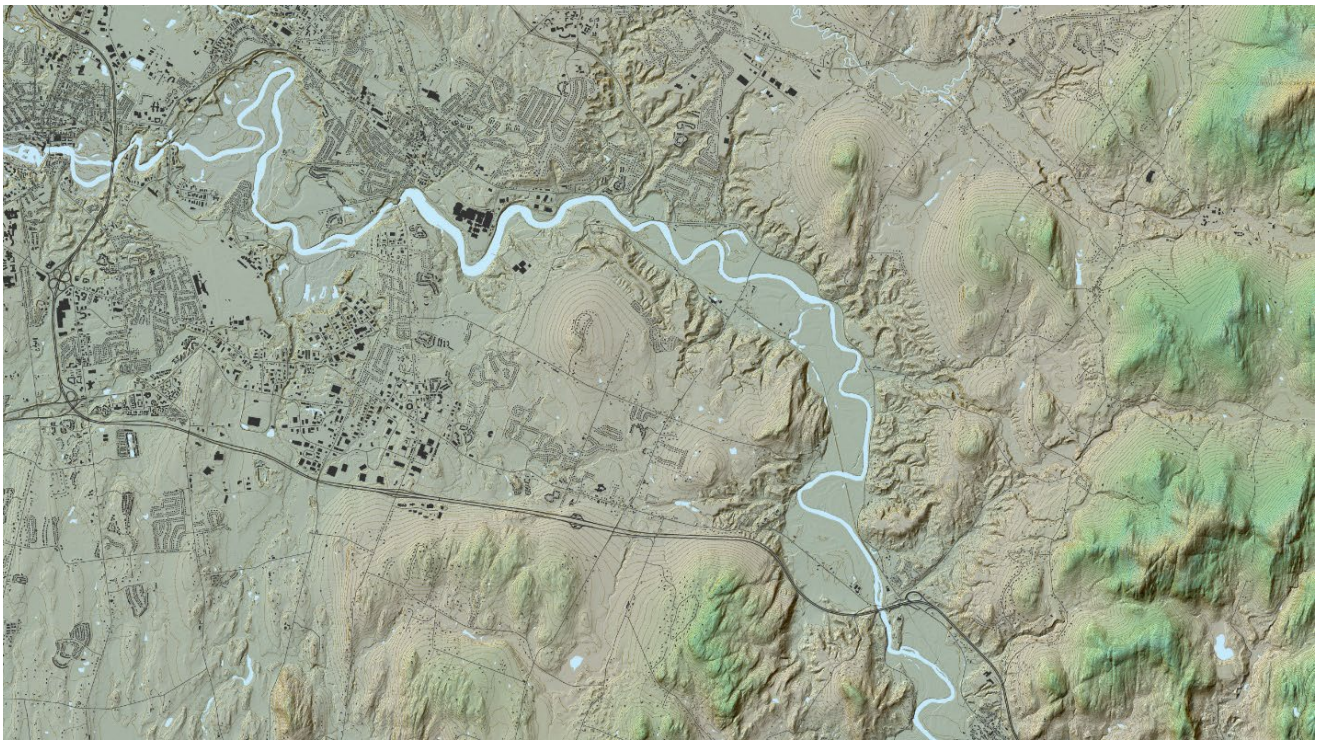


Figure 2. A segment of QL2 terrestrial lidar data combined with other map datasets as of January 2019. Rivers, lakes, and ponds are currently depicted as flat areas and use cases that rely on them would greatly benefit from QL2B (or better) data.

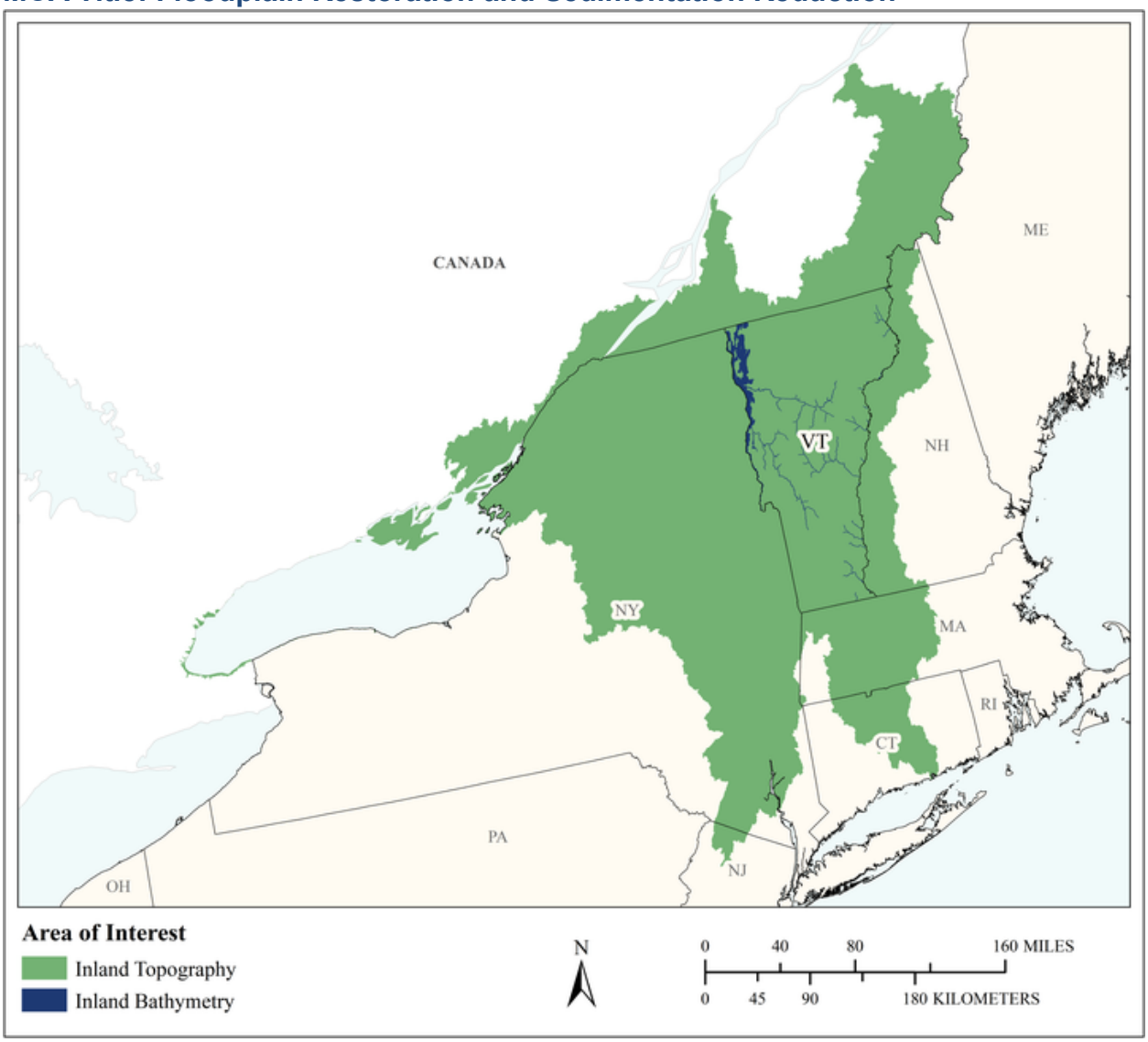
The State of Vermont has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	Vermont Agency of Natural Resources	1180	Floodplain Restoration and Sedimentation Reduction	Inland Topo	QL2	6-10 years	$53,306	$14,278	Major	Major	Major
				Inland Bathy	QL2B	4-5 years	$230,609	$24,099	Major	Major	Major
BU 01 – Water Supply and Quality	Middlebury College	1308	3D Hydrodynamic Modeling for Management of Major Lakes	Inland Bathy	QL0B	>10 years	$2,055,340	$91,656	Major	Major	Major
BU 01 – Water Supply and Quality	VT Agency of Agriculture	1424	Up to Date Determination of Farmland Flooding	Inland Topo	QL2	2-3 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate
				Inland Bathy	Cross sections and/or transects meet needs	2-3 years	Unable to quantify	Unable to quantify	Minor	Minor	Minor
BU 01 – Water Supply and Quality	Lake Champlain Basin Program	21674	Water Resource Protection	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
				Inland Bathy	QL2B	6-10 years	Unable to quantify	Unable to quantify	Moderate	Moderate	I don't know
BU 02 – Riverine Ecosystem Management	State of Vermont	60479	Riverine Ecosystem Management	Inland Topo	QL1 HD	6-10 years	$14,715	$1,469	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$7,833	$552	Major	Major	Major
BU 04 – Forest Resource Management	State of Vermont	60480	Forest Resources Management	Inland Topo	QL1	2-3 years	$38,012	$55,103	Major	Major	Major
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 06 – Natural Resource Management	State of Vermont	60481	Natural Resources Conservation	Inland Topo	QL1 HD	4-5 years	$377,094	$1,384,806	Major	Major	Major
				Inland Bathy	QL0B	6-10 years	$51,110	$2,300	Major	Major	Major
BU 07 – Wildlife and Habitat Management	State of Vermont	60482	Wildlife and Habitat Management	Inland Topo	QL2	4-5 years	$2,290	$6,614	Moderate	Major	Moderate
				Inland Bathy	QL2B	4-5 years	$18,353	$11,093	Moderate	Moderate	Moderate
BU 09 – Fisheries Management and Aquaculture	State of Vermont	60483	Fisheries Management and Aquaculture	Inland Topo	QL2	2-3 years	$9,827	$21,346	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	6-10 years	$19,236	$8,755	Major	Major	Moderate
BU 10 – Geologic Assessment	State of Vermont	60484	Geologic Assessment and Hazard Mitigation	Inland Topo	QL1	4-5 years	$2,029,447	$35,626	Major	Major	Major
				Inland Bathy	QL1B	6-10 years	$26,863	$29,519	Moderate	Moderate	Major

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 12 – Renewable Energy Resources	State of Vermont	60485	Renewable Energy Resources	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	None
BU 15 – Flood Risk Management	State of Vermont	60486	Flood Risk Management	Inland Topo	QL2	4-5 years	$1,349,881	$236,187	Major	Moderate	Major
				Inland Bathy	QL1B	4-5 years	$93,772	$105,282	Moderate	Moderate	Major
BU 19 – Land Navigation	State of Vermont	60487	Land Navigation and Safety	Inland Topo	QL0	2-3 years	$124,545	$10,057	Minor	Major	Major
				Inland Bathy	QL0B	2-3 years	$5,312	$54	Minor	Moderate	Moderate
BU 20 – Marine and Riverine Navigation	State of Vermont	60488	Marine and Riverine Navigation and Safety	Inland Bathy	QL0B	2-3 years	$175,369	$23,080	Moderate	Moderate	Moderate
BU 22 – Infrastructure Management	Vermont Agency of Transportation	21535	Management of Transportation Infrastructure	Inland Topo	QL1	4-5 years	$200,000	Unable to quantify	I don't know	Moderate	Moderate
				Inland Bathy	QL2B	4-5 years	Unable to quantify	Unable to quantify	None	Minor	Minor
BU 23 – Urban and Regional Planning	State of Vermont	60489	Urban and Regional Planning	Inland Topo	QL1	4-5 years	$2,586,790	$298,646	Moderate	Major	Major
				Inland Bathy	QL1B	6-10 years	$105,355	$133,283	Moderate	Moderate	Major
BU 27 – Recreation	State of Vermont	60490	Recreation	Inland Topo	QL1	4-5 years	$2,206	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	4-5 years	$1,328	Unable to quantify	Major	Major	Moderate
BU 28 – Telecom-munications	State of Vermont	60491	Telecommunications	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

MCA Title: Floodplain Restoration and Sedimentation Reduction



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Stream channel analysis and mapping. Stream bank erosion analysis. Flood resilience planning. Point or non-point source pollution modeling. Landslide hazard mapping and assessment. Runoff and sedimentation analyses. Fate and transport of contaminants. Flood resilience planning. Flood damage mitigation. Flood risk modeling and mapping of riverine and lake flooding. Stream geomorphic assessment. Future: cut cross sections without field surveys for floodplain modeling. Additional requirements for hydro enforcement of culverts beyond current USGS QL2 specification. Frequent, integrated topographic data is important for watershed management efforts inclusive of water quality, flood resilience, hazard mitigation, and the abatement of eutrophication.
MCA Title	Floodplain Restoration and Sedimentation Reduction
MCA ID	1180
Organization Type	State or U.S. Territorial government
Organization Name	Vermont Agency of Natural Resources
Sub-Agency or Division	
Organization Mission	The Agency of Natural Resources is comprised of three departments. The Department of Environmental Conservation's mission is to preserve, enhance, restore and conserve Vermont's natural resources, and protect human health as it relates to the larger environment. Through its programs, the DEC manages water and air quality, regulates solid and hazardous wastes, and administers a number of pollution and waste reduction programs. The Department of Fish & Wildlife conserves Vermont's fish, wildlife, plants and their habitats for Vermonters to enjoy. The department includes over 125 biologists, game wardens, educational coordinators and support staff committed to five divisions: Fisheries, Wildlife, Law Enforcement, Outreach and Administration. The Department of Forests, Parks and Recreation is responsible for the conservation and management of Vermont's forest resources, the operation and maintenance of the State Park system, and the promotion and support of outdoor recreation for Vermonters and our visitors. In addition, FPR is responsible for the acquisition, planning coordination and administration of all Agency of Natural Resources lands. In addition to these departments, the Agency of Natural Resources supports certain initiatives extending beyond the traditional specializations of any single department. Cross-Agency topics include climate change, flood resilience, and invasive species management.
Program Name	Watershed Management
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required

What Needs to be Measured in 3D	Response
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Exposed bedrock and built features that establish valley walls and limit the area available for stream channel equilibrium.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B		
Update Frequency	6-10 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter		
Acceptable Vertical Error	Up to 30 cm	Up to 50 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have			Not required	
Entire AOI under same environmental conditions	Required	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Required	Required		
DEM	Highly desirable	Highly desirable		
Raw point cloud data	Highly desirable	Nice to have		
Classified point cloud	Highly desirable	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Highly desirable		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Nice to have		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Required		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Not required	Nice to have		
Cultural resources	Not required	Nice to have		
Coastal and riverine structures	Highly desirable	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL2 and QL3	Bathymetry is restricted to soundings on larger lakes.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	http://maps.vcgi.vermont.gov http://anr.vermont.gov/maps	http://dec.vermont.gov/watershed/lakes-ponds/data-maps/charts http://dec.vermont.gov/geological-survey/publication-gis/general-interest/lcd		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	I don't know		

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Cost avoidance	Major	None		
Increased revenues	None	Minor		
Mission-driven performance improvements	Major	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		
Improved response or timeliness	Major	Minor		
Improved customer experience	Major	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate		
Environmental	Major	Moderate		
Public safety, including life and property	Major	Minor		

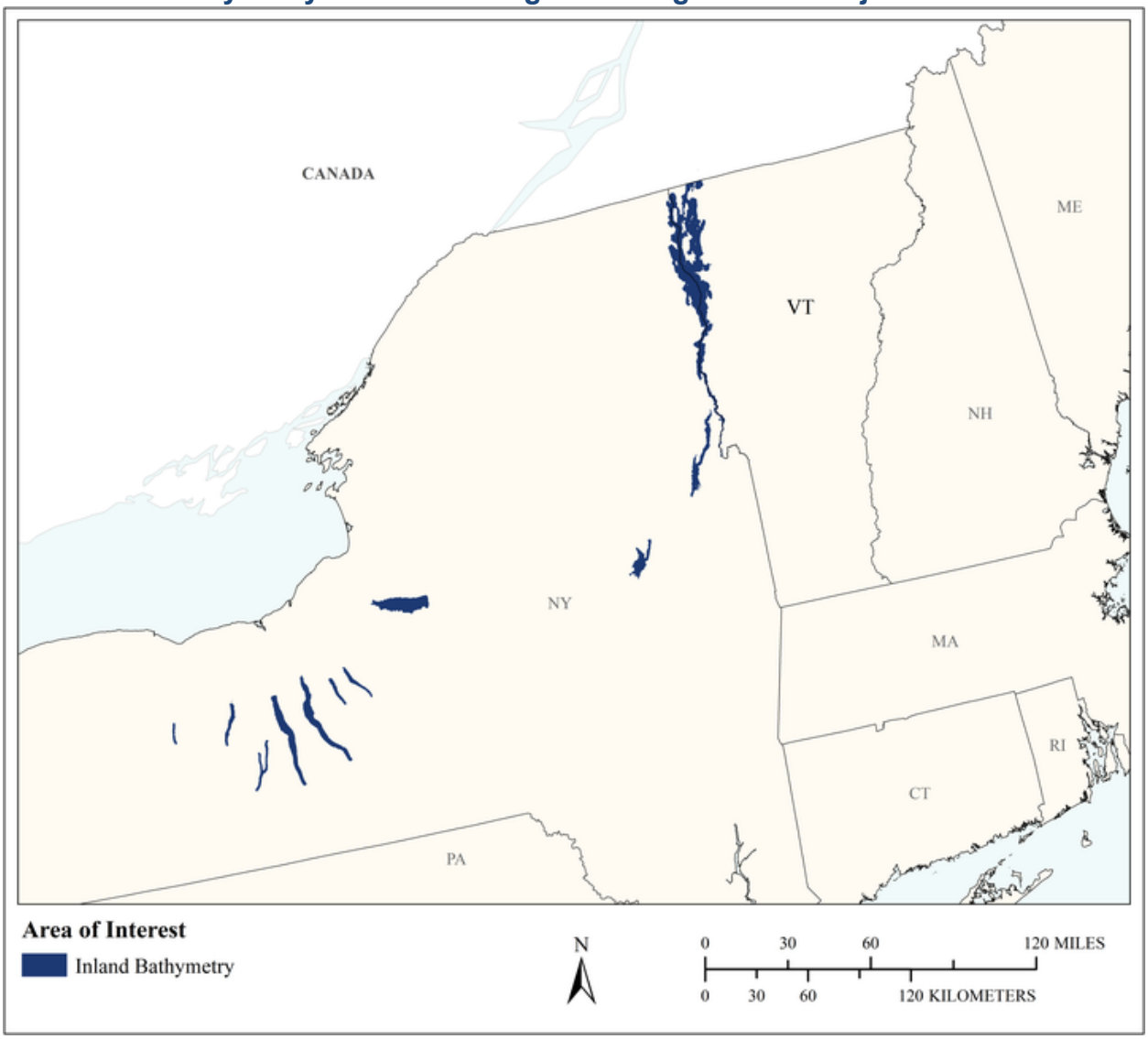
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Time savings description				Field surveys would be greatly reduced.								
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Cost avoidance description	Key task.											
Increased revenues	I don't know	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements description	Ability to protect and mitigate resources. Establishes a better comparative baseline to prioritize investments. Ability to respond more quickly and accurately.											
Other operational benefits	Major	Unable to provide		Major	Unable to provide							
Other operational benefits description				Documentation of channel adjustments and sediment/nutrient depostion.								
Future annual operational benefits added during validation		Annual dollars saved/ realized	$53,306		Annual dollars saved/ realized	$230,609						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide							
Value added to products or services description	High demand for many uses. Accuracy critical for floodplain and river corridor management.											
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness description	Of critical importance. Key to providing guidance for project development. Critical to project development and permit review. Speeds site planning and response. Key to emergency project scoping. Of critical importance to planning, emergency operations and mitigation.											
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Improved customer experience description	More widespread use by municipal officials, developers and citizens. Provides data with an understandable and useable level of precision and accuracy.											
Other customer service benefits	Major	Unable to provide		Major	Unable to provide							
Other customer service benefits description	More effective avoidance of damage from flooding.			Periodic comparable data will allow us to do better sampling of fluvial geomorphic process and the impact of protections, permitted interventions and other changes. Ability to track change over time.								
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$14,278		Annual dollars saved/ realized	$24,099						

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Societal Benefits	**Benefits**	**Benefits**	**Benefits**	**Benefits**
Education or outreach	Major	Major		
Education or outreach description	Provides authoritative data to support public policy.	Capacity to show change over time is critical to river corridor protection work. Major value to being able to cut cross-sections from inland bathometry, which is a critical task.		
Environmental	Major	Major		
Environmental description	Needed to promote protection of ecological processes and prioritize mitigation.	Capacity to identify, find, and address drivers of fluvial geomorphic disequilibrium are important for public safety, reducing damage costs, restoring ecological functions and reducing sediment transport. Major value to being able to cut cross-sections from inland bathometry, which is a critical task.		
Public safety, including life and property	Major	Major		
Public safety, including life and property description	Needed to prioritize mitigation funding.	Important for hazard mitigation planning and prioritization. Major value to being able to cut cross-sections from inland bathometry, which is a critical task.		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps	Yes	Yes		
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: 3D Hydrodynamic Modeling for Management of Major Lakes



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type		Required		
Geographic Area Requirements		Custom description		
Sub Area Requirements		Shoreline regions of all major lakes in Vermont and New York. Primary focus on the Finger Lakes of New York and Lake Champlain, including the parts in Canada		

MCA Description	Response
Mission Critical Activity	3D hydrodynamic modeling for the purpose of understanding the 1) disposition of nutrients from land sources, 2) effects of causeways within Lake Champlain, 3) implementing better choices for effluent & water intake pipes and finally, 4) investigations on the effects of flooding within the lake. Also, modeling of pollutant movement, algal bloom dynamics, and circulation dynamics; bathymetry is critical to the models.
MCA Title	3D Hydrodynamic Modeling for Management of Major Lakes
MCA ID	1308
Organization Type	Academic or Not-for-Profit
Organization Name	Middlebury College
Sub-Agency or Division	
Organization Mission	Liberal Arts College
Program Name	Geology and Lake Studies Program
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 20 - Marine and Riverine Navigation and Safety

What Needs to be Measured in 3D	Response
Bare earth ground	Not required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Shoals, shallow bathymetry around rock-filled causeway opening, river depths, shipwrecks, river delta expanses, submerged river channels, subsurface structure of bridges and roadway. Four square meters size.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Required
Other	Required
Other description	Shoreline Bathy < 10m for entire lake

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order		QL0B		
Update Frequency		>10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error		Up to 1 meter		
Acceptable Vertical Error		Less than 10 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season		Required				
Entire AOI under same environmental conditions		Required				
Other		Required				
Other description		Early spring and immediately after ice cover has gone and plant growth is minimal				
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless		Required				
DEM for entire AOI needs to be seamless		Required				
Amount of acceptable vertical manipulation to achieve spatial seamlessness		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM		Nice to have		
DTM		Nice to have		
DEM		Required		
Raw point cloud data		Nice to have		
Classified point cloud		Nice to have		
Edited/cube XYZ		Highly desirable		
Full waveform		Not required		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening		Required		
Additional breaklines for hydro-enforcement of culverts				
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery		Nice to have		
Ground control/ground truthing		Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery		Nice to have		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data		Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Floating observation/navigation systems				
Shorelines – current, historic, change rates		Highly desirable		
Land use/land cover		Highly desirable		
Wetlands		Highly desirable		
Estuaries				
Inland surface water features		Required		
Bridges/culverts		Highly desirable		
Landmark features		Nice to have		
Cultural resources		Highly desirable		
Coastal and riverine structures		Required		
Overhead structures				
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used		Presently using a 10 meter x 10 meter gridded data set from both single-beam marginally-calibrated 1996-2002 data as well as NOAA's mid-1800s lead-line observations from original NOAA maps for water depths < 12 feet. Multi-beam sonar is slowly being collected (2013-present) for 60% of lake with depths > 10 meter. LIDAR is required for shallow waters < 10m. Primary concern it to gather bathy data (<10 meter) for all regions in NY that do not presently have LIDAR data.		

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other		Yes		
Other description		The 10 meter x 10 meter gridded bathy data base can be requested from Middlebury College		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings		Major		
Cost savings/cost reduction		None		
Cost avoidance		Major		
Increased revenues		None		
Mission-driven performance improvements		Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services		Moderate		
Improved response or timeliness		Moderate		
Improved customer experience		Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach		Major		
Environmental		Moderate		
Public safety, including life and property		Major		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings				Major	Annual dollars saved/realized	$1,434,236						
Time savings description				It would take ~12,000 hours for us to gather multibeam data in shallow water <10 meters in Lake Champlain. Additionally, the time it would take to map the shallow waters of the NY Finger Lakes would be similar to that of Champlain. Plus another 20,000 hours would be a conservative estimate of the time needed to gather bathy data >10 meters in these regions. Need higher quality data for modeling - particularly in shallow water. Better data, better modeling results - rather straight forward. Older data sets are full of potential error due to their antiquity (mid 1800s). Low quality data sets require a lot of time to clean and augment. Shallow data used in this region are moderately poor - new data, we don't have to concern ourselves with locating other better data. Combining multiple data sets vs. a complete high quality data set. Modeling results are better and more realistic - therefore reduced time.								
Cost savings/cost reduction				Major	Annual dollars saved/realized	$310,000						
Cost savings/cost reduction description				Cost of vessel and personnel time to map these regions with multibeam. Fuel for research vessel.								
Cost avoidance				Major	Annual dollars saved/realized	$290,000						
Cost avoidance description				Modeling can't prevent accidents. However, better shallow water bathymetry can. Major benefit would be lack of repeated 3D model runs. Also less time required to find problems in available data. Just because a warning is issued about flooding doesn't mean that there is going to be a cost saving unless government agencies use flooding information to restrict future development. Benefit would also be in lives saved. Don't have to provide post processing - data is valid to certain specs - easier to deal with. If data is high quality, no need for extensive QC.								
Increased revenues				Major	Unable to provide							
Increased revenues description				Better bathymetric maps for general public use. Models would be considered applications that can then be used to inform management.								
Mission-driven performance improvements				Major	Annual percent improvement	22%						

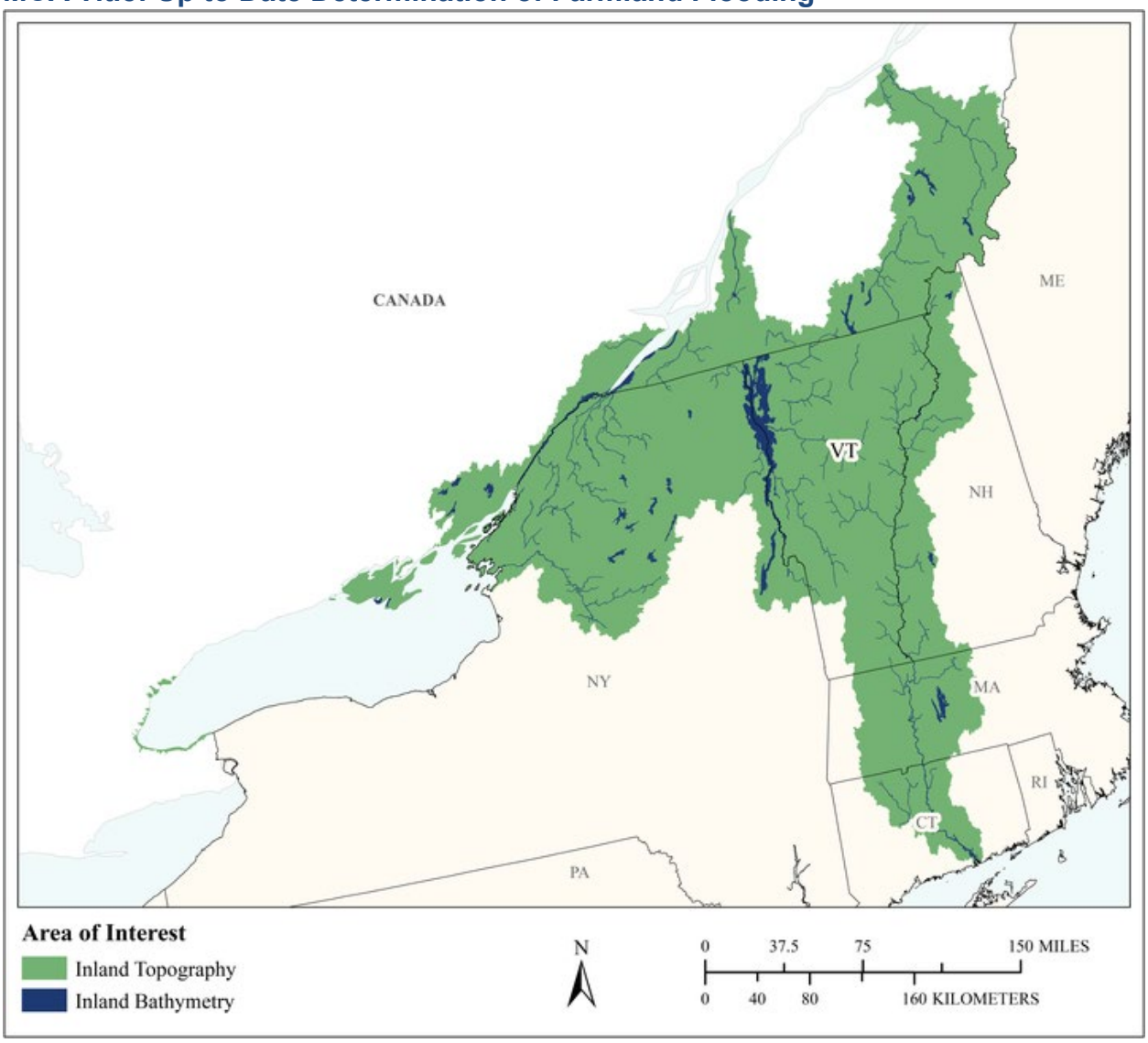
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Mission-driven performance improvements description				As mentioned earlier, accurate bottom bathy is essential for proper 3d hydrodynamic and flood modeling. Better modeling results helps better lake management. Quality bathy data bases are extremely important for modeling and products for research & public outreach. We can concentrate on issues outside bathymetry such as wind forcing, radiation balances, etc. Speed up output products for fellow researchers and the public. Bathy is extremely important for this modeling, if we have it, we can improve our mission. Quantification is difficult.								
Other operational benefits				Major	Annual dollars saved/realized	$21,105						
Other operational benefits description				This is our major focus - without this data set, our modeling efforts will continually be lacking credible results. Higher quality modeling.								
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services				Major	Annual dollars saved/realized	$36,180						
Value added to products or services description				Improved flood hazard maps; we don't produce any charts - that would be a by-product for another agency. But charts can be made more accurate and modeling will be improved for flood warnings. This would be more for researchers & public outreach (local maps). Also, maybe 3rd party vendors will create new lake charts.								
Improved response or timeliness				Major	Annual dollars saved/realized	$46,431						
Improved response or timeliness description				The model will run just as fast but there will be fewer model runs needed to compensate for marginal shallow bathy. Faster response of model will help provide faster response to the public. Modeling is essential for management of many purposes on the lake (e.g. flooding, P- and sediment movement, pollution, movement of accidental spills). Faster response of model will help provide faster response to the public. Data would be online -- this would save a lot of time for us handling the data. Hazard (flooding) maps would be more reliable and faster to produce. Also, as mentioned earlier, it is quite probable that some vendor may create a new bathy map based on the lidar data. So benefits would also be related to the time the product can get to market and how good it is. Better bathy = better and faster results. Faster response of model will help provide faster response to the public.								
Improved customer experience				Major	Annual dollars saved/realized	$9,045						
Improved customer experience description				Data to public can be easily streamlined to the public. A model is a good as the components one puts in it...								
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach				Major								

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Education or outreach description		A complete bathy data base for the lake would be a major benefit for education, research and public outreach		
Environmental		Major		
Environmental description		Modeling would be important in circulation dynamics, P and sediment movement, rock-filled causeway effects and potentially algal bloom dynamics.		
Public safety, including life and property		Major		
Public safety, including life and property description		Flood management is a prime concern of this program. Extreme events can lead to extreme environment responses. Model should be able to help predict this.		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps		Yes		
Aspect maps				
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Up to Date Determination of Farmland Flooding



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)	One or more Hydrologic Units (HUC4s)		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Alluvial Soil Management / Flooding Issues with farm infrastructure - stream banks & farmland Water Quality Soil Erosion & Nutrient Loss Prevention (on farmland). Farm field flooding identification. Soil type "frequently flooded" and field observations are used but these are not accurate enough. New Required Agriculture Practices require extra care for fields that flood frequently. Elevation data and riverine bathymetry will help with H&H modeling to identify fields that flood. FEMA maps are helpful but do not cover all needed streams, also some are quite old. VCGI did FIRM conversion but there are not many new studies. Animation of flood waters using elevation model can help with communication, outreach to farmers. The goal is to avoid manure and fertilizer runoff into streams. Also farm infrastructure siting to avoid flooded areas.
MCA Title	Up to Date Determination of Farmland Flooding
MCA ID	1424
Organization Type	State or U.S. Territorial government
Organization Name	VT Agency of Agriculture
Sub-Agency or Division	
Organization Mission	The Vermont Agency of Agriculture's mission is to facilitate, support and encourage the growth and viability of agriculture while protecting the working landscape, human health, animal health, plant health, consumers and the environment.
Program Name	Water Quality Division
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 02 - Riverine Ecosystem Management
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Farm infrastructure (barns, bunks, manure pits), constricting features in rivers (areas of bedrock outcrop), vegetative buffers along streams & rivers or lack thereof

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	Cross sections and/or transects meet needs		
Update Frequency	2-3 years	2-3 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter		
Acceptable Vertical Error	Up to 20 cm	Up to 20 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial	Yes		
Cross section/transect requirement		500 foot spacing and at significant elevation change and/or structures		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Nice to have	
DEM for entire AOI needs to be seamless	Highly desirable	Nice to have			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level			Up to double the required TVU at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Nice to have	Nice to have		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Highly desirable		
Landmark features	Not required	Not required		
Cultural resources	Not required	Not required		
Coastal and riverine structures	Nice to have	Not required		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Statewide coverage of lidar in VT - can make TINs & use DEMS for flow accumulation	None available at this time		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Vermont Center for Geographic Info			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Inland bathy data not available		
Cost savings/cost reduction	Moderate	Inland bathy data not available		

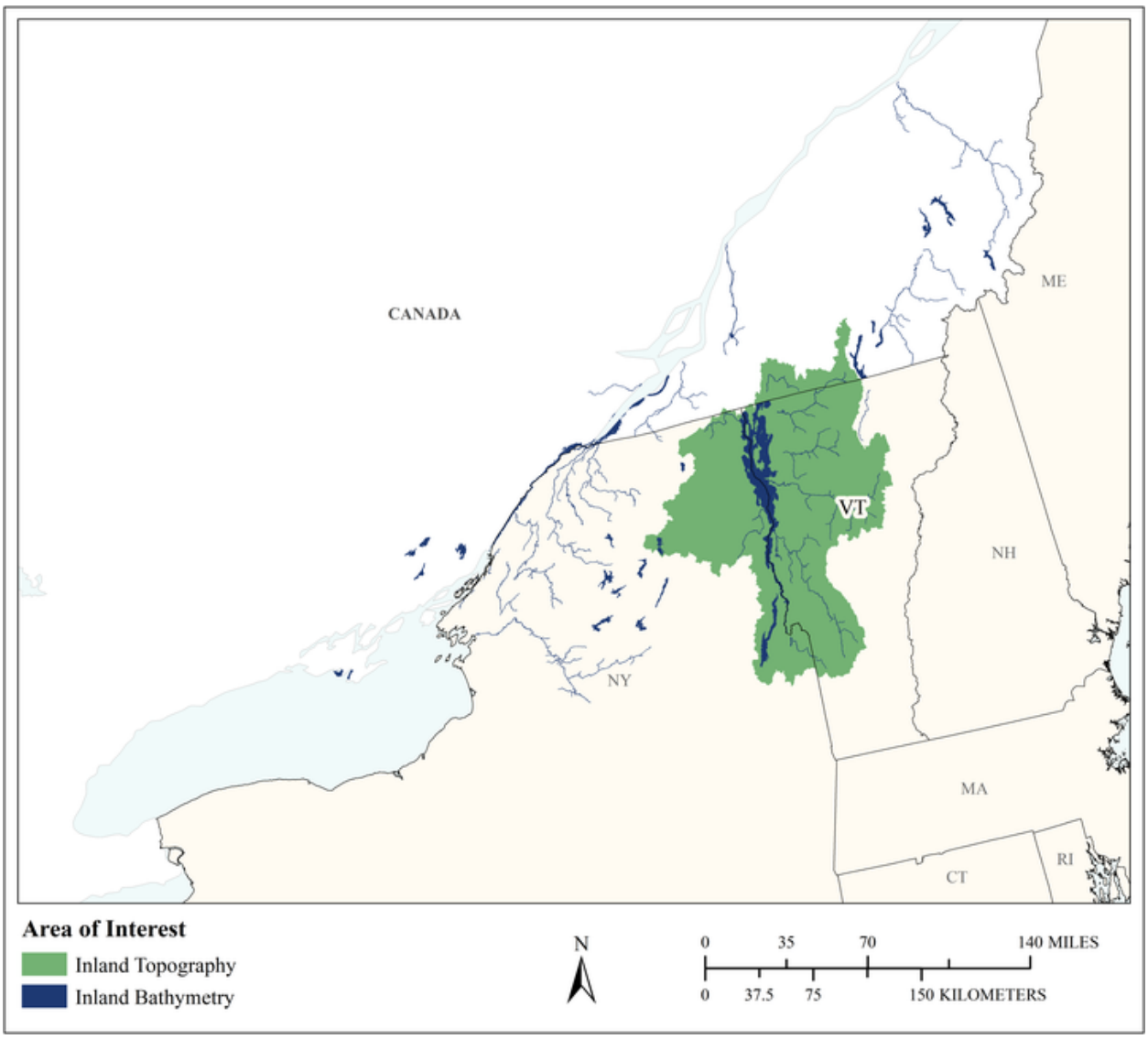
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Cost avoidance	Moderate	Inland bathy data not available		
Increased revenues	None	Inland bathy data not available		
Mission-driven performance improvements	Moderate	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available		
Improved response or timeliness	Moderate	Inland bathy data not available		
Improved customer experience	Major	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Inland bathy data not available		
Environmental	Major	Inland bathy data not available		
Public safety, including life and property	Moderate	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Moderate	Unable to provide							
Time savings description	Water quality inspectors would still need to make field visits.											
Cost savings/cost reduction	Moderate	Unable to provide		Minor	Unable to provide							
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide							
Cost avoidance description	Serious flooding in VT is a huge problem - less infrastructure in areas that flood saves property loss.											
Increased revenues	Moderate	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide							
Value added to products or services description	VAAFM does not have a good methodology to predict flooding hazards now except where mapped on the FIRMs.			Flood prediction is key.								
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness description	We need current flood hazard maps in VT. Farm infrastructure is placed in flood hazard areas due to out dated or non-existent info. Flooding from rivers / streams.			Flood hazard maps are needed. At risk locations for flooding.								
Improved customer experience	Moderate	Unable to provide		I don't know	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Minor								
Education or outreach description	Help convince farmers to avoid areas that flood frequently for nutrient application or building farm infrastructure											
Environmental	Major			Minor								
Environmental description	Less nutrients in water & less encroachment on the floodplain											
Public safety, including life and property	Moderate			Minor								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Water Resource Protection



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Respondent provided own shapefile, KML, or geodatabase	One or more Hydrologic Units (HUC4s)		
Sub Area Requirements	Lake Champlain Basin			

MCA Description	Response
Mission Critical Activity	Water quality and ecosystem integrity, protection, and restoration.
MCA Title	Water Resource Protection
MCA ID	21674
Organization Type	Academic or Not-for-Profit
Organization Name	Lake Champlain Basin Program
Sub-Agency or Division	
Organization Mission	The Lake Champlain Basin Program (LCBP) works in partnership with government agencies from New York, Vermont, and Québec, private organizations, local communities, and individuals to coordinate and fund efforts that benefit the Lake Champlain Basin's water quality, fisheries, wetlands, wildlife, recreation, and cultural resources.
Program Name	Supporting nutrient loading modeling.
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Small tree or shrub, underwater intake pipes

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B		
Update Frequency	4-5 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 30 cm	Up to 5 meters		
Acceptable Vertical Error	I don't know	Up to 20 cm		
How far onshore needed				
How far down the beach profile needed	Below MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Not required			Not required	
Entire AOI under same environmental conditions	Nice to have	Nice to have			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Not required			Not required	
DEM for entire AOI needs to be seamless	Nice to have	Nice to have			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have		
DTM	Highly desirable	Nice to have		
DEM	Required	Required		
Raw point cloud data	Not required	Not required		
Classified point cloud	Not required	Not required		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Not required	Not required		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Not required		
Ground control/ground truthing	Not required	Not required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Not required		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Highly desirable		
Bridges/culverts	Not required	Not required		
Landmark features	Not required	Not required		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Not required	Not required		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	LiDAR-derived DEM	No inland bathy except Lake Champlain, NOAA charts used for Lake Champlain		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts		Yes		
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	USGS			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None	None		
Cost savings/cost reduction	None	None		
Cost avoidance	None	None		

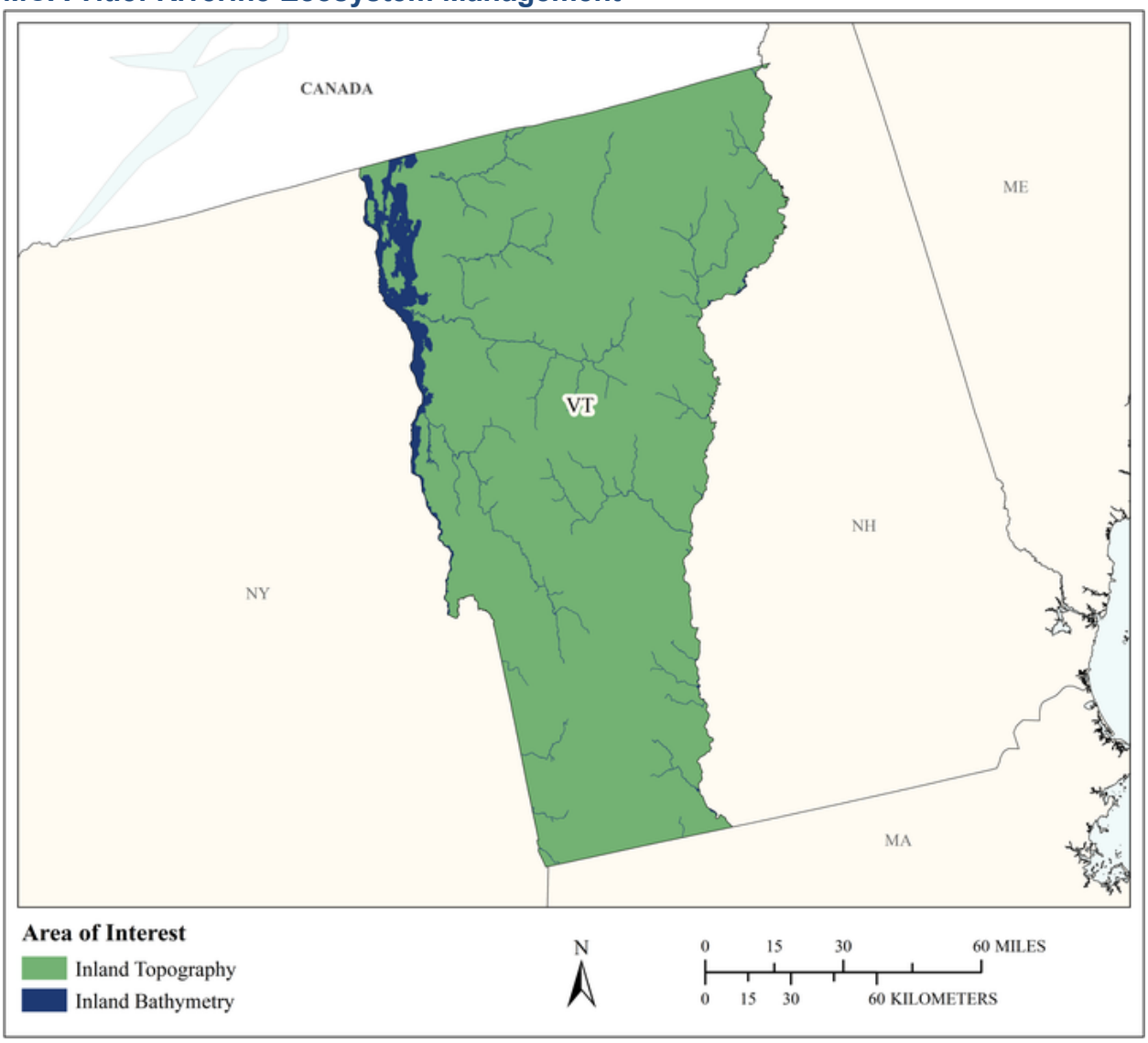
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Increased revenues	None	None		
Mission-driven performance improvements	None	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None	None		
Improved response or timeliness	None	None		
Improved customer experience	None	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate		
Environmental	Major	Minor		
Public safety, including life and property	Major	None		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		Minor	Unable to provide							
Cost savings/cost reduction	I don't know	Unable to provide		Minor	Unable to provide							
Cost avoidance	I don't know	Unable to provide		Moderate	Unable to provide							
Increased revenues	None			Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide							
Mission-driven performance improvements description	Resolution and accuracy improvement by partners who use the data.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide							
Improved customer experience	None			Moderate	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate								
Environmental	Major			Moderate								
Public safety, including life and property	Major			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Riverine Ecosystem Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Stream channel analysis and mapping. Stream bank erosion analysis. Aquatic and terrestrial species habitat management. Environmental management.
MCA Title	Riverine Ecosystem Management
MCA ID	60479
Organization Type	State or U.S. Territorial government
Organization Name	State of Vermont
Sub-Agency or Division	Vermont Agency of Natural Resources, Department of Environmental Conservation
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B		
Update Frequency	6-10 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Required			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Required	Highly desirable		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Highly desirable	Nice to have		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Moderate	Minor		
Cost avoidance	Moderate	None		
Increased revenues	None	None		
Mission-driven performance improvements	Major	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		

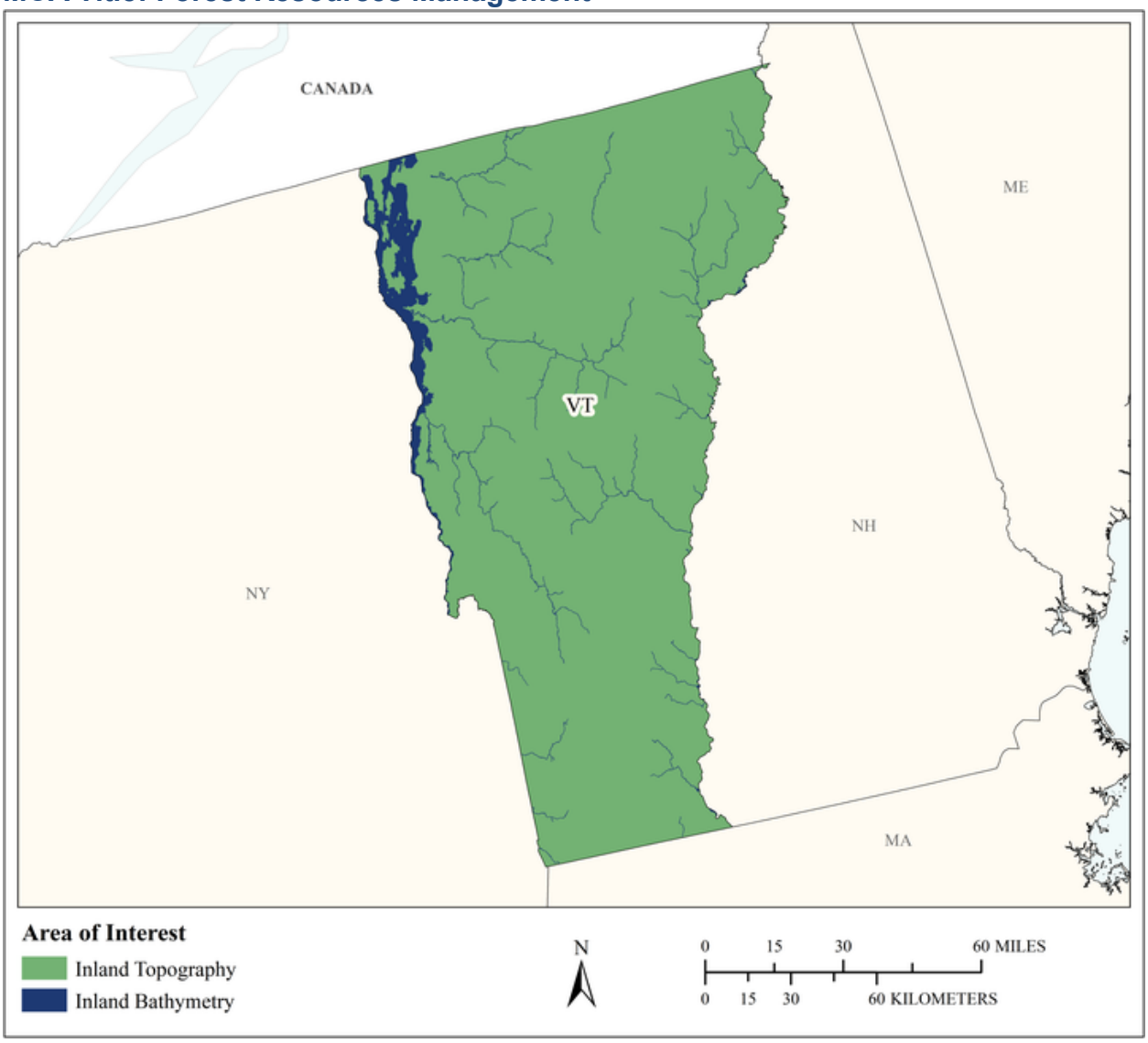
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Moderate		
Improved customer experience	Major	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate		
Environmental	Major	Major		
Public safety, including life and property	Major	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$14,715		Annual dollars saved/ realized	$7,833						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,469		Annual dollars saved/ realized	$552						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Major			Major								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Forest Resources Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Forest health assessment. Determination of standing inventory of forest resources. Prescribed burn planning. Analysis of carbon stocks for trade. Harvest systems planning.
MCA Title	Forest Resources Management
MCA ID	60480
Organization Type	State or U.S. Territorial government
Organization Name	State of Vermont
Sub-Agency or Division	Vermont Agency of Natural Resources, Department of Environmental Conservation
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B		
Update Frequency	2-3 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Not required		
DTM	Required	Not required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Required	Highly desirable		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Required		
Land use/land cover	Required	Required		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Highly desirable	Required		
Landmark features	Nice to have	Nice to have		
Cultural resources	Highly desirable	Nice to have		
Coastal and riverine structures	Nice to have	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Major		
Increased revenues	Minor	Moderate		
Mission-driven performance improvements	Major	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		

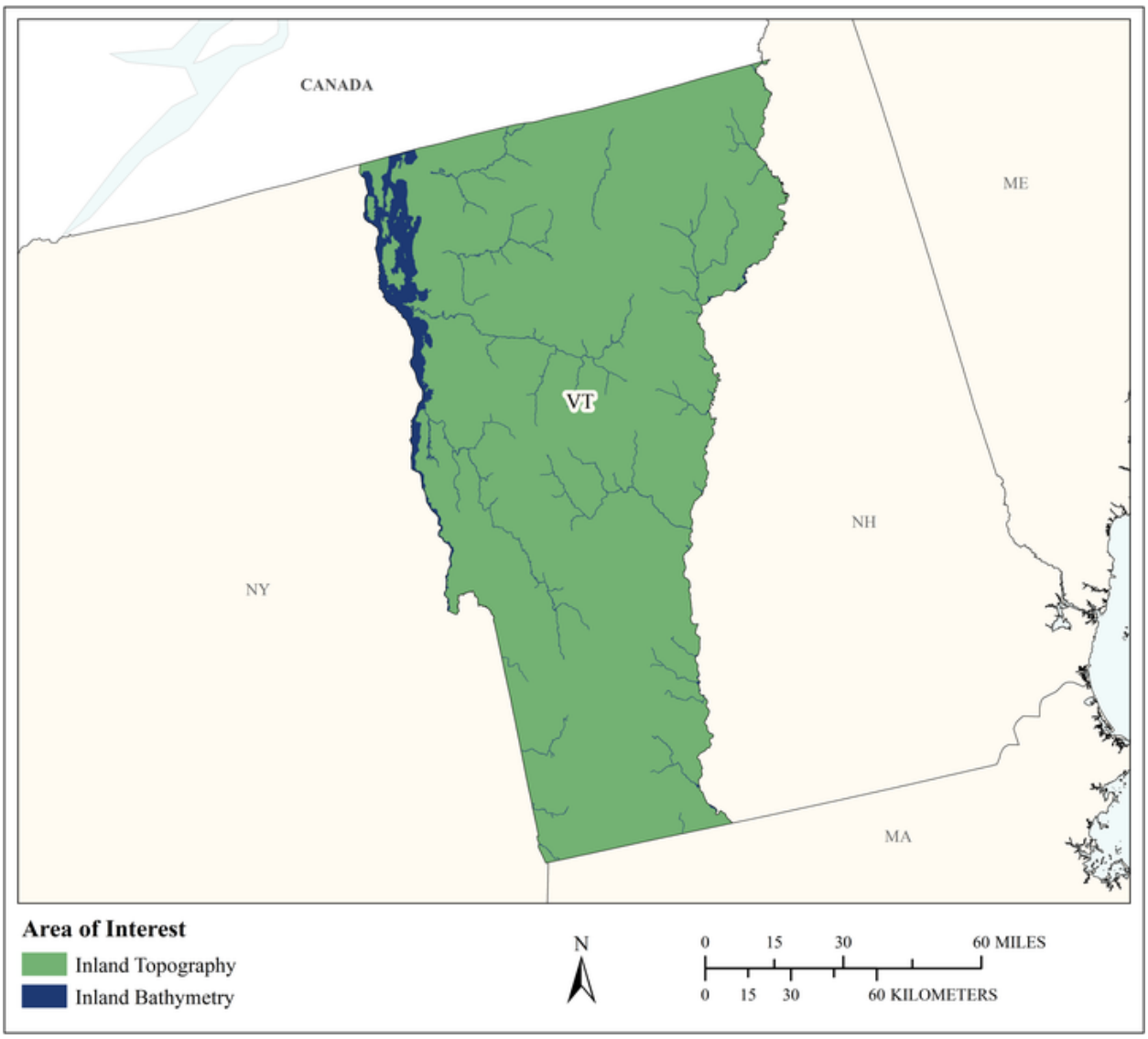
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major		
Improved customer experience	Moderate	Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Major		
Environmental	Major	Major		
Public safety, including life and property	Moderate	Major		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Major	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$38,012									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$55,103									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Major			Major								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes		
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Natural Resources Conservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation engineering. Soils and wetlands mapping and characterization. Modeling of biological and ecological systems. Erosion control. Rainfall penetration studies, impervious surfaces. Assessment of blue carbon stocks.
MCA Title	Natural Resources Conservation
MCA ID	60481
Organization Type	State or U.S. Territorial government
Organization Name	State of Vermont
Sub-Agency or Division	Vermont Agency of Natural Resources, Department of Environmental Conservation
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B		
Update Frequency	4-5 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Highly desirable			Required	
Entire AOI under same environmental conditions	Required	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Required	Required		
Classified point cloud	Required	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Required		
Land use/land cover	Required	Required		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Moderate		
Increased revenues	Minor	Minor		
Mission-driven performance improvements	Major	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		

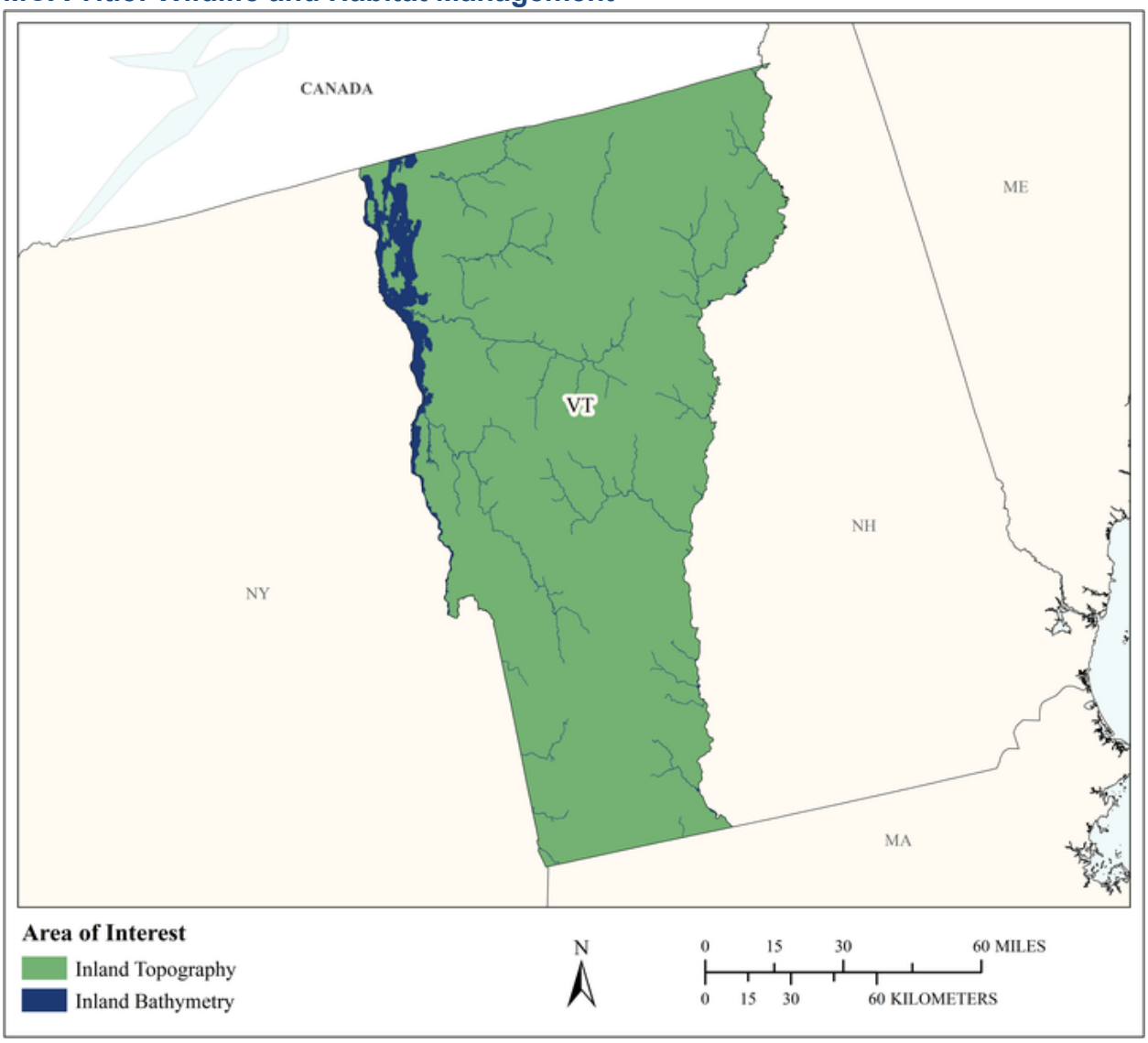
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major		
Improved customer experience	Major	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate		
Environmental	Major	Major		
Public safety, including life and property	Major	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$377,094		Annual dollars saved/ realized	$51,110						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,384,806		Annual dollars saved/ realized	$2,300						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Major			Major								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Wildlife and Habitat Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation planning for wildlife refuges and marine sanctuaries. Conservation of critical habitats. Management of diverse migratory bird habitats, coral reef and coral communities, marine mammals, protected fish species, and trust resources.
MCA Title	Wildlife and Habitat Management
MCA ID	60482
Organization Type	State or U.S. Territorial government
Organization Name	State of Vermont
Sub-Agency or Division	Vermont Agency of Natural Resources, Department of Environmental Conservation
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Highly desirable	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Nice to have		
Classified point cloud	Highly desirable	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Highly desirable		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Nice to have	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	Major	Minor		
Increased revenues	None	Minor		
Mission-driven performance improvements	Moderate	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate		

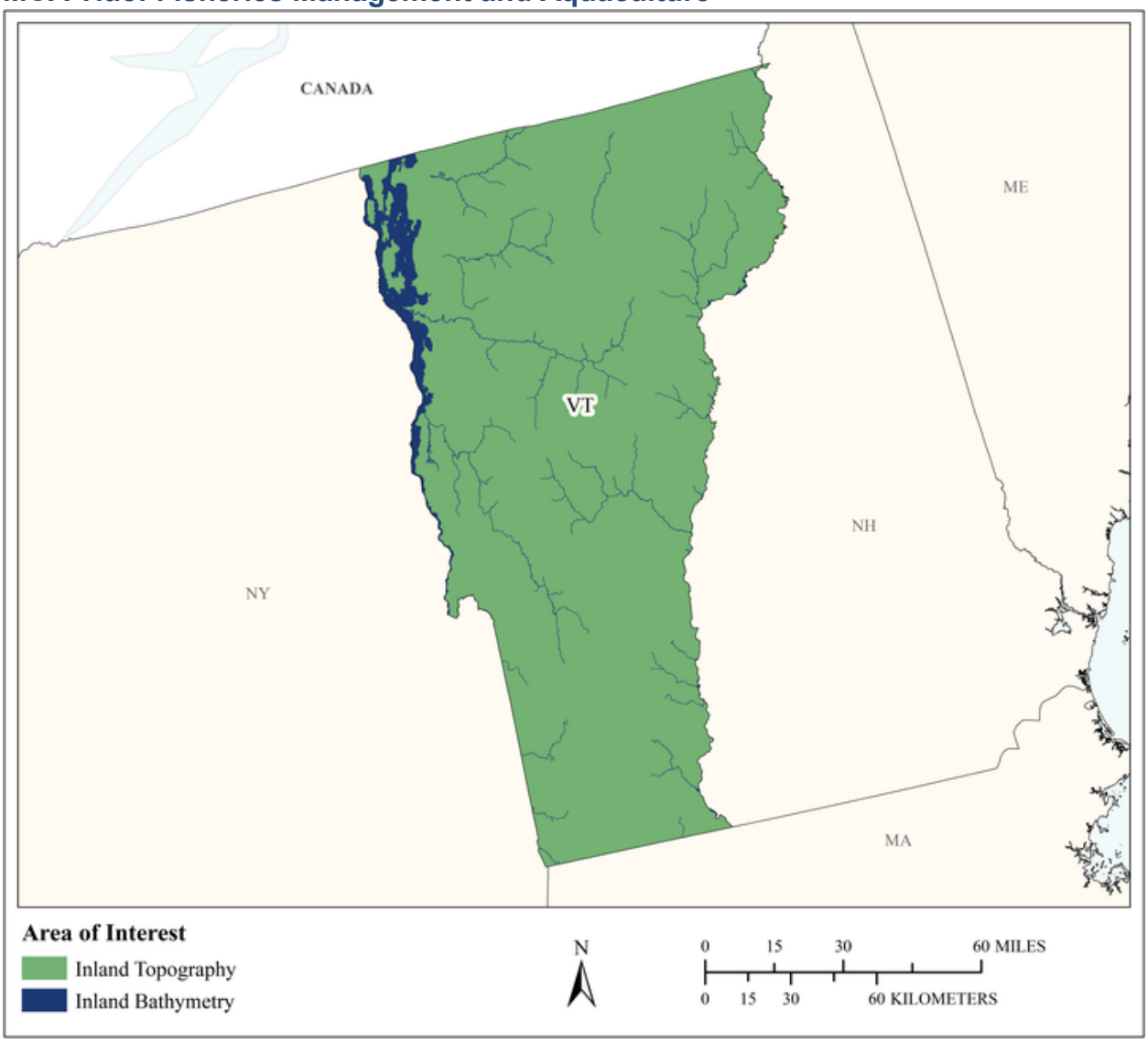
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Minor	Minor		
Improved customer experience	Minor	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Moderate		
Environmental	Moderate	Moderate		
Public safety, including life and property	Minor	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,290		Annual dollars saved/ realized	$18,353						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide							
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$6,614		Annual dollars saved/ realized	$11,093						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate								
Environmental	Major			Moderate								
Public safety, including life and property	Moderate			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Fisheries Management and Aquaculture



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Management of fisheries. Sustainable aquaculture.
MCA Title	Fisheries Management and Aquaculture
MCA ID	60483
Organization Type	State or U.S. Territorial government
Organization Name	State of Vermont
Sub-Agency or Division	Vermont Agency of Natural Resources, Department of Environmental Conservation
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B		
Update Frequency	2-3 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Required	
Entire AOI under same environmental conditions	Required	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Required	
DEM for entire AOI needs to be seamless	Required	Required			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Nice to have		
Classified point cloud	Highly desirable	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Nice to have		
Ground control/ground truthing	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required	Highly desirable		
Land use/land cover	Required	Highly desirable		
Wetlands	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Required	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Moderate		
Cost avoidance	Moderate	Moderate		
Increased revenues	Moderate	Moderate		
Mission-driven performance improvements	Major	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		

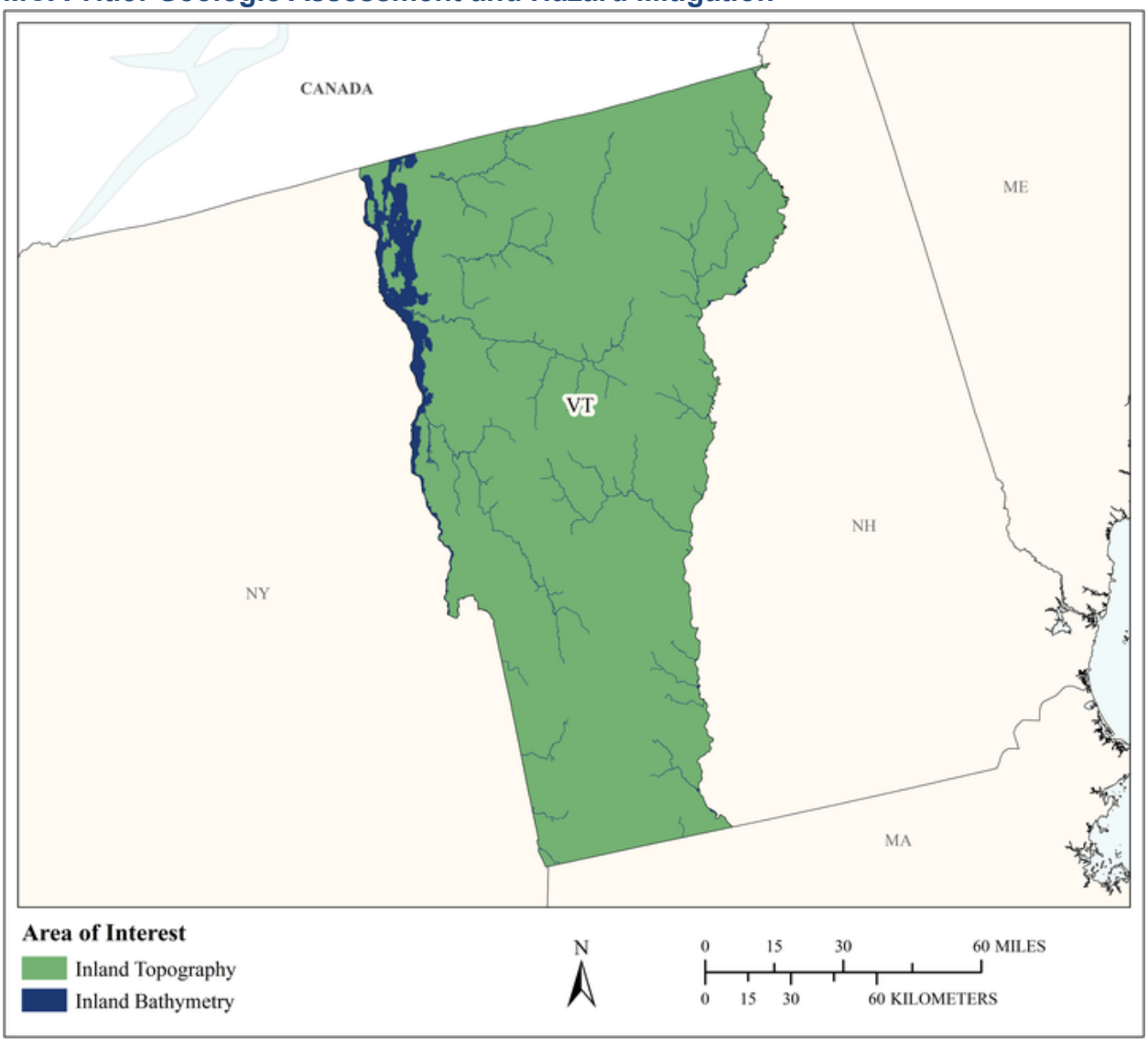
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major		
Improved customer experience	Moderate	Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor		
Environmental	Major	Moderate		
Public safety, including life and property	Moderate	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		None								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$9,827		Annual dollars saved/ realized	$19,236						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$21,346		Annual dollars saved/ realized	$8,755						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major								
Environmental	Moderate			Major								
Public safety, including life and property	Moderate			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic Assessment and Hazard Mitigation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Geologic mapping and analysis. Sinkhole and steephead mapping, monitoring, and analysis. Identification of geomorphologic units. Landslide hazard mapping and assessment. Karst mapping, including springs and caves. Aquifer recharge.
MCA Title	Geologic Assessment and Hazard Mitigation
MCA ID	60484
Organization Type	State or U.S. Territorial government
Organization Name	State of Vermont
Sub-Agency or Division	Vermont Agency of Natural Resources, Department of Environmental Conservation
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B		
Update Frequency	4-5 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Highly desirable	
Entire AOI under same environmental conditions	Required	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Nice to have		
Classified point cloud	Required	Highly desirable		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required	Required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required	Required		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	Major	Minor		
Increased revenues	None	None		
Mission-driven performance improvements	Major	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate		

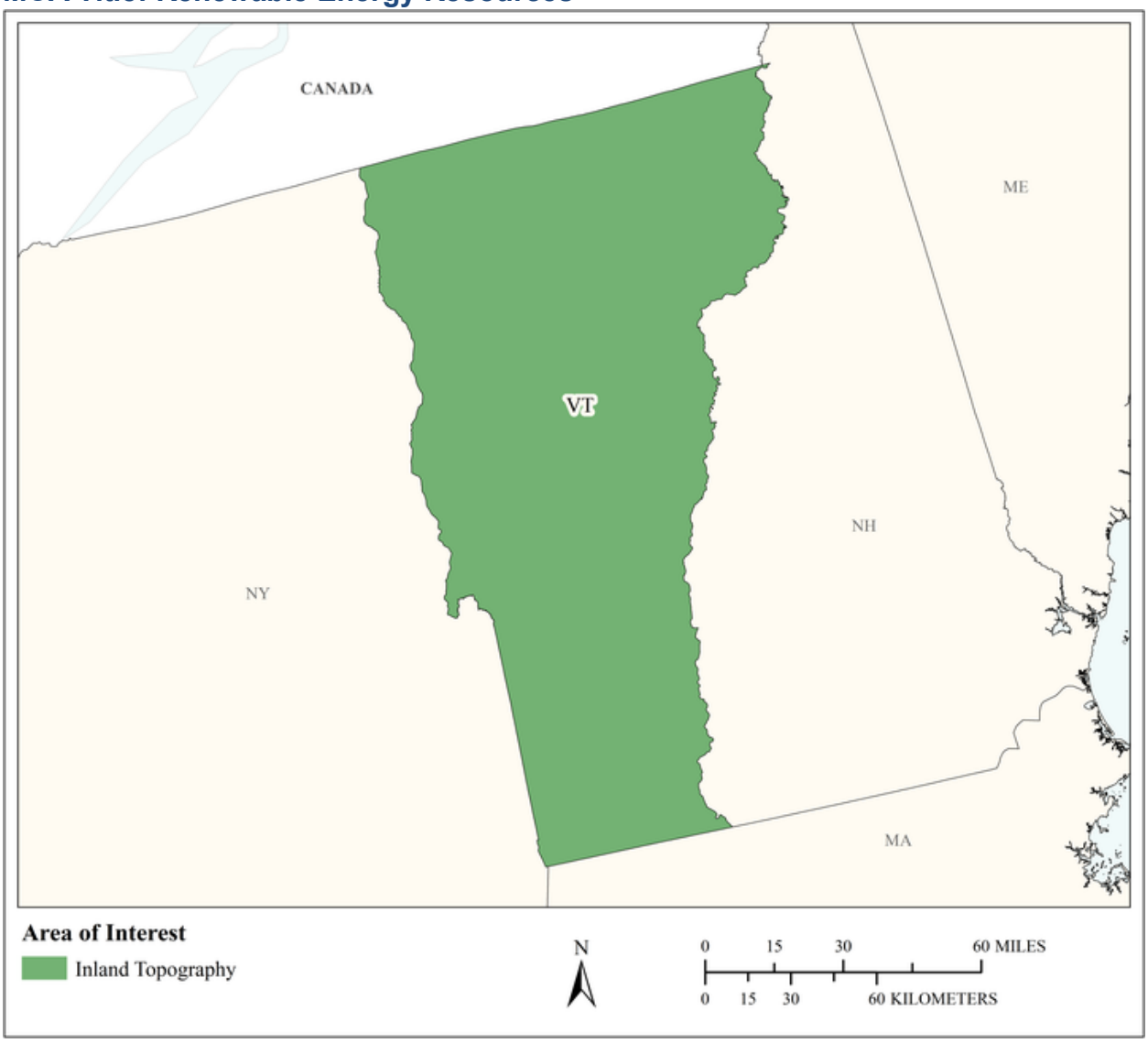
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor		
Improved customer experience	Major	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate		
Environmental	Major	Moderate		
Public safety, including life and property	Major	Major		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Minor	Unable to provide							
Cost avoidance	Major	Unable to provide		Minor	Unable to provide							
Increased revenues	Minor	Unable to provide		None								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,029,447		Annual dollars saved/ realized	$26,863						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$35,626		Annual dollars saved/ realized	$29,519						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate								
Environmental	Major			Moderate								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Renewable Energy Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Alternate energy development – solar, tidal, wind, wave, and ocean current. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Low head power potential for hydropower.
MCA Title	Renewable Energy Resources
MCA ID	60485
Organization Type	State or U.S. Territorial government
Organization Name	State of Vermont
Sub-Agency or Division	Vermont Center for Geographic Information
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Not required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Minor			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor			

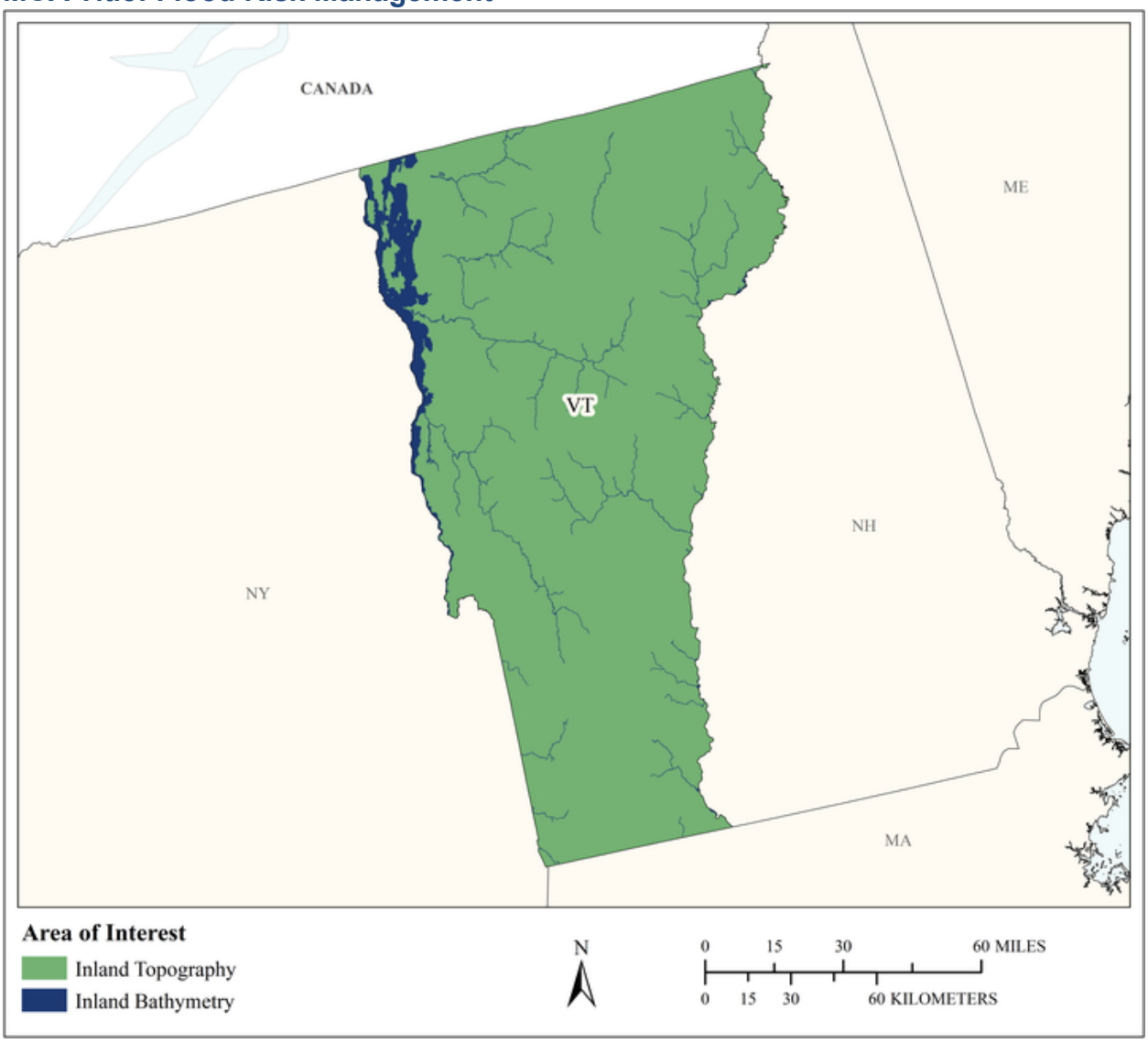
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Minor			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	None											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Flood Risk Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Flood risk modeling and mapping of riverine and coastal areas. Dam/dike/levee safety analysis. Emergency management. Flood forecasts.
MCA Title	Flood Risk Management
MCA ID	60486
Organization Type	State or U.S. Territorial government
Organization Name	State of Vermont
Sub-Agency or Division	Vermont Agency of Natural Resources, Department of Environmental Conservation
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Required	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Required	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	Major	Moderate		
Increased revenues	Minor	Minor		
Mission-driven performance improvements	Major	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		

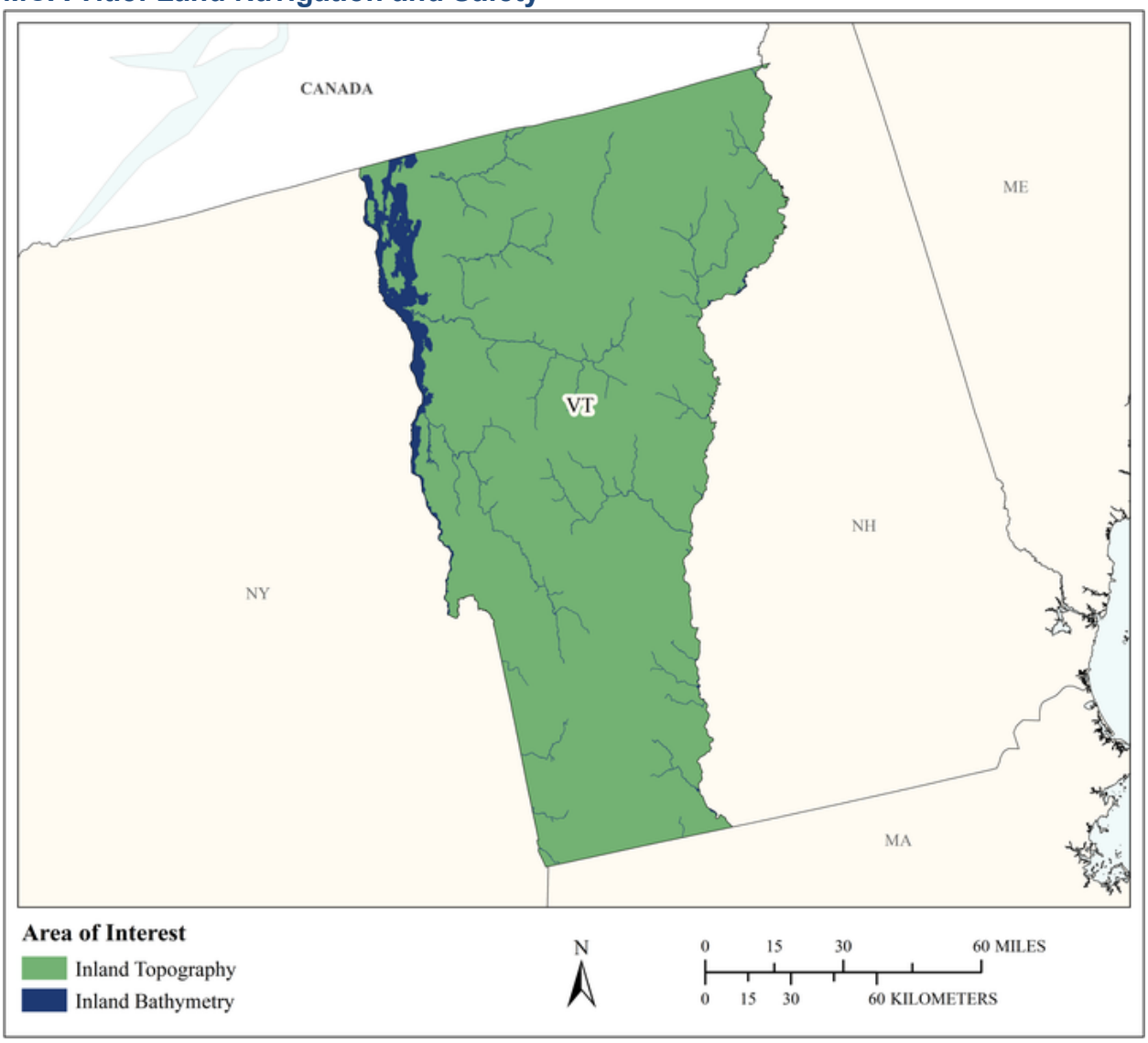
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor		
Improved customer experience	Major	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor		
Environmental	Major	Moderate		
Public safety, including life and property	Major	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		None								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,349,881		Annual dollars saved/ realized	$93,772						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$236,187		Annual dollars saved/ realized	$105,282						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate								
Environmental	Moderate			Moderate								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Land Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Road and railroad route selection and maintenance. Slope analysis for autonomous cars. GPS navigation visualization.
MCA Title	Land Navigation and Safety
MCA ID	60487
Organization Type	State or U.S. Territorial government
Organization Name	State of Vermont
Sub-Agency or Division	Vermont Agency of Transportation
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 19 - Land Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL0B		
Update Frequency	2-3 years	2-3 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	Up to 2 meters		
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Highly desirable	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Required		
Land use/land cover	Highly desirable	Required		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	Moderate	Minor		
Increased revenues	None	None		
Mission-driven performance improvements	Major	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		

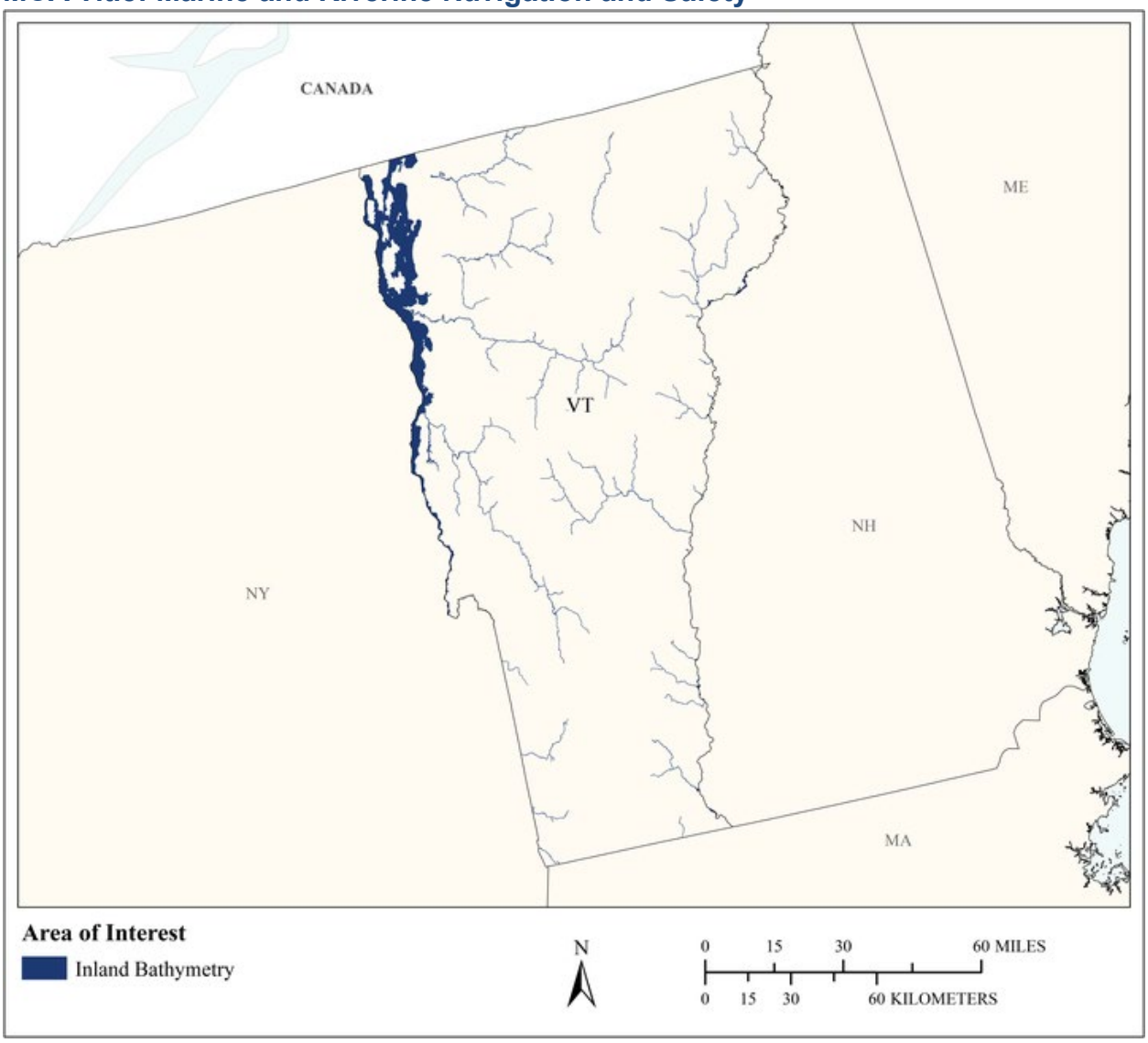
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor		
Improved customer experience	Major	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor		
Environmental	Moderate	Moderate		
Public safety, including life and property	Major	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$124,545		Annual dollars saved/ realized	$5,312						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide							
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$10,057		Annual dollars saved/ realized	$54						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor								
Environmental	Major			Moderate								
Public safety, including life and property	Major			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Marine and Riverine Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type		Required		
Geographic Area Requirements		One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Nautical charting. Bathymetric measurements of nearshore submerged coastal topography. Identification of hazards to navigation. Sediment management at coastal navigation projects. Precision marine navigation. Movement of goods and fishing vessels.
MCA Title	Marine and Riverine Navigation and Safety
MCA ID	60488
Organization Type	State or U.S. Territorial government
Organization Name	State of Vermont
Sub-Agency or Division	Vermont Center for Geographic Information
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Nice to have
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order		QL0B		
Update Frequency		2-3 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error		Up to 2 meters		
Acceptable Vertical Error		Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season		Nice to have				
Entire AOI under same environmental conditions		Nice to have				
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless		Required				
DEM for entire AOI needs to be seamless		Required				
Amount of acceptable vertical manipulation to achieve spatial seamlessness		Up to double the required TVU at the 95% confidence level				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM		Highly desirable		
DTM		Highly desirable		
DEM		Required		
Raw point cloud data		Nice to have		
Classified point cloud		Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform		Not required		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening		Not required		
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery		Nice to have		
Ground control/ground truthing		Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery		Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data		Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates		Required		
Land use/land cover		Nice to have		
Wetlands		Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features		Required		
Bridges/culverts		Highly desirable		
Landmark features		Nice to have		
Cultural resources		Highly desirable		
Coastal and riverine structures		Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts		Yes		
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings		Major		
Cost savings/cost reduction		I don't know		
Cost avoidance		Major		
Increased revenues		None		
Mission-driven performance improvements		Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services		None		

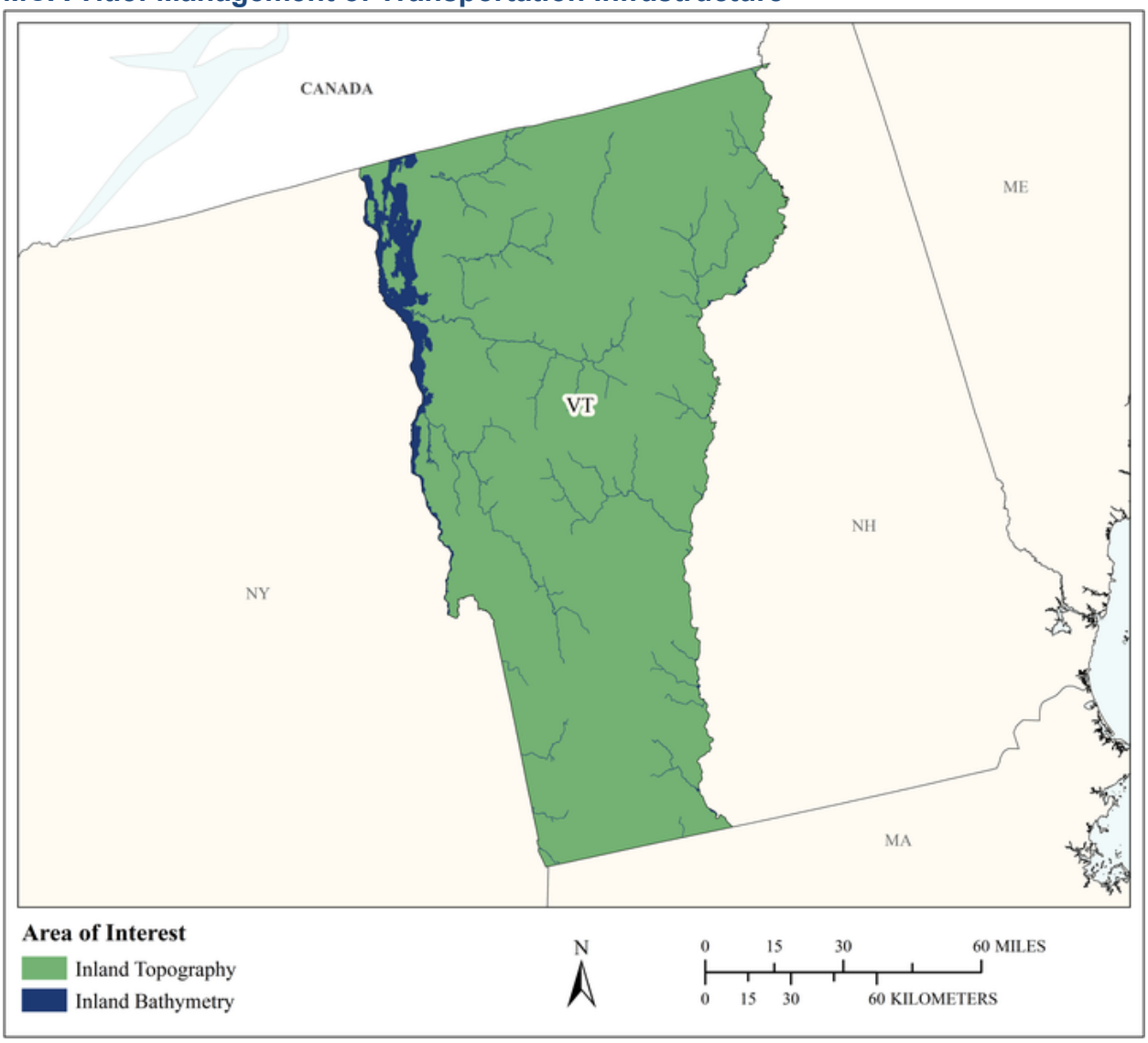
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness		None		
Improved customer experience		None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach		None		
Environmental		None		
Public safety, including life and property		None		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings				Major	Unable to provide							
Cost savings/cost reduction				Major	Unable to provide							
Cost avoidance				Moderate	Unable to provide							
Increased revenues				Moderate	Unable to provide							
Mission-driven performance improvements				Major	Unable to provide							
Future annual operational benefits added during validation					Annual dollars saved/ realized	$175,369						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services				Minor	Unable to provide							
Improved response or timeliness				Major	Unable to provide							
Improved customer experience				Moderate	Unable to provide							
Future annual customer service benefits added during validation					Annual dollars saved/ realized	$23,080						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach				Moderate								
Environmental				Moderate								
Public safety, including life and property				Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes		
Contours		Yes		
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints		Yes		
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Management of Transportation Infrastructure



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Risk management for the transportation infrastructure, hydraulic modeling for structure design, assessment of aviation approach obstructions, terrain data for highway design, and stormwater assessments. VTrans has many areas that terrain data and bathymetry are used to meet mission critical activities. These include planning for aviation, rail, highways, and public transportation, as well as resiliency of infrastructure. Terrain models are used to assess runoff in culverts. Bankfull width is needed for sizing of infrastructure. Lidar data are used for planning, bridge/culvert design, modeling, resilience, hydraulic work, and layout of preliminary design; then field surveys can be more targeted. Obstructions can be modeled for aviation approaches. Intermediate data collection is also needed. Bathymetry would aid in the work that we do with structures and their planning, design, and risk management.
MCA Title	Management of Transportation Infrastructure
MCA ID	21535
Organization Type	State or U.S. Territorial government
Organization Name	Vermont Agency of Transportation
Sub-Agency or Division	
Organization Mission	Providing for the safe and efficient movement of people and goods. The Vermont Agency of Transportation (VTrans) plans, develops, implements, and manages a statewide transportation network – including roads, bridges, railroads, airports, park-and-rides, bicycle and pedestrian facilities, and public transportation facilities and services.
Program Name	Statewide Transportation Improvement Plan (STIP) – Project development through the Vtrans Structures Section and Highway, Safety & Design Bureau. Aviation Section
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 21 - Aviation Navigation and Safety
Tertiary Business Use	BU 15 - Flood Risk Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Highway design requires curbs, signs, guardrail, wingwalls, abutments, exposed footing underwater, stormdrains

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Less than 50 cm		
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Required		
Classified point cloud	Highly desirable	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Highly desirable		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Highly desirable		
Ground control/ground truthing	Highly desirable	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Nice to have	Required		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Required	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			
Other	Required			
Other description	Transportation infrastructure			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Vermont has multiple lidar acquisition years and all of the State is QL2 (~2013-2017) See vcgi.vermont.gov	Field collected with transects on boats		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Vcgi.vermont.gov			
Other	Yes			
Other description	Local data from survey			
Data that meet my needs are not available				

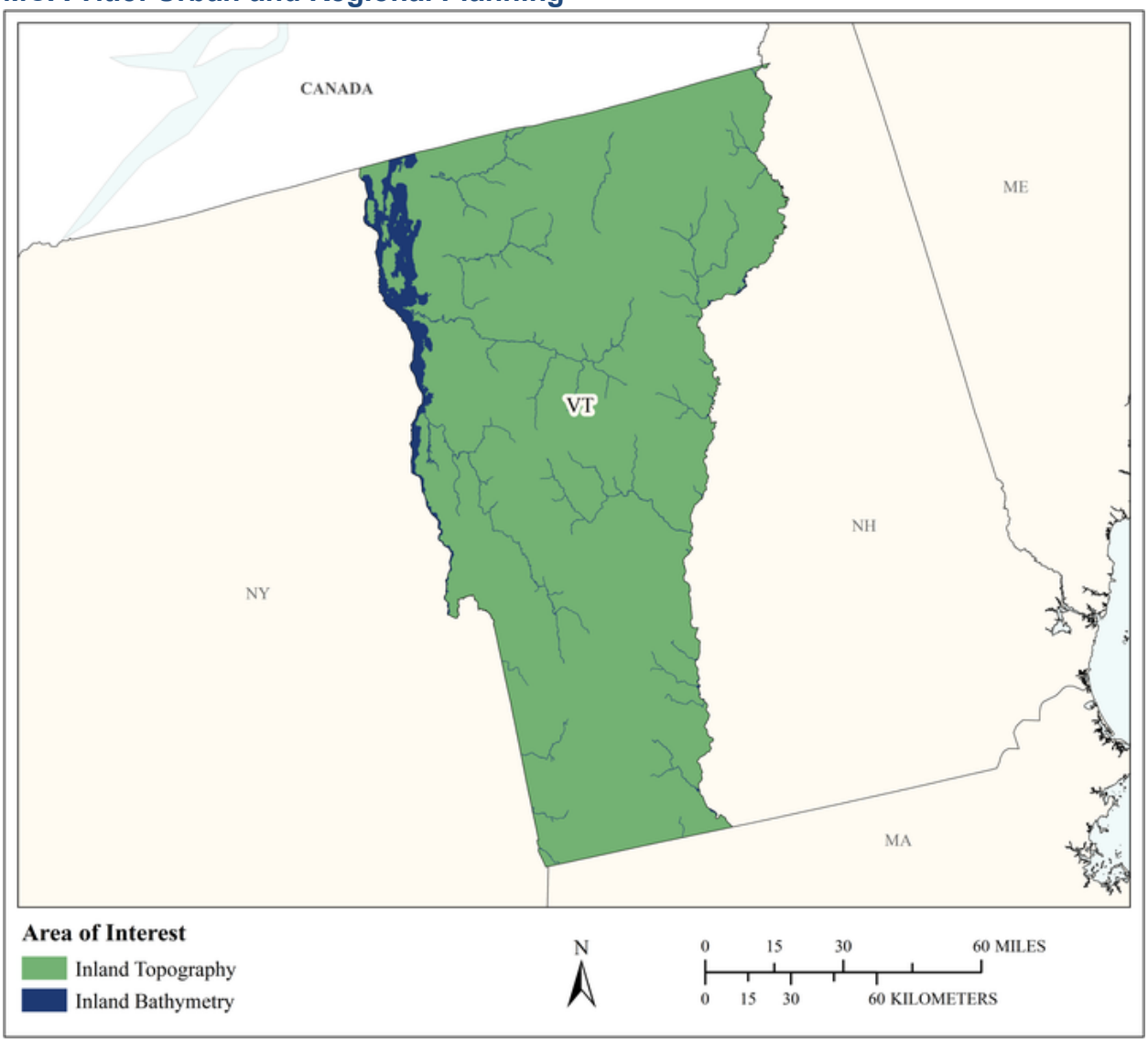
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available		
Cost savings/cost reduction	Major	Inland bathy data not available		
Cost avoidance	Major	Inland bathy data not available		
Increased revenues	None	Inland bathy data not available		
Mission-driven performance improvements	Moderate	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know	Inland bathy data not available		
Improved response or timeliness	Moderate	Inland bathy data not available		
Improved customer experience	I don't know	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	Inland bathy data not available		
Environmental	Moderate	Inland bathy data not available		
Public safety, including life and property	Moderate	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Moderate	Unable to provide							
Cost savings/cost reduction	Moderate	Annual dollars saved/realized	$200,000	Moderate	Unable to provide							
Cost savings/cost reduction description	This is a coarse estimate and a better number would take a bit of time to define.											
Cost avoidance	Moderate	Unable to provide		I don't know	Unable to provide							
Increased revenues	None			None								
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		None								
Improved response or timeliness	Moderate	Unable to provide		Moderate	Unable to provide							
Improved customer experience	I don't know	Unable to provide		None								
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			None								
Environmental	Moderate			Minor								
Public safety, including life and property	Moderate			Minor								
Public safety, including life and property description	Better design, resilience planning, aviation											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Urban and Regional Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Land development and zoning. Municipal mapping of building footprints and elevations. Port resilience planning. Parks and transportation planning. Virtual city creation. Urban ecology planning.
MCA Title	Urban and Regional Planning
MCA ID	60489
Organization Type	State or U.S. Territorial government
Organization Name	State of Vermont
Sub-Agency or Division	Vermont Center for Geographic Information
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B		
Update Frequency	4-5 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Required	Nice to have		
Classified point cloud	Required	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Highly desirable		
Land use/land cover	Required	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Nice to have		
Coastal and riverine structures	Highly desirable	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	Major	Minor		
Increased revenues	Minor	Minor		
Mission-driven performance improvements	Major	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		

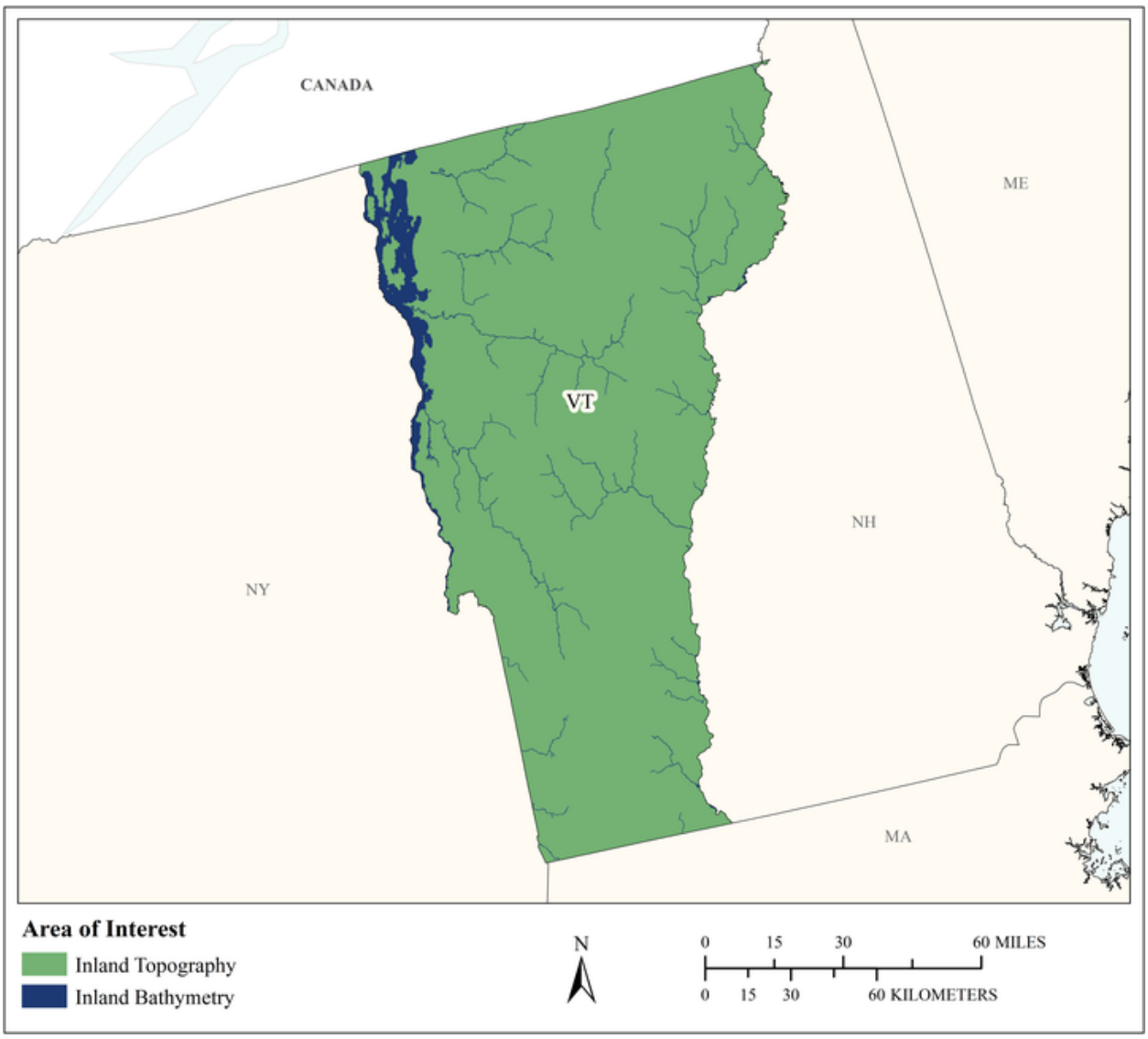
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor		
Improved customer experience	Major	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor		
Environmental	Major	Minor		
Public safety, including life and property	Major	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,586,790		Annual dollars saved/ realized	$105,355						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$298,646		Annual dollars saved/ realized	$133,283						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate								
Environmental	Major			Moderate								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Recreation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Planning and development of recreational facilities such as rafting, boating, swimming, diving, and fishing areas; ski slopes; and golf courses. Location- based products and services such as maps and guides. Tourism. Trail and vista site planning. Orienteering.
MCA Title	Recreation
MCA ID	60490
Organization Type	State or U.S. Territorial government
Organization Name	State of Vermont
Sub-Agency or Division	Vermont Agency of Natural Resources, Department of Environmental Conservation
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 27 - Recreation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required			Not required	
Entire AOI under same environmental conditions	Required	Not required			Not required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have			Nice to have	
DEM for entire AOI needs to be seamless	Required	Nice to have			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required		
DTM	Nice to have	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Highly desirable	Highly desirable		
Edited/cube XYZ		Highly desirable		
Full waveform	Not required	Nice to have		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Nice to have		
Ground control/ground truthing	Nice to have	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Highly desirable		
Land use/land cover	Nice to have	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Not required	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor		
Cost savings/cost reduction	Moderate	Minor		
Cost avoidance	Major	Minor		
Increased revenues	None	Minor		
Mission-driven performance improvements	Major	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor		

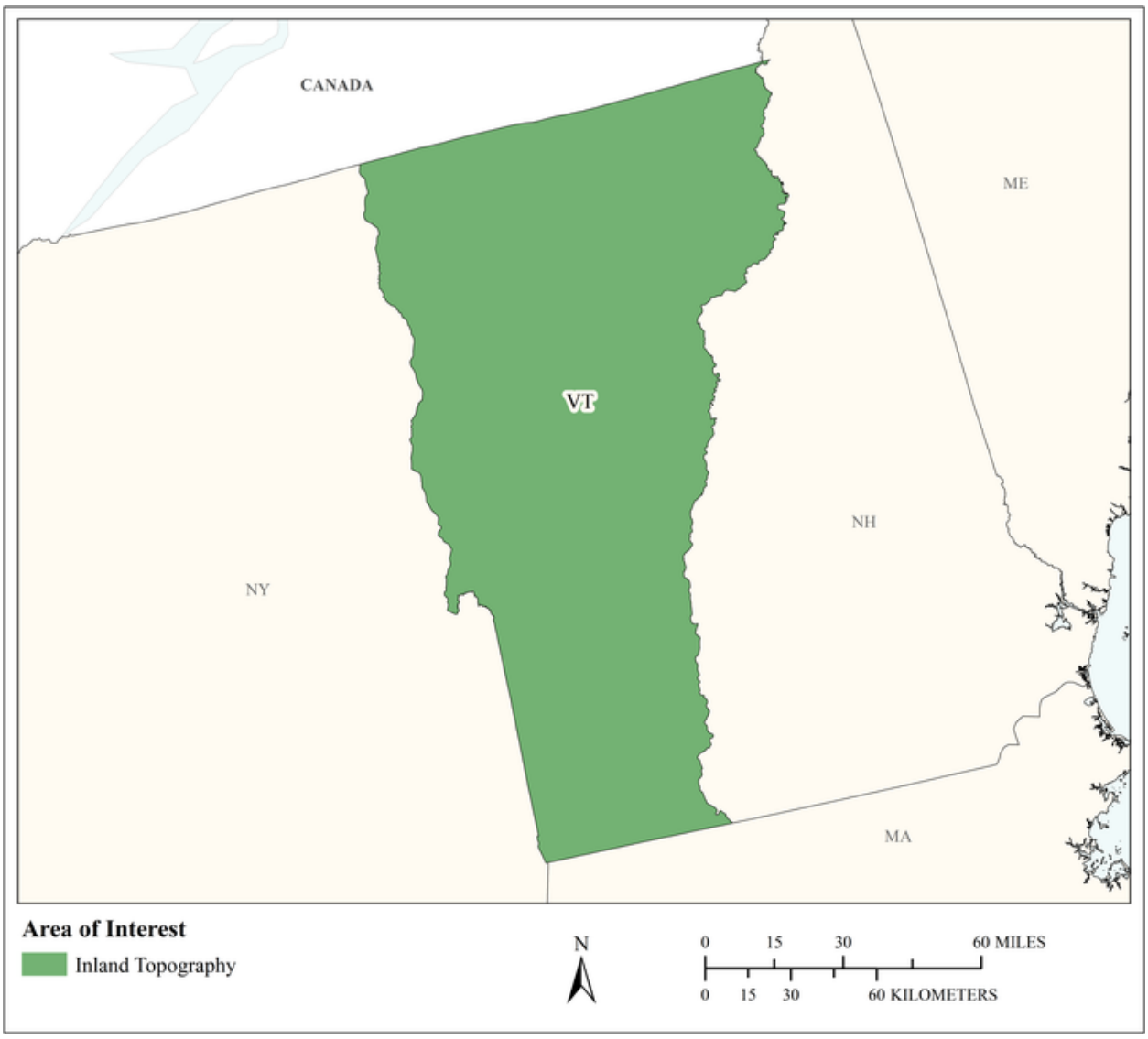
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Minor		
Improved customer experience	Moderate	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor		
Environmental	Major	Minor		
Public safety, including life and property	Major	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	None			Moderate	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,206		Annual dollars saved/ realized	$1,328						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Minor	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major								
Environmental	Moderate			Major								
Public safety, including life and property	Moderate			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Telecommunications



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Telecommunication tower site selection. Design of radio and radar systems. Interference analysis. Path profiles. Undersea telecommunication route selection and deployment.
MCA Title	Telecommunications
MCA ID	60491
Organization Type	State or U.S. Territorial government
Organization Name	State of Vermont
Sub-Agency or Division	Vermont Center for Geographic Information
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 28 - Telecommunications
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Highly desirable			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
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Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
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Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

Virginia

Geographic Setting

The Commonwealth of Virginia has a total area of 42,774 square miles, including 3,180 square miles of water, making it the 35th-largest state by area (https://www.usgs.gov/states/virginia).

The physiography of Virginia is composed of five northeast-to-southwest trending belts. Arranged side by side, from east to west, they are the Coastal Plain, Piedmont, Blue Ridge, Valley and Ridge, and Allegheny Plateau. (http://csmgeo.csm.jmu.edu/geollab/vageol/vahist/PhysProv.html#provinces). Elevations range from sea level on the coast to the highest peak, Mount Rogers, at 5,729 feet (1,746 meters) above sea level, located in Grayson County in the southwestern part of the commonwealth.

In addition to the Chesapeake Bay, other major physiographic landmarks of significance include the Great Dismal Swamp, the Shenandoah Valley, and the Fall Line. The Fall Line is named for a zone of falls and rapids in rivers along the Coastal Plain-Piedmont boundary and is the most inland extent of tidal influence. Each of Virginia's five physiographic provinces has distinct geological and topographical features that require varying approaches to lidar planning and collection. Dependable topographic and bathymetric elevation data are vital for a state with such a diverse landscape.

Virginia surface water drainage is defined by nine major river systems: the Potomac-Shenandoah, Rappahannock, York, James, Roanoke, Chowan, New, Tennessee, and Big Sandy. The rivers that flow east toward the Atlantic are the Potomac-Shenandoah, Rappahannock, York, James, and Chowan. The rivers that flow west toward the Gulf of Mexico are the New, Tennessee, and Big Sandy. (https://www.radford.edu/jtso/GeologyofVirginia/VirginiasRivers/Drainage-1.html)

According to the Virginia Institute of Marine Science (VIMS), Virginia has 7,213 miles of shoreline at sea level. (https://www.vims.edu/bayinfo/faqs/shoreline_miles.php)

Virginia has some of the most densely populated coastal urbanization in the United States. Of the total population of approximately 8.3 million in Virginia, 4.9 million people, or 59 percent, live in coastal portions of the commonwealth. Coastal Virginia employs almost 2.3 million people annually, earning a total of approximately $140 billion, with an annual output of almost $344 billion in gross domestic product. (https://www.coast.noaa.gov/states/virginia.html). The coastal counties of Virginia contain resort and recreational communities with beaches and tourism that drive a significant portion of the economies for those counties as well as the commonwealth. Nine of the ten largest cities in Virginia are in the coastal zone (https://www.virginia-demographics.com/cities_by_population). This urban core stretches from the District of Columbia south to Richmond and eastward toward Virginia Beach/Hampton Roads.

In addition, there is a significant U.S. Department of Defense presence in the Hampton Roads/Tidewater area in the coastal zone, including the Norfolk Naval Base, Fort Eustis, and Langley Air Force Base. (https://militarybases.com/virginia/)

The commonwealth's coastal areas are historically prone to severe storms, including tornadoes, hurricanes, and Nor'easters. Thirty billion-dollar weather disasters affected the commonwealth between 2010 and 2018.

Current status of elevation data for Virginia

Topographic lidar coverage in Virginia consists of several federal and state collection efforts dating from the early 2000s to 2021. Interest in lidar and elevation modernization increased in 2011 after the Mineral

earthquake in Louisa County, which had a magnitude of 5.8 and was felt over a broad area of the U.S. Mid-Atlantic region. Extensive damage was reported to structures as far away as Washington, D.C. (https://pubs.er.usgs.gov/publication/70141609). Additional resources were devoted to recovery from Superstorm Sandy in 2012, including supplemental Congressional appropriations that funded several federal lidar collection efforts focusing on the coastal and flood-prone areas of the commonwealth. FEMA has contributed funding for new flood risk mapping update efforts. USDA-NRCS has contributed the most federal funding through the National Digital Elevation Program (NDEP) to help complete its land conservation mission requirements. The U.S. Forest Service (USFS) also partnered toward collections over the Jefferson-Davis National Forest. Other major state partners include the VA Department of Transportation (VDOT) and the VA Department of Environmental Quality (VA-DEQ). The Chesapeake Bay Program and individual counties such as Loudoun and Fairfax have also contributed funding and lidar data. Most of the existing lidar projects in Virginia now meet the 8-year age range and Quality Level 2 (QL2) NDEP specifications outlined in the original 3DEP goals.

Although heretofore not as well documented as those for terrestrial lidar, major bathymetric data collection efforts have been conducted by NOAA, USACE, USGS, VIMS, and VA-DEQ. The data were collected for use in coastal management decision making, including applications related to projected sea level rise and the remapping of Coastal Erosion Hazard Areas. (https://www.deq.virginia.gov/water/chesapeake-bay)

A summary of the current status of elevation data for the commonwealth shows that significant progress has been made in lidar data acquisition over Virginia in the last decade. The National Enhanced Elevation Assessment (NEEA) survey in 2011 found that "elevation data for Virginia are not of sufficient resolution, accuracy or currency" and recommended that the shortcomings be resolved. As of 2019 additional terrestrial lidar acquisition from combined efforts by federal agencies (NRCS, USGS, FEMA, USFS) and state agencies (VA-DEQ and VDOT) has occurred so that by 2021 there will be coverage for the entire commonwealth, with current data collection efforts upgrading older or areas of no data to QL2. As part of the upgrade, 15 coastal localities will have tide-coordinated lidar collected in 2020 (with two other counties already possessing tide-coordinated QL2 data).

Deliverables should include hydrologically flattened DEMs and the classified point cloud. The commonwealth requires lidar products delivered in State Plane Feet HARN projection. Academic institutions tend to work in UTM. A refresh cycle of 4-5 years was adequate for most users.

While Virginia now is close to 100% recent terrestrial lidar coverage, with upgrades planned to bring all data to at least QL2 specifications, there are still data gaps. Shallow water bathymetry in the Chesapeake Bay and oceanside coastal lagoons, and inland bathymetry for the entire commonwealth are the two most significant data gaps. Sea level rise is already incurring impacts on the commonwealth's natural resources, economic future, transportation network and existing infrastructure, and effects to the residential and industrial tax base along the Virginia coast, and because of high rates of sea level rise acceleration detrimental effects will increase.

Importance of elevation data to Virginia

Lidar data in the commonwealth are used by stakeholders for a variety of Business Uses and Mission Critical Activities. Stakeholders include county agencies, state agencies, academic institutions, and non-governmental organizations, although there were some key groups for which we do not have information, including transportation and emergency management. Diverse uses of lidar data include:

- hazard risk assessment and mitigation, such as inundation mapping, dam breaks, stream bank erosion, rainfall and hydrologic runoff, drainage areas and base flood elevations, pollution, and geologic hazards;
- sea level rise and storm surge modeling;
- coastal zone management and coastal ecology (tidal wetland location and migration, and health and habitat studies);
- navigation, recreational boating, commercial shipping, marine transportation, beach management/renourishment;
- natural resource conservation and management;
- municipal mapping and urban forest management;
- agricultural best management practices to improve water quality; and
- subsidence monitoring and mapping.

Topographic lidar and nearshore bathymetry data are also important to city and county government agencies for municipal mapping of building footprints, virtual city creation, urban hydrology for surface water flow, capital planning, shoreline change detection, inland change detection, identification of staging locations for crisis events (public safety), elevation studies, flood risk management, mapping first floor elevation of buildings, public event viewsheds and resource siting, and three-dimensional (3D) building models. These data have been identified as a vital part of city and county geospatial data coordination activities.

Virginia has several of the largest ports in the country (Newport News, Hampton Roads, Norfolk) serving military, commercial shipping, and fishing industries. There is an abundance of coastal and marine-dependent tourism in in eastern localities, including Virginia Beach, Chesapeake Bay, and the Eastern Shore. Nearshore and offshore bathymetric data are important for supporting the critical coastal areas of the commonwealth. The coastal areas of Virginia play an important role in furthering and achieving the commonwealth's energy goals, as they provide access to shipping corridors, proximity to energy consumers, availability of high volumes of water for cooling or direct production of energy, and strength and consistency of offshore wind resources relative to land-based wind resources. Bathymetric data can be used in efforts involving energy resource development, beach and habitat restoration projects, contaminant studies, and hurricane and storm-related preparedness studies in support of the VA Coastal Zone Management Program. For example, concerns raised by the maritime commerce and navigation communities about the placement of offshore wind turbines could be addressed through the use of bathymetric data to support proper placement of these structures to suit the needs of involved stakeholders. In addition to supporting the siting of offshore renewable energy, updated and accurate offshore bathymetric data would be able to support other initiatives such as efficient maritime transportation or the identification of offshore habitats, including those affected by fisheries or sand replenishment efforts.

Virginia is a member of the Mid-Atlantic Regional Council on the Ocean (MARCO), a partnership among Mid-Atlantic states to address priorities for improving ocean health and contributing to the vitality of the Mid-Atlantic coastal region's ocean ecosystem and economy. MARCO strives to establish a common foundation that will guide actions to address shared regional priorities and improve understanding of how ocean resources and places are being used, managed, and conserved through its Mid-Atlantic Ocean Data Portal. Recently collected and accurate bathymetric data would provide an appropriate data foundation for

this portal and facilitate regional planning and collaboration among contributing states. (https://www.midatlanticocean.org/)

The Virginia Institute of Marine Science (VIMS) is mandated by the Commonwealth of Virginia to conduct research and provide sound scientific advice concerning issues surrounding the use and conservation of marine resources, and the pressing issues facing rivers, estuaries, wetlands, coasts, and ocean. (https://www.vims.edu/)

Also, additional agencies have identified topographic lidar as part of their Mission Critical Activities. The VA Department of Mines, Minerals, and Energy (VA-DMME) requires topographic lidar data to refine the commonwealth's geologic framework, and lidar is a valuable resource for planning and verifying geologic mapping. Examples of derivative uses of the data include farming, soil erosion, slope failures (landslides, bluff erosion, etc.), aggregate resources and mining, natural resource conservation, and groundwater protection. The VDOT requires elevation data for construction planning, mapping, and 3D modeling of the commonwealth's transportation system infrastructure. Hydrologic modeling and flood inundation mapping have been identified by local conservation districts as Mission Critical Activities for which updated lidar data are a requirement every 6-10 years. In addition, these data are important for land use and environmental planning pertaining to sea level rise in urbanized areas.

In summary, lidar data are used for many different assessment and management applications in both terrestrial and aquatic systems throughout the commonwealth.

High-level summary of elevation data requirements

The VA Information Technologies Agency (VITA) has identified all of Virginia as in need of inland topographic lidar and nearshore bathymetry. This agency is primarily focused on data discovery and provisioning through the Virginia GIS Clearinghouse. The VA Department of Emergency Management (VDEM) requires the provision of accurate and up-to-date elevation data to support emergency management activities across the entire commonwealth. Emergency management activities involve response to and recovery from incidents, emergencies, and disasters. Ideally, no part of Virginia would have its newest available topographic elevation data be older than 10 years and lower than QL2, and coastal areas would have more frequent updates every 4-6 years.

Elevation data are required in all four zones delineated by the survey (inland topography, inland bathymetry, nearshore bathymetry, offshore bathymetry), with stakeholders having different needs that are partially dependent upon whether they have tidal shoreline and the scale at which they work (e.g. county vs regional):

- Inland topography—most stakeholders require inland topography at QL1 or QL2. Careful reading of the survey was required to understand that wetlands and other transitional environments at the land/water interface come under the inland topography category, but there is an overlap with nearshore bathymetry.
- Inland bathymetry—over half the stakeholders need inland bathymetry with the majority requiring QL0B.
- Nearshore bathymetry—over half the stakeholders (mainly those with tidal shorelines) require nearshore bathymetry with the majority requesting QL0B.

- Offshore bathymetry—nine stakeholders require offshore bathymetry, with disparate needs of Special Order, Order 1b, Order 2, and transects. Sophisticated hydrodynamic models require higher horizontal and vertical accuracies, so distributed data (not transects) are needed.

High-level summary of benefits that would come from higher resolution elevation data

Most stakeholders agree that major societal benefits would occur in education/outreach and environmental arenas. Major to moderate benefits would occur in public safety. These benefits are expected in all four elevation zones.

Most survey participants did not detail the operational and customer service benefits. Of those respondents that did, operational time savings ranged from 35 to 11,000 annual hours saved, cost savings ranged from $10,000 to $250,000 per year, and cost avoidance ranged from $5,000 to $50,000 per year. Customer service savings were significant for one research stakeholder on the order of millions of dollars and thousands of hours.

There are additional intangible benefits to be gained from generating better products and increased accuracy using higher resolution elevation data.

Additional Comments

Since the initial stages of this project organizational changes have occurred with GIS data services in Virginia. The Virginia Geographic Information Network (VGIN) was transitioned from the VITA to the VDEM effective July 1, 2020. The Virginia GIS Clearinghouse is undergoing a refresh. The Clearinghouse URL will not change (https://vgin.maps.arcgis.com/home/index.html), but the URL for REST services will be updated to: https://GISMaps.VDEM.Virginia.gov/arcgis/rest. The current platform will be turned off and decommissioned beginning February 24, 2021. The storage platform VGIN has used previously for elevation and lidar support will need to be replaced by the end of April 2021. Current plans are to serve unique Virginia lidar data in-house (e.g., the VA State Plane/ Feet elevation grids), and rely on federal data sources such as USGS and NOAA for the lidar point cloud and standard 3DEP products downloads (Joe Sewash (VDEM), pers. Comm.) Please contact vbmp@vdem.virginia.gov for more information.

A combined dataset (for example, the USGS Coastal National Elevation Database [CoNED] seamless topobathy surface developed for the Chesapeake Bay) is an extremely useful integration of terrestrial lidar and bathymetric data. The problem is that the CoNED program only has a return rate of at least five to six years, and possibly more. Funds to allow USGS to update the topobathy surface more frequently, such as when significant data collection has occurred (for example, lidar for the 15 coastal localities being collected in Virginia in the next year and the NOAA NGS topobathymetric lidar being collected in the Chesapeake Bay) would be a valuable dataset for many stakeholders.

The Commonwealth of Virginia has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

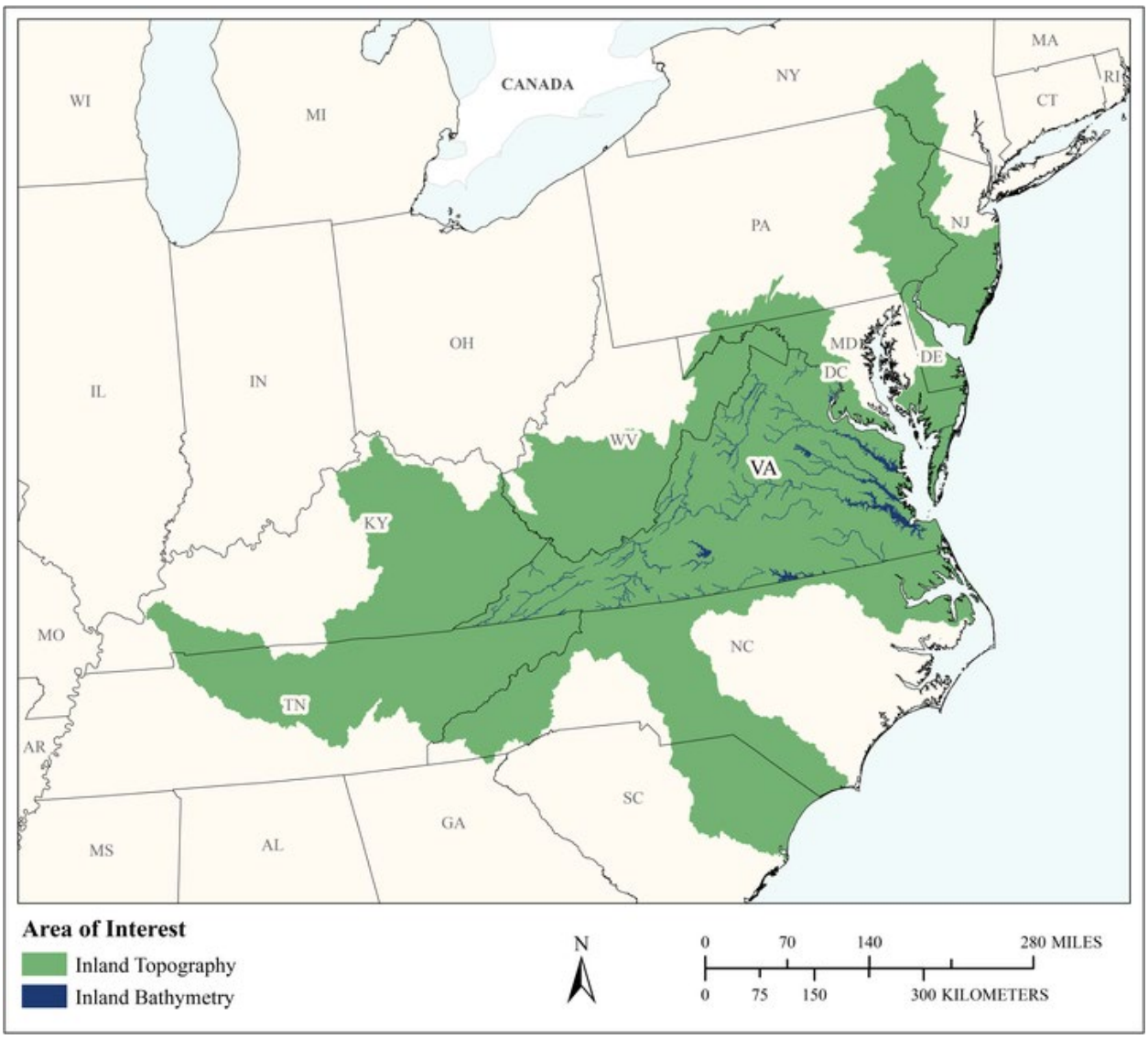
MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	Virginia Department of Conservation and Recreation	1079	Natural Resource Protection	Inland Topo	QL2	4-5 years	$223,897	$59,971	Major	Major	Major
				Inland Bathy	I don't know	4-5 years	$968,600	$101,222	Major	Major	Major
BU 01 – Water Supply and Quality	Montgomery County, VA GIS & Planning Services	1317	Pollution, Hazard Risk Mitigation, and Municipal Mapping	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	Major	Moderate	Moderate
BU 01 – Water Supply and Quality	Fairfax County GIS	1457	Geospatial Data Coordination and Stormwater Planning	Inland Topo	QL1	4-5 years	$72,000	Unable to quantify	Major	Moderate	I don't know
				Inland Bathy	QL0B	6-10 years	Unable to quantify	Unable to quantify	Minor	Moderate	I don't know
BU 02 – Riverine Ecosystem Management	Commonwealth of Virginia	60492	Riverine Ecosystem Management	Inland Topo	QL1 HD	6-10 years	$61,808	$6,173	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$32,902	$2,320	Major	Major	Major
				Nearshore Bathy	QL0B	2-3 years	$195,513	$149,403	Moderate	Moderate	Moderate
BU 03 – Coastal Zone Management	The Nature Conservancy	1204	Conservation of Natural Resources	Inland Topo	QL1	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Minor
				Nearshore Bathy	QL2B	4-5 years	Unable to quantify	Unable to quantify	Moderate	Moderate	None
				Offshore Bathy	Order 1b	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	I don't know
BU 03 – Coastal Zone Management	Virginia Institute of Marine Science	1252	Coastal Zone Management, Education, and Research	Inland Topo	(a) QL0 HD (b) QL2	4-5 years	$2,079,803	$363,592	Major	Major	Major
				Inland Bathy	QL2B	6-10 years	$893,395	$523,750	Major	Major	Major
				Nearshore Bathy	QL1B	4-5 years	$437,802	$740,594	Major	Major	Major
				Offshore Bathy	Special Order	4-5 years	$47,943	$9,564	Major	Major	Major
BU 04 – Forest Resource Management	Commonwealth of Virginia	60493	Forest Resources Management	Inland Topo	QL1	2-3 years	$159,658	$231,444	Major	Major	Major
BU 06 – Natural Resource Management	Commonwealth of Virginia	60494	Natural Resources Conservation	Inland Topo	QL1 HD	4-5 years	$1,583,863	$5,816,430	Major	Major	Major
				Inland Bathy	QL0B	6-10 years	$214,674	$9,664	Major	Major	Major
				Nearshore Bathy	QL1B	6-10 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate
				Offshore Bathy	Cross sections and/or transects meet needs	4-5 years	Unable to quantify	Unable to quantify	Moderate	Major	Major

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 07 – Wildlife and Habitat Management	Commonwealth of Virginia	60495	Wildlife and Habitat Management	Inland Topo	QL2	4-5 years	$9,619	$27,782	Moderate	Major	Moderate
				Inland Bathy	QL2B	4-5 years	$77,088	$46,595	Moderate	Moderate	Moderate
				Nearshore Bathy	QL0B	4-5 years	$1,935	$114	Moderate	Major	Moderate
				Offshore Bathy	Special Order	4-5 years	$600	$41	Moderate	Major	Major
BU 08 – Agriculture	Commonwealth of Virginia	60496	Agriculture and Precision Farming	Inland Topo	QL2	2-3 years	$46,752	$37,063	Major	Major	Minor
				Inland Bathy	QL4B	4-5 years	$81,911	$37,063	Moderate	Major	Major
BU 09 – Fisheries Management and Aquaculture	Commonwealth of Virginia	60497	Fisheries Management and Aquaculture	Inland Topo	QL2	2-3 years	$41,277	$89,658	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	6-10 years	$80,798	$36,774	Major	Major	Moderate
				Nearshore Bathy	QL0B	6-10 years	$307,075	$22,552	Moderate	Major	Minor
				Offshore Bathy	Special Order	6-10 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Minor
BU 10 – Geologic Assessment	Virginia Department of Mines, Minerals and Energy	1316	Geologic Hazards	Inland Topo	QL2	2-3 years	$21,577	Unable to quantify	Moderate	None	Major
BU 14 – Cultural Resource Management	Commonwealth of Virginia	60498	Cultural Resources Preservation and Management	Inland Topo	QL1	4-5 years	$7,401	$6,471	Minor	Minor	Minor
				Inland Bathy	QL0B	6-10 years	$17,749	Unable to quantify	Moderate	Minor	Minor
				Nearshore Bathy	QL0B	4-5 years	$5,594	Unable to quantify	Minor	Moderate	Minor
BU 15 – Flood Risk Management	Commonwealth of Virginia	60499	Flood Risk Management	Inland Topo	QL2	4-5 years	$5,669,741	$992,027	Major	Moderate	Major
				Inland Bathy	QL1B	4-5 years	$393,859	$442,203	Moderate	Moderate	Major
				Nearshore Bathy	QL2B	4-5 years	$370,087	$274,287	Major	Moderate	Major
BU 16 – Sea Level Rise and Subsidence	Commonwealth of Virginia	60500	Sea Level Rise and Subsidence	Inland Topo	QL1 HD	4-5 years	$2,125,960	Unable to quantify	Moderate	Major	Major
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Minor
				Offshore Bathy	Order 2	6-10 years	Unable to quantify	Unable to quantify	Major	Major	Moderate
BU 18 – Homeland Security	Commonwealth of Virginia	60501	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management	Inland Topo	QL2	4-5 years	$1,191,248	$21,054	Major	Moderate	Major
				Inland Bathy	QL0B	4-5 years	$335,486	$21,404	Major	Moderate	Major
				Nearshore Bathy	QL1B	6-10 years	$18,007	$516	Moderate	Moderate	Major
BU 19 – Land Navigation	Commonwealth of Virginia	60502	Land Navigation and Safety	Inland Topo	QL0	2-3 years	$523,111	$42,243	Minor	Major	Major
				Inland Bathy	QL0B	2-3 years	$22,313	$230	Minor	Moderate	Moderate

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 20 – Marine and Riverine Navigation	Commonwealth of Virginia	60503	Marine and Riverine Navigation and Safety	Nearshore Bathy	QL0B	2-3 years	$1,498,381	$50,730	Minor	Major	Major
				Offshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 21 – Aviation Navigation	Commonwealth of Virginia	60504	Aviation Navigation and Safety	Inland Topo	QL1 HD	Annually	$136,510	$170,018	Minor	Moderate	Moderate
BU 22 – Infrastructure Management	Commonwealth of Virginia	60505	Infrastructure and Construction Management	Inland Topo	QL0 HD	4-5 years	$1,814,715	$5,340,342	Minor	Moderate	Major
				Inland Bathy	QL0B	4-5 years	$611,406	$63,487	Minor	Moderate	Moderate
				Nearshore Bathy	QL1B	4-5 years	$40,847	$5,616	Minor	Moderate	Major
BU 23 – Urban and Regional Planning	Virginia Geographic Information Network	1386	Virginia Base Mapping Data Stewardship	Inland Topo	QL2	4-5 years	$932,489	$627,183	Major	Moderate	Moderate
				Inland Bathy	QL2B	4-5 years	$442,511	$559,815	Moderate	Moderate	Moderate
				Nearshore Bathy	QL2B	4-5 years	$357,753	$377,416	I don't know	I don't know	I don't know
				Offshore Bathy	Cross sections and/or transects meet needs	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 23 – Urban and Regional Planning	Green Infrastructure Center	22040	Ecological and Cultural Asset Conservation	Inland Topo	QL1 HD	6-10 years	$933,530	$627,183	Moderate	Major	Moderate
BU 24 – Health and Human Services	Commonwealth of Virginia	60506	Health and Human Services	Inland Topo	QL1	6-10 years	$14,408	$1	Moderate	Moderate	Major
				Inland Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 26 – Education and Basic Research	Old Dominion University, VA	1199	Risk Assessment for Coastal Hazards	Nearshore Bathy	QL2B	4-5 years	$9,045	$301	Moderate	Minor	Minor
BU 26 – Education and Basic Research	UVA Environmental Sciences	21631	Coastal Research	Nearshore Bathy	QL0B	4-5 years	$37,060	$603	Major	Major	Minor

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 26 – Education and Basic Research	Virginia Tech Center for Geospatial Information Technology	21659	Interdisciplinary Research to Develop Advanced Applications of Geospatial Information Science and Technology for Societal Benefit	Inland Topo	QL2	2-3 years	$10,631,650	$25,361,800	Major	Major	Major
				Inland Bathy	QL2B	2-3 years	$4,522	Unable to quantify	Major	Major	Moderate
				Nearshore Bathy	QL3B	Annually	$3,015	Unable to quantify	Major	Moderate	Minor
				Offshore Bathy	Order 1b	4-5 years	$1,206	Unable to quantify	Minor	Minor	Minor
BU 27 – Recreation	Commonwealth of Virginia	60507	Recreation	Inland Topo	QL1	4-5 years	$9,265	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	4-5 years	$5,580	Unable to quantify	Major	Major	Moderate
				Nearshore Bathy	QL0B	4-5 years	$252,968	Unable to quantify	Major	Major	Moderate
BU 28 – Telecom-munications	Commonwealth of Virginia	60508	Telecommunications	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Inland Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	Major
BU 30 – Maritime and Land Boundary Management	Commonwealth of Virginia	60509	Maritime and Land Boundary Management	Inland Topo	QL1	6-10 years	$45,439	$174,217	Moderate	Minor	None
				Nearshore Bathy	QL0B	2-3 years	$449,001	Unable to quantify	Moderate	Major	Moderate

MCA Title: Natural Resource Protection



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Implement agricultural best management practices to improve water quality. Protect the public from dam breaks and related flooding events.
MCA Title	Natural Resource Protection
MCA ID	1079
Organization Type	State or U.S. Territorial government
Organization Name	Virginia Department of Conservation and Recreation
Sub-Agency or Division	
Organization Mission	Protect and preserve Virginia natural resources, implement conservation practices, and provide recreational opportunities for Virginia's citizens.
Program Name	Virginia Cost Share Program, Virginia Nutrient Management Program, Virginia Dam Safety Program
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Survey-level features

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Highly desirable
51 - 100 ft	Nice to have
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Highly desirable
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Not required
5.1 – 10 acres	Not required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Not required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	I don't know		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 2 meters	Less than 50 cm		
Acceptable Vertical Error	Up to 10 cm	Less than 10 cm		
How far onshore needed				
How far down the beach profile needed	To MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Highly desirable	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Not required	Not required		
Classified point cloud	Not required	Not required		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Not required	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Not required		
Ground control/ground truthing	Not required	Not required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Highly desirable		
Land use/land cover	Required	Required		
Wetlands	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Not required	Not required		
Cultural resources	Not required	Not required		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We currently use a Virginia state wide DEM at 10 meter resolution. Data was downloaded from NRCS website and state wide layer was created by DCR staff. We also use a state wide DEM at 30 meter resolution for applications that cannot handle processing the 10 meter DEM.	Currently we are not using any bathymetry data.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				

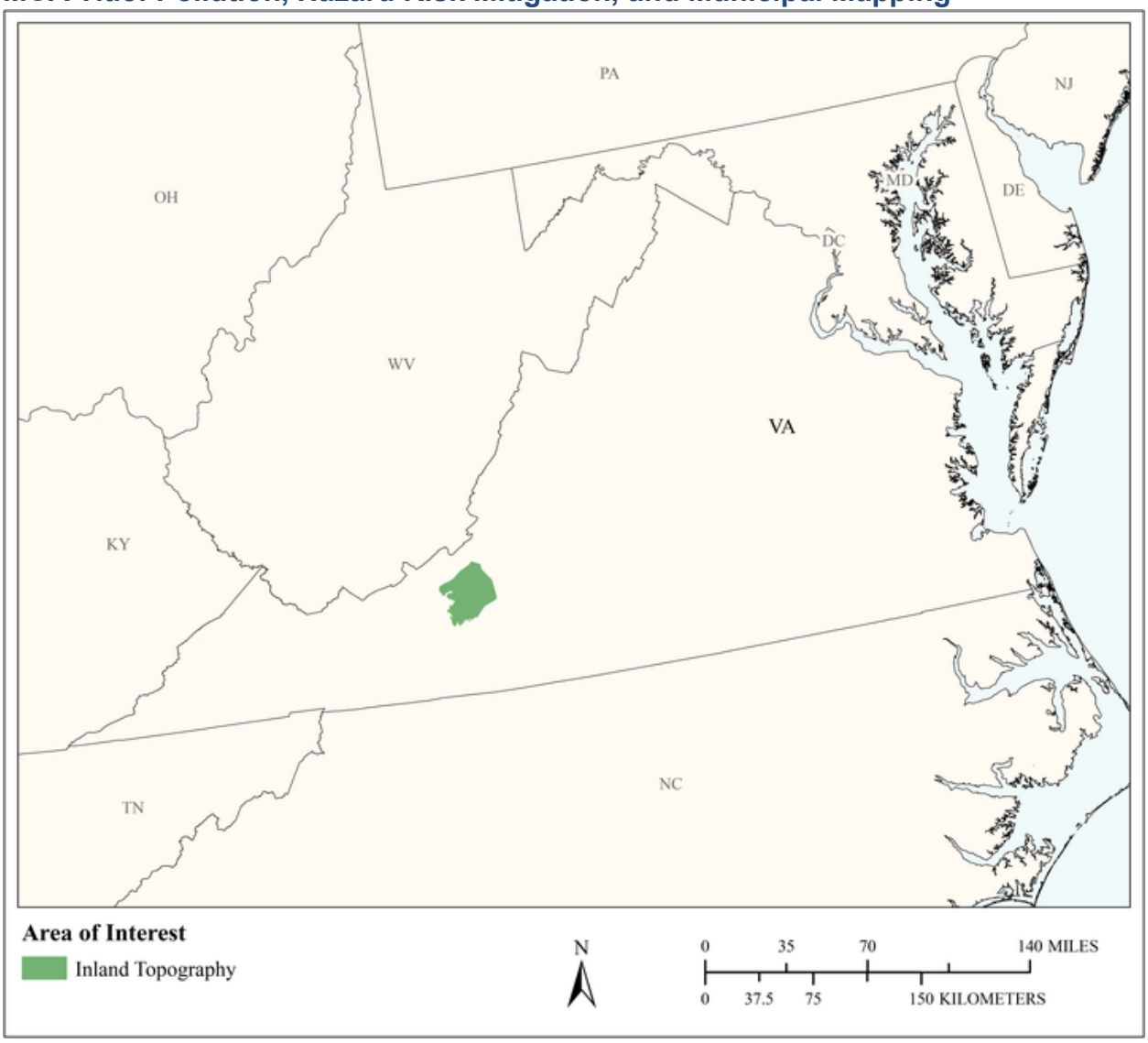
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other	Yes			
Other description	NRCS			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available		
Cost savings/cost reduction	None	Inland bathy data not available		
Cost avoidance	None	Inland bathy data not available		
Increased revenues	None	Inland bathy data not available		
Mission-driven performance improvements	Major	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available		
Improved response or timeliness	Major	Inland bathy data not available		
Improved customer experience	Major	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Inland bathy data not available		
Environmental	Major	Inland bathy data not available		
Public safety, including life and property	Major	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	None			None								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$223,897		Annual dollars saved/ realized	$968,600						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$59,971		Annual dollars saved/ realized	$101,222						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Major			Major								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps	Yes	Yes		
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes	Yes		
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Pollution, Hazard Risk Mitigation, and Municipal Mapping



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements	Montgomery County, VA			

MCA Description	Response
Mission Critical Activity	Pollution and hazard risk mitigation. This includes determination of drainage areas and base flood elevations, stormwater modeling, environmental management pertaining to identification and monitoring of point source pollution into streams and waterways. Municipal mapping. Additional Business Use is BU 23 - Urban and Regional Planning.
MCA Title	Pollution, Hazard Risk Mitigation, and Municipal Mapping
MCA ID	1317
Organization Type	Regional, County, City, or other local government
Organization Name	Montgomery County, VA GIS & Planning Services
Sub-Agency or Division	
Organization Mission	The local county government of Montgomery, VA, works to serve its citizens. Mission statements of those departments that use elevation data are below. Note that GIS is housed within the Planning Dept. The Planning Department administers the comprehensive land use plan, zoning and subdivision ordinances, provides geographical information and mapping services and maintains official street names and addresses in the unincorporated areas. The Montgomery County Code provides detailed information about various ordinances. The Montgomery County, VA GIS departmental mission is to coordinate, manage and facilitate GIS at departmental, office and enterprise levels. We create and manage E911 site addresses and street names. We serve as primary custodian for county GIS data, aerial imagery and LiDAR topography contours. GIS and Mapping Services fulfills public requests for GIS data, mapping and imagery services. General Services manages and maintains buildings and grounds, including the Courthouse, libraries and parks, and provides oversight for capital development projects. The Solid Waste Collections Department and Litter Control division provides litter control and solid waste services, primarily through the consolidated recycling and waste collection centers, and litter "clean-up" and recycling events. Emergency Services provides pre-planning, preparation, mitigation, response and recovery for natural and man-made disasters and major emergencies. This includes provisions for law enforcement, fire services, emergency medical response, specialty rescue, emergency communications, enhanced 9-1-1 and hazardous material responses for the Town of Blacksburg, Town of Christiansburg and rural Montgomery County.
Program Name	Compliance with the 3 following programs: VA Stormwater Management Program (VSMP), Municipal Separate Storm Sewer System (MS4), National Flood Insurance Program (NFIP), Montgomery Matters Comprehensive Plan.
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 22 - Infrastructure and Construction Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have

What Needs to be Measured in 3D	Response
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Small features

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 60 cm			
Acceptable Vertical Error	Up to 60 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Nice to have					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Currently we have complete coverage by products from VARGIS in 2005, from which 2 foot contours are most frequently used, often for communicating site slopes on basemaps. Partial coverage by Sanborn, spring 2015: Horizonatal Accuracy <= 60 cm RMSEh and Vertical accuracy <= 10 cm RMSEz Also use National Elevation Dataset from USGS, 1/3 arcsecond for complete coverage on various basemaps.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				

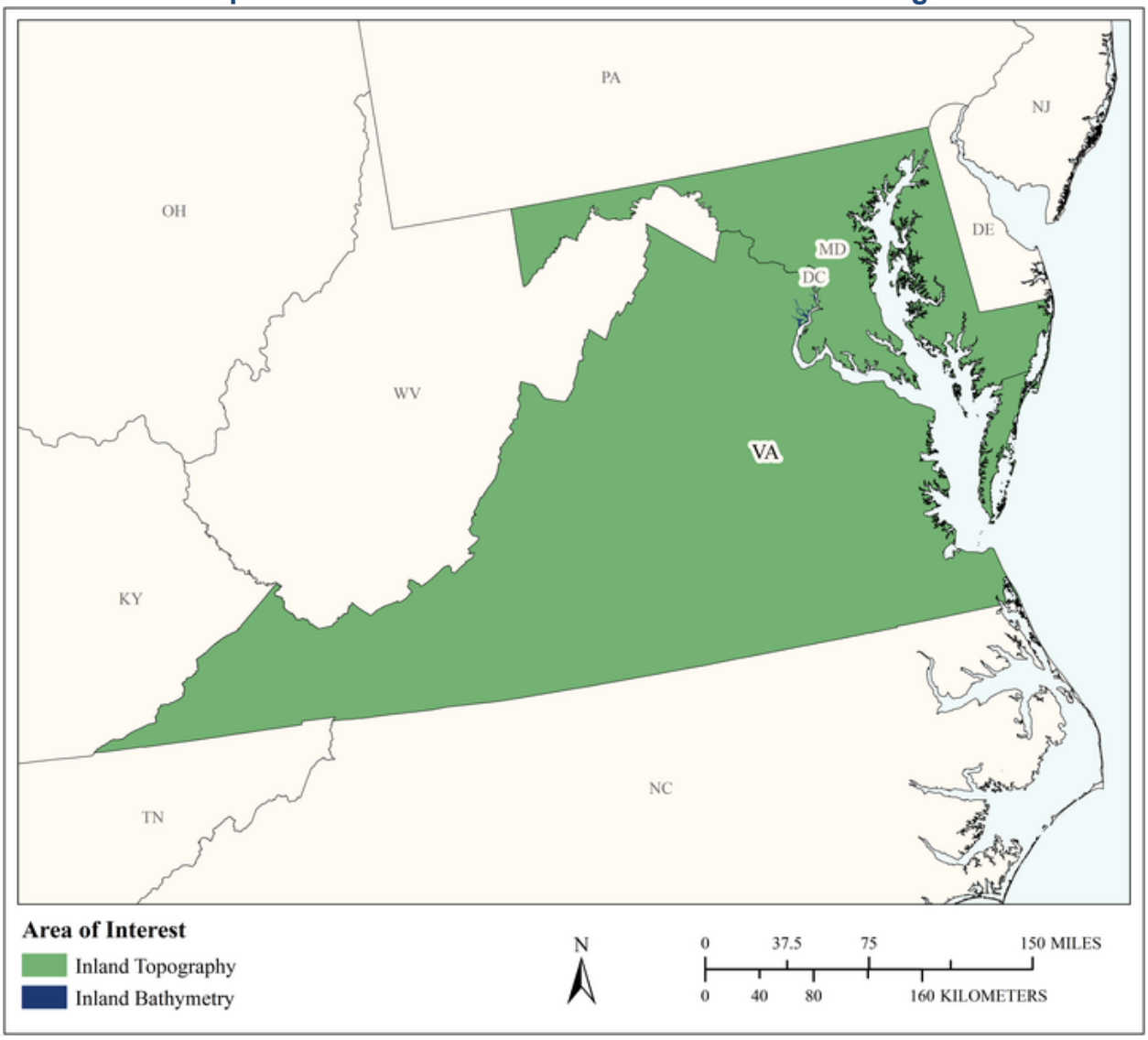
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	VGIN LiDAR and Basemap Clearinghouse			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know			
Cost savings/cost reduction	I don't know			
Cost avoidance	Moderate			
Increased revenues	I don't know			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Moderate			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Time savings description	Inspections for compliance needs in other respects still required.											
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Increased revenues description	Value added data we can sell for revenue. Does not apply.											
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Moderate											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geospatial Data Coordination and Stormwater Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements		Fairfax County, VA		

MCA Description	Response
Mission Critical Activity	Watershed delineation for water quality assessment, flood inundation mapping, streambank erosion evaluation, cultural resources preservation and management, 3D visualization, visual impact analysis, urban forest management
MCA Title	Geospatial Data Coordination and Stormwater Planning
MCA ID	1457
Organization Type	Regional, County, City, or other local government
Organization Name	Fairfax County GIS
Sub-Agency or Division	
Organization Mission	Developing, maintaining, coordinating, and distributing GIS data and technology to Fairfax County government agencies and residents. The branch also provides products and services for the public.
Program Name	Stormwater Planning
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 23 - Urban and Regional Planning

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	We are also interested in streetlights and transmission lines

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B		
Update Frequency	4-5 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 30 cm	Up to 1 meter		
Acceptable Vertical Error	Up to 10 cm	Up to 20 cm		
How far onshore needed				
How far down the beach profile needed	To MHW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required		
DTM	Highly desirable	Required		
DEM	Required	Required		
Raw point cloud data	Required	Highly desirable		
Classified point cloud	Required	Highly desirable		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Not required		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Required	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Highly desirable		
Bridges/culverts	Required	Nice to have		
Landmark features	Highly desirable	Not required		
Cultural resources	Highly desirable	Not required		
Coastal and riverine structures	Highly desirable	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We are using QL2 LiDAR from 2012/2014	Not applicable		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	County			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available		
Cost savings/cost reduction	Moderate	Inland bathy data not available		

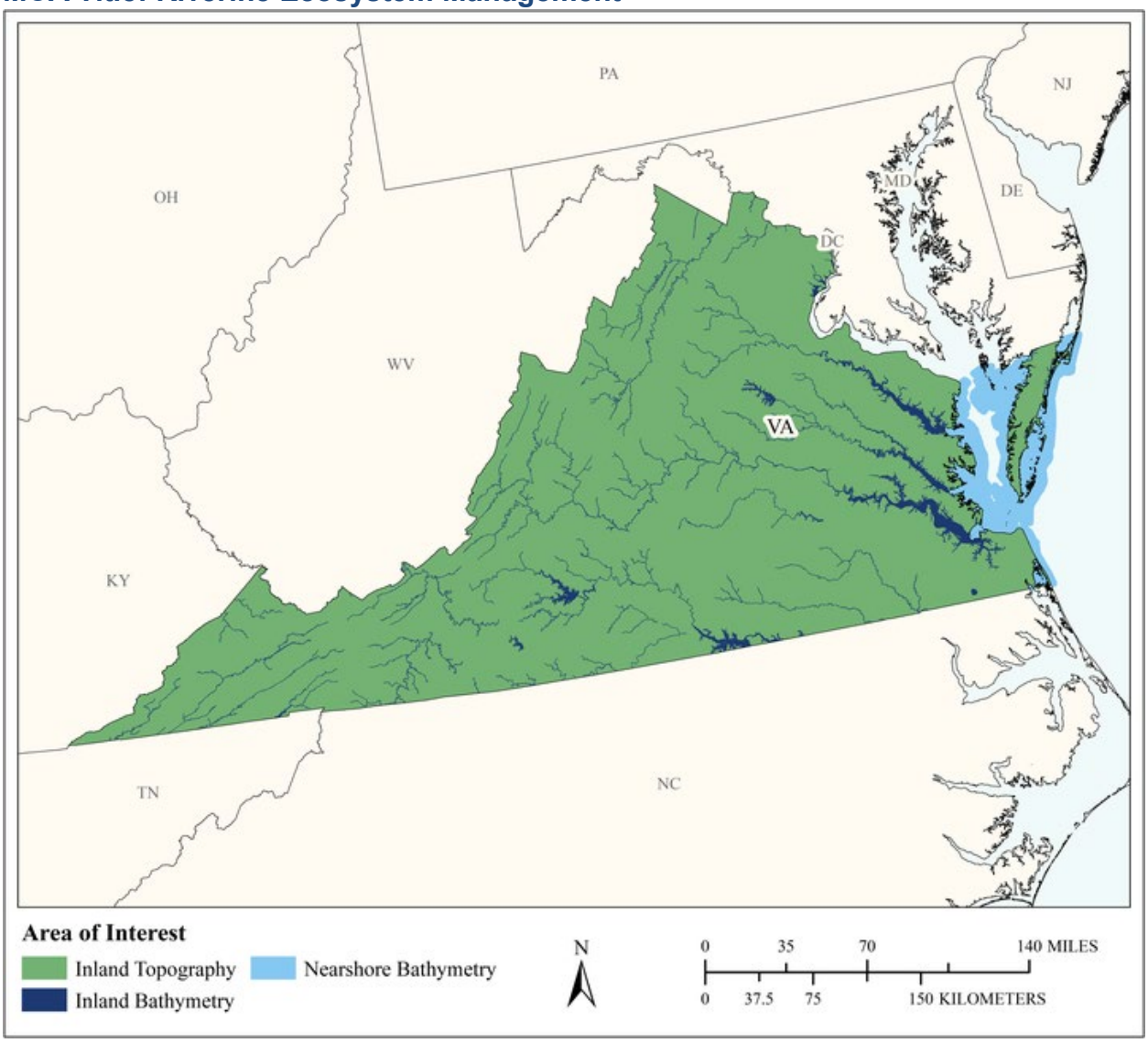
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost avoidance	I don't know	Inland bathy data not available		
Increased revenues	I don't know	Inland bathy data not available		
Mission-driven performance improvements	Major	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available		
Improved response or timeliness	Major	Inland bathy data not available		
Improved customer experience	Major	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Inland bathy data not available		
Environmental	Major	Inland bathy data not available		
Public safety, including life and property	I don't know	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$72,000	Major	Unable to provide							
Time savings description	No more photogrammetrically compiled elevation that we QA/QC ourselves at estimated cost of $72,000.											
Cost savings/cost reduction	Major	Unable to provide		I don't know	Unable to provide							
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide							
Increased revenues	Major	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide							
Mission-driven performance improvements description				Dept of Public Works would have a better understanding of deposition rates in stormwater retention ponds.								
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide							
Value added to products or services description	We are doing much more with above ground features now that we have LiDAR.											
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide							
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Minor								
Education or outreach description	LiDAR visualizations help us explain visual impact analysis of proposed developments											
Environmental	Moderate			Moderate								
Public safety, including life and property	I don't know			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Riverine Ecosystem Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Stream channel analysis and mapping. Stream bank erosion analysis. Aquatic and terrestrial species habitat management. Environmental management.
MCA Title	Riverine Ecosystem Management
MCA ID	60492
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Virginia
Sub-Agency or Division	Virginia Department of Conservation and Recreation
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B	QL0B	
Update Frequency	6-10 years	4-5 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable		Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Required		Highly desirable	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Required	Required		Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	
DTM	Required	Highly desirable	Required	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Nice to have	Nice to have	
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Not required	Nice to have	
Full waveform	Nice to have	Nice to have	Highly desirable	
Bathymetric Attributed Grid (BAG)		Not required	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Nice to have	
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Highly desirable	Required	
Underwater videography			Not required	
Bottom texture			Highly desirable	
Bottom type			Required	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Nice to have	Nice to have	Not required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates	Nice to have	Nice to have	Highly desirable	
Land use/land cover	Highly desirable	Nice to have	Required	
Wetlands	Highly desirable	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have	Not required	
Cultural resources	Nice to have	Nice to have	Not required	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	
Cost savings/cost reduction	Moderate	Minor	Moderate	
Cost avoidance	Moderate	None	None	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	None	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Minor	

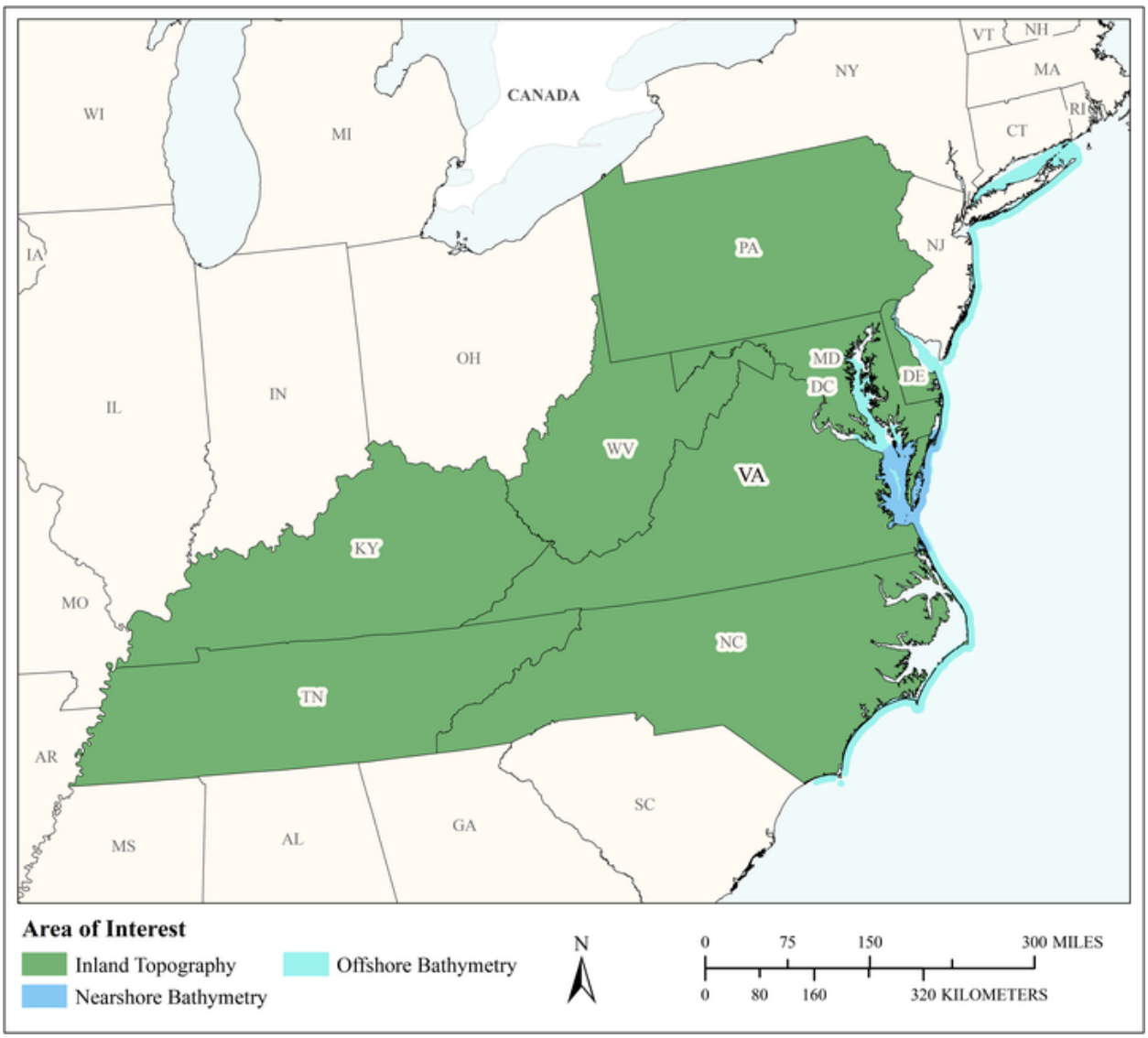
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Moderate	Minor	
Improved customer experience	Major	Minor	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Minor	
Environmental	Major	Major	Moderate	
Public safety, including life and property	Major	Moderate	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$61,808		Annual dollars saved/ realized	$32,902		Annual dollars saved/ realized	$195,513			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$6,173		Annual dollars saved/ realized	$2,320		Annual dollars saved/ realized	$149,403			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate					
Environmental	Major			Major			Moderate					
Public safety, including life and property	Major			Major			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps			Yes	
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints			Yes	
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Conservation of Natural Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	Required
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Custom description
Sub Area Requirements				Atlantic State waters off of North Carolina, Virginia, Maryland, Delaware, New Jersey, and New York

MCA Description	Response
Mission Critical Activity	Conservation of natural resources
MCA Title	Conservation of Natural Resources
MCA ID	1204
Organization Type	Academic or Not-for-Profit
Organization Name	The Nature Conservancy
Sub-Agency or Division	
Organization Mission	To conserve the lands and waters on which all life depends.
Program Name	Virginia Operating Unit
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 04 - Forest Resources Management
Tertiary Business Use	BU 07 - Wildlife and Habitat Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Patches of trees, patches of marsh, culverts, roads, buildings

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1		QL2B	Order 1b
Update Frequency	4-5 years		4-5 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter		The best horizontal accuracy achievable for the vertical accuracy I need	Up to 5 meters
Acceptable Vertical Error	Up to 10 cm		Up to 20 cm	Up to 5 meters
How far onshore needed			To cover the beach slope	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			No requirement for tide correction	No requirement for tide correction
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have		Not required	Not required		Not required
Entire AOI under same environmental conditions	Highly desirable		Nice to have	Not required		Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Nice to have	Not required		Not required
DEM for entire AOI needs to be seamless	Required		Highly desirable	Nice to have		Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable		Not required	Not required
DTM	Highly desirable		Not required	Not required
DEM	Required		Required	Required
Raw point cloud data	Nice to have		Nice to have	Not required
Classified point cloud	Highly desirable		Nice to have	
Edited/cube XYZ			Not required	Not required
Full waveform	Not required		Not required	Not required
Bathymetric Attributed Grid (BAG)			Not required	Not required

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Nice to have	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Nice to have		Nice to have	Nice to have
Ground control/ground truthing	Nice to have		Nice to have	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Not required	Not required
Nautical and/or navigation charts			Nice to have	Not required
Acoustic imagery of the seafloor			Not required	Not required
Aerial and/or satellite imagery	Nice to have		Not required	Not required
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Not required
Bottom type			Nice to have	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Nice to have	Not required
Geologic and seismic data	Not required		Not required	Not required
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Nice to have	Nice to have
Tide/wave heights			Nice to have	Not required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Not required	Nice to have
Routes			Not required	Not required
Offshore cadastral			Not required	Not required
Lease areas			Highly desirable	Nice to have
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Not required	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable		Highly desirable	
Land use/land cover	Nice to have		Not required	Not required
Wetlands	Highly desirable		Highly desirable	Not required
Estuaries			Nice to have	Not required
Inland surface water features	Highly desirable		Nice to have	
Bridges/culverts	Highly desirable			
Landmark features	Not required		Not required	
Cultural resources	Not required		Not required	
Coastal and riverine structures	Highly desirable		Highly desirable	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	DEM and DSM derived from LiDAR where available and at varying quality levels and dates. NED where LiDAR is not available.		We have some high resolution data developed by local researchers using traditional survey methods and shallow draft boat based soundings. Otherwise we use what's publicly available from NOS, which is often very dated.	Mostly publicly available data from NOAA NCEI
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI			Yes	Yes
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				

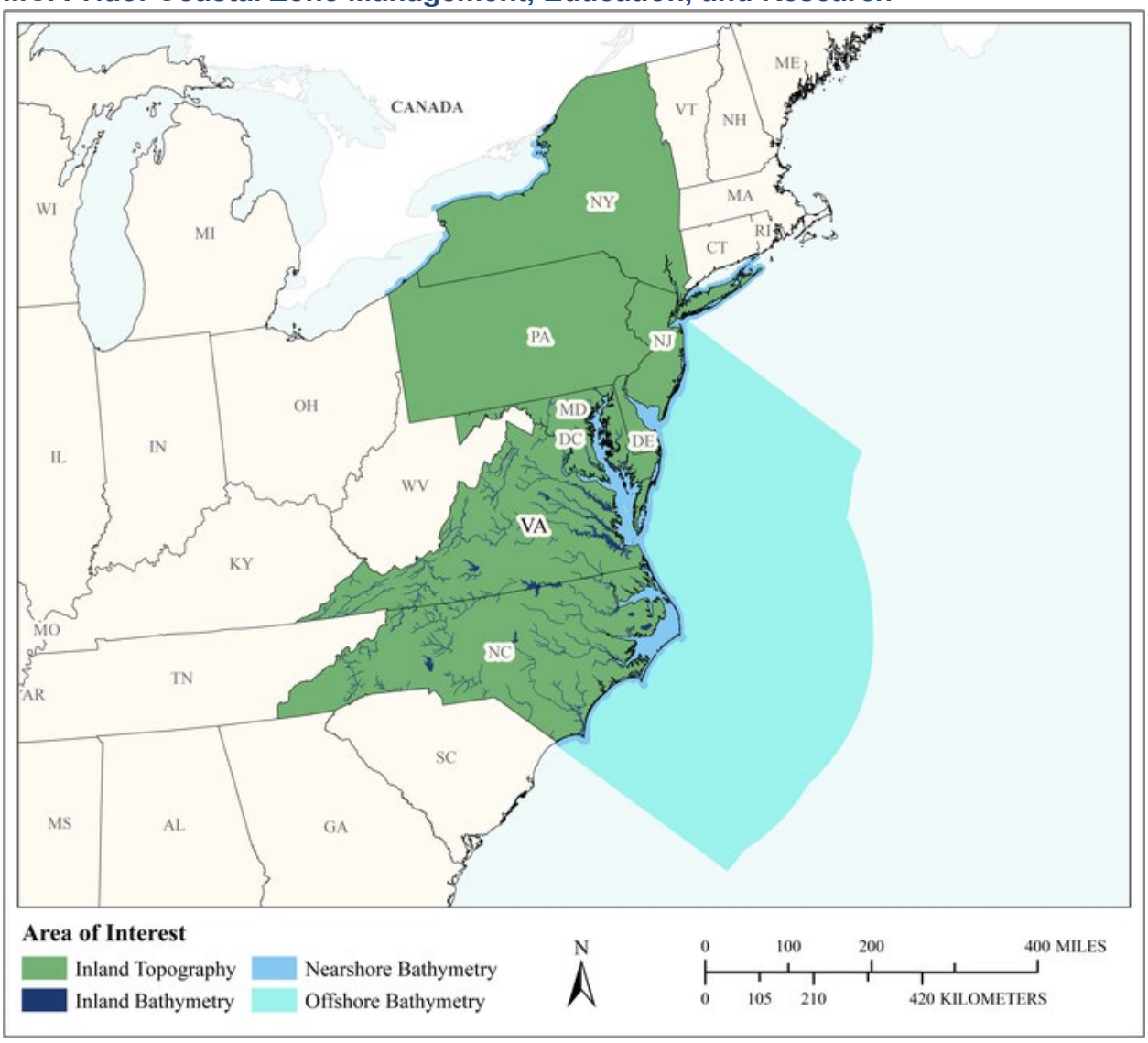
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
State Repositories	Yes			
State repositories used	Virginia Geographic Information Network			
Other			Yes	
Other description			Directly from university researchers who developed it	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		None	None
Cost savings/cost reduction	Moderate		None	None
Cost avoidance	None		None	None
Increased revenues	None		None	None
Mission-driven performance improvements	Major		Moderate	None
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		None	None
Improved response or timeliness	Moderate		None	None
Improved customer experience	Major		None	None
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major		Minor	Moderate
Environmental	Major		Moderate	Moderate
Public safety, including life and property	Minor		None	None

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide					Moderate	Unable to provide		Minor	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide					None			None		
Cost avoidance	Moderate	Unable to provide					None			Minor	Unable to provide	
Increased revenues	None						None			None		
Mission-driven performance improvements	Major	Unable to provide					Moderate	Unable to provide		Minor	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide					Moderate	Unable to provide		None		
Improved response or timeliness	Moderate	Unable to provide					None			None		
Improved customer experience	Moderate	Unable to provide					Moderate	Unable to provide		None		
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major						Moderate			Minor		
Environmental	Major						Moderate			Minor		
Public safety, including life and property	Minor						None			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades	Yes		Yes	Yes
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Coastal Zone Management, Education, and Research



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Area split by varying quality level or update frequency	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Custom description
Sub Area Requirements	Virginia, Maryland, Pennsylvania, New York, New Jersey, Delaware, North Carolina			North Carolina to New Jersey, out to the OCS

MCA Description	Response
Mission Critical Activity	Our formal mission is to support informed decision-making on resource management issues at all levels of government, including private and corporate citizens. In that capacity we have several mission critical activities, including Coastal Zone Management (e.g. coastal inundation, littoral zone management), Coastal Ecology (e.g. wetlands' present and future location and health, habitat studies), Sea level rise and flood risk management, and Outreach Education. We have an overarching mission but because we have grants that change over time (1-3 years), the focus may shift or evolve depending upon the grants. This affects the areal extent over which we work, as well as the smallest 3D features of interest.
MCA Title	Coastal Zone Management, Education, and Research
MCA ID	1252
Organization Type	Academic or Not-for-Profit
Organization Name	Virginia Institute of Marine Science
Sub-Agency or Division	
Organization Mission	Tripartite mission: education, research, and advisory to state government
Program Name	The Center for Coastal Resources Management has several programs supported by the mission critical activities, including Comprehensive Coastal Resource Management Portals (CCRMPs), Research, and Outreach Education.
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 16 - Sea Level Rise and Subsidence
Tertiary Business Use	BU 15 - Flood Risk Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	2 areas--less than 1 sq mi, and small to large counties
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Street level features for storm surge inundation modeling, and role of natural and nature-based features to protect houses. Submerged vegetation, oyster reefs, marine debris (abandoned crab pots).

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required

Inland Bathy Feature Size Requirements	Response
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	(a) QL0 HD (b) QL2	QL2B	QL1B	Special Order
Update Frequency	4-5 years	6-10 years	4-5 years and certain events.	4-5 years
Event type(s)			Large hurricanes or if new technology is developed that can better handle the turbid waters of the Chesapeake.	
Quality Level and/or update frequency variability across AOI	For wetland studies we would need the highest horizontal and vertical resolution possible, and that may not get accurate elevational differences. However, for sea level rise studies we need QL0 (or QL0HD) in a 2km swath inland from the shoreline. A 4-5 year repeat cycle is fine.			
Acceptable Horizontal Error	Up to 1 meter	Less than 50 cm	Less than 50 cm	The best horizontal accuracy achievable for the vertical accuracy I need
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm	Less than 10 cm	Up to 2 meters

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed			Somewhere between 2km inland and covering the coastal uplands, for accurate sea level rise projections in the very low-lying areas of Chesapeake Bay and environs	
How far down the beach profile needed	Below MLLW but I picked "other" to point out that one of our Mission Critical Activities is the study of wetlands, including current extent (particularly of tidal wetlands) and future migration. Since tidal wetlands occur in the land/shallow water interface I am pointing it out explicitly since wetlands are not described in any of the zones in FAQ#4.		For sediment transport studies in the nearshore and wave modeling we need accurate bathymetry to at least 1m depth	
Tide correction requirement			MLLW	No requirement for tide correction
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Not required	Nice to have	Required	Nice to have	Nice to have
Entire AOI under same environmental conditions	Required	Highly desirable	Required	Nice to have	Required	Required
Other	Required					Required
Other description	Tidally-coordinated lidar data for coastal and estuarine areas					It is difficult to pick one choice across all geographic regions--our offshore bathymetry needs are different from inland and nearshore. Inland and nearshore needs to be collected under similar environmental conditions; offshore needs to be collected concurrently.
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Nice to have	Required	Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Not required	Not required	Highly desirable
DTM	Required	Not required	Not required	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Nice to have	Nice to have	Not required	Highly desirable
Classified point cloud	Highly desirable	Highly desirable	Nice to have	
Edited/cube XYZ		Not required	Not required	Highly desirable
Full waveform	Not required	Not required	Not required	Highly desirable
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)			Required	Highly desirable
Tide Predictions			Required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Nice to have
Ground control/ground truthing	Required	Highly desirable	Highly desirable	Highly desirable
Other			Required	
Other description			Just want to clarify the DEM--we need bare earth for terrestrial surfaces and bottom for subaqueous environments	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Not required	Required
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Highly desirable	Required
Underwater videography			Not required	Required
Bottom texture			Nice to have	Highly desirable
Bottom type			Nice to have	Highly desirable
Submerged features			Not required	Highly desirable
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Not required	Not required	Not required	Nice to have
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Highly desirable	Not required
Tide/wave heights			Highly desirable	Not required
Sea ice conditions			Not required	Required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Not required	Nice to have
Routes			Not required	Nice to have
Offshore cadastral			Not required	Nice to have
Lease areas			Not required	Nice to have
Fixed obstructions			Not required	Nice to have
Floating observation/navigation systems			Not required	Nice to have
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Highly desirable	Highly desirable	Required	Required
Wetlands	Required	Required	Required	Required
Estuaries			Required	
Inland surface water features	Highly desirable	Highly desirable	Highly desirable	
Bridges/culverts	Highly desirable	Nice to have		
Landmark features	Nice to have	Nice to have	Not required	
Cultural resources	Not required	Not required	Not required	
Coastal and riverine structures	Highly desirable	Highly desirable	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current dataset used	We primarily use 2 sets of data: 1) CoNED seamless topobathy surface for Chesapeake Bay (we are using a breakline-revised, as yet unreleased version) 2) bare earth dems for ranging from QL3 to QL2 (QL3 areas to be upgraded within the next year or two). Now that we have the CoNED layer, we rarely go back to the NOS Hydrographic Survey data or the Chesapeake Bay Program bathymetry grid.	We have limited to nonexistent inland bathymetry data for lakes, reservoirs, etc. For rivers, if they are freshwater tidal or estuarine there may be some limited NOS Hydrographic Survey data. For streams and creeks, there are no data.	In Chesapeake Bay the zone between MLW to a depth of 2m or more is what is often called the white band (i.e. the area where there is no shallow water bathymetry), so any "bathymetry" we have in that zone comes from interpolation between topographic lidar and NOS Hydrographic Surveys (most of which are 60-100 years old in the shallows of Chesapeake Bay). That is to say, the depths are manufactured, not measured. The topographic lidar is QL2 and QL3, and most of it is not tide-coordinated.	1. ETOPO1,2 2. GEBCO 3. TORI (Taiwan)
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				Yes
Open Topography				
NOAA nautical charts				Yes
USACE navigation charts				Yes
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Virginia Geographic Information Network Eastern Shore Regional GIS Cooperative			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other	Yes		Yes	
Other description	Directly from CoNED		I use https://maps.ngdc.noaa.gov/viewers/bathymetry/	
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available	None	Major
Cost savings/cost reduction	Moderate	Inland bathy data not available	None	Minor
Cost avoidance	Moderate	Inland bathy data not available	None	Minor
Increased revenues	None	Inland bathy data not available	None	Moderate
Mission-driven performance improvements	Major	Inland bathy data not available	None	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available	None	Major
Improved response or timeliness	Moderate	Inland bathy data not available	None	Major
Improved customer experience	Moderate	Inland bathy data not available	None	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Inland bathy data not available	None	Major
Environmental	Major	Inland bathy data not available	None	Major
Public safety, including life and property	Moderate	Inland bathy data not available	None	Major

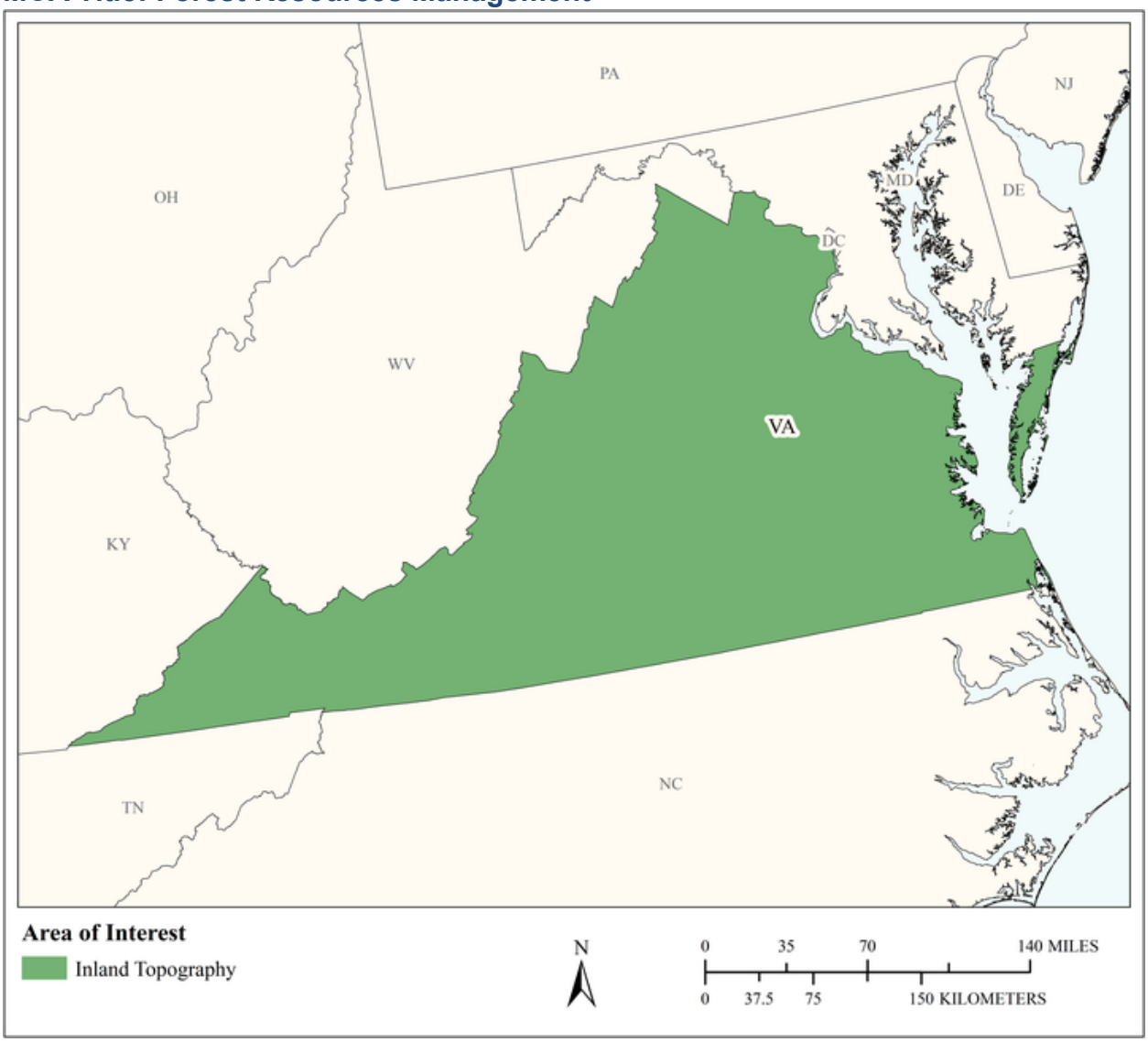
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Annual dollars saved/realized	$5,065
Time savings description	We are an academic institution so hours spent and cost are not always tracked. This is true for most of these questions.									Eliminate the need to merge data of different sources. Avoid QA/QC on our side before modelling exercise.		
Cost savings/cost reduction	None			Minor	Unable to provide		Major	Unable to provide		Major	Annual dollars saved/realized	$3,618
Cost savings/cost reduction description	Grant money we receive is for specific projects and cannot be used for other purposes.									Right now we have to gather data from difference sources and make sure they match at boundary.		
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Annual dollars saved/realized	$3,618
Cost avoidance description										We have applied our own judgement in correcting data errors so far.		
Increased revenues	None			I don't know	Unable to provide		None			Minor	Unable to provide	
Increased revenues description	As a state academic institution we do not sell any of our products or services.			Since we are state and grant funded we do not sell our products or applications--they are provided free of charge.								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Annual percent improvement	10%
Mission-driven performance improvements description										Reduce modeling errors/uncertainties in offshore region to aid decision making. Reduce modeling errors/uncertainties in offshore region.		
Other operational benefits	I don't know	Unable to provide										
Other operational benefits description	No additional operational benefits known at this time.											
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,079,803		Annual dollars saved/ realized	$893,395		Annual dollars saved/ realized	$437,802		Annual dollars saved/ realized	$35,642
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Annual dollars saved/realized	$603
Value added to products or services description										Improve our inundation mapping effort for tsunami and hurricane.		
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Annual dollars saved/realized	$1,508
Improved response or timeliness description										More accurate forecast from us would help response management agencies in their planning. We are forecasting Chesapeake Bay and adjacent coastal waters, including oil spill, search & rescue etc. Newer DEM will help improve our forecasts. We'd love to update our forecast and hindcast products with newer and more consistent offshore DEM.		
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$363,592		Annual dollars saved/ realized	$523,750		Annual dollars saved/ realized	$740,594		Annual dollars saved/ realized	$7,453
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major			Major		
Education or outreach description										Teach students on the effects of error/uncertainty of DEM on forecast product		
Environmental	Major			Major			Major			Major		
Environmental description										More accurate forecast would lead to better management decisions		
Public safety, including life and property	Major			Major			Major			Major		
Public safety, including life and property description										More accurate forecast would help hazard mitigation and resilience		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes		Yes	
Hillshades				
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness			Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Forest Resources Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Forest health assessment. Determination of standing inventory of forest resources. Prescribed burn planning. Analysis of carbon stocks for trade. Harvest systems planning.
MCA Title	Forest Resources Management
MCA ID	60493
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Virginia
Sub-Agency or Division	Virginia Department of Forestry
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	BU 17 - Wildfire Management, Planning, and Response
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Highly desirable			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

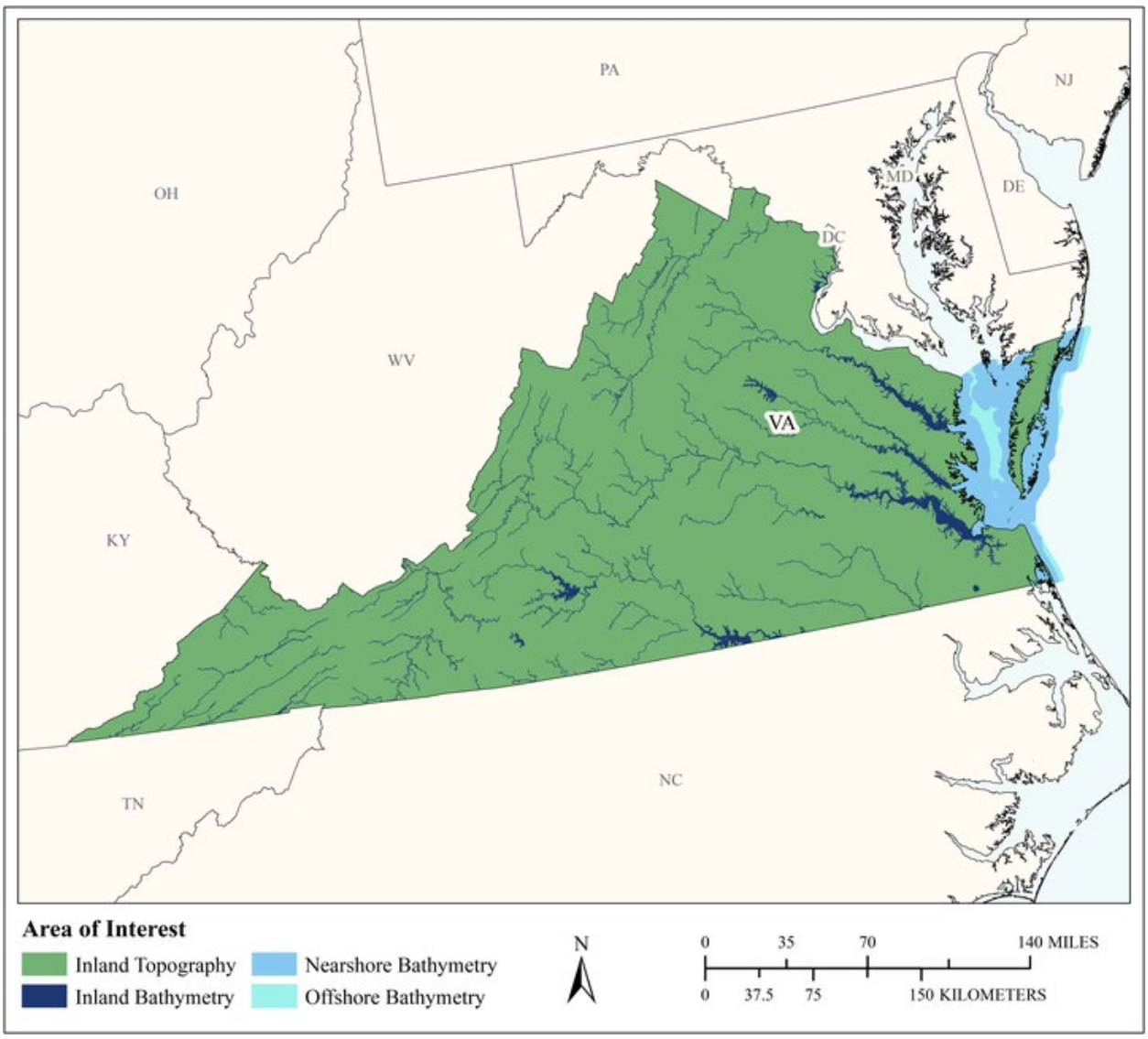
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$159,658									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$231,444									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Natural Resources Conservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation engineering. Soils and wetlands mapping and characterization. Modeling of biological and ecological systems. Erosion control. Rainfall penetration studies, impervious surfaces. Assessment of blue carbon stocks.
MCA Title	Natural Resources Conservation
MCA ID	60494
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Virginia
Sub-Agency or Division	Virginia Department of Conservation and Recreation
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B	QL1B	Cross sections and/or transects meet needs
Update Frequency	4-5 years	6-10 years	6-10 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				Yes
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Highly desirable	Required	Required	Required	Required
Entire AOI under same environmental conditions	Required	Required	Required	Required	Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Required	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Required	Required	Required	Required
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Highly desirable	Required	Highly desirable
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Nice to have	Highly desirable
Ground control/ground truthing	Required	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Nice to have	Required
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Highly desirable
Underwater videography			Nice to have	Highly desirable
Bottom texture			Nice to have	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Highly desirable	Highly desirable
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Nice to have	Highly desirable
Habitat distribution and classification			Required	Highly desirable
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Highly desirable
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates	Highly desirable	Required	Highly desirable	
Land use/land cover	Required	Required	Highly desirable	Nice to have
Wetlands	Required	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Highly desirable
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Nice to have	Highly desirable	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	Major
Cost savings/cost reduction	Major	Major	Minor	Major
Cost avoidance	Major	Moderate	Minor	I don't know
Increased revenues	Minor	Minor	None	I don't know
Mission-driven performance improvements	Major	Major	Moderate	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Moderate	Major

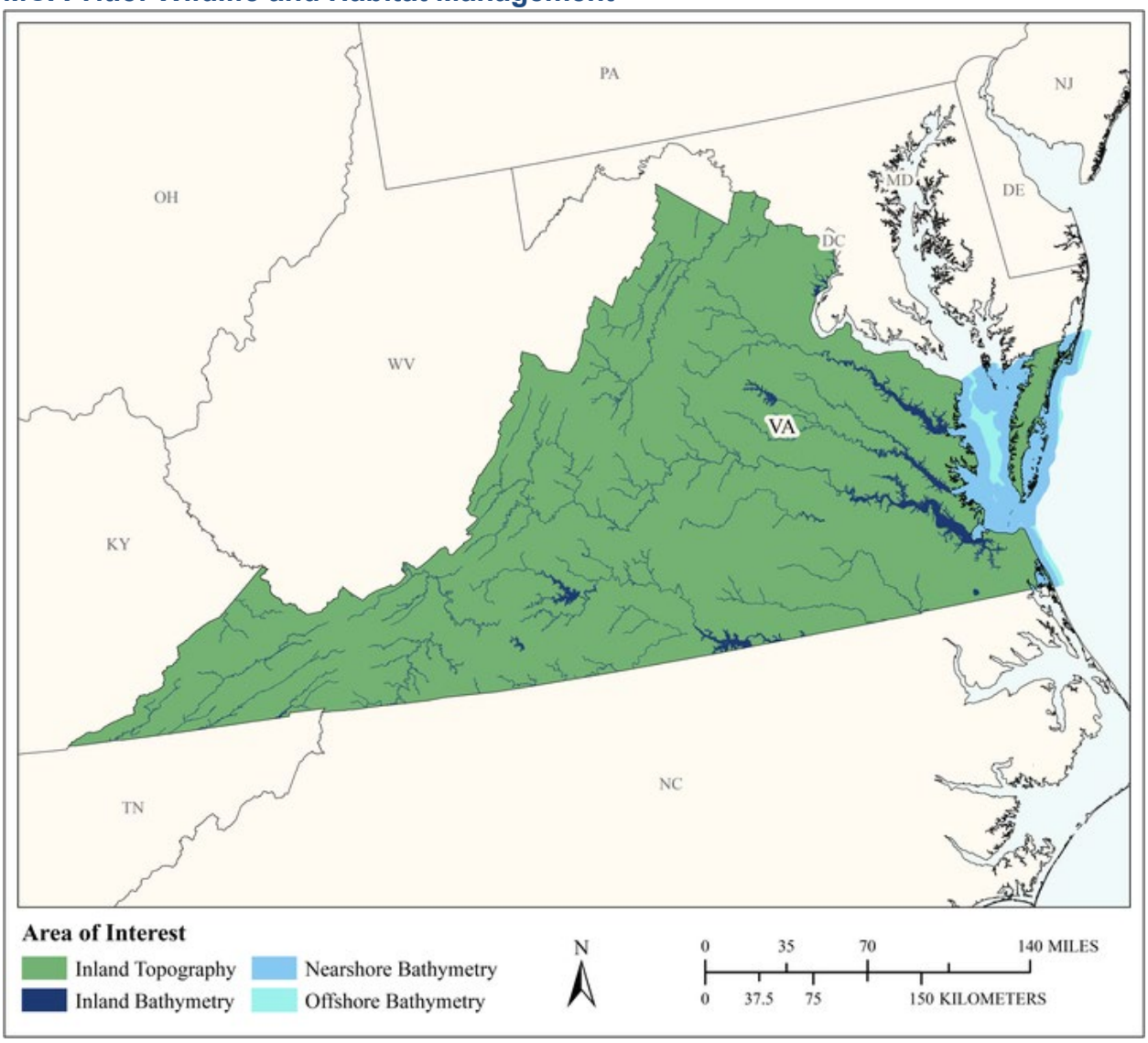
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major	Moderate	Major
Improved customer experience	Major	Moderate	Minor	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Moderate	Major
Environmental	Major	Major	Major	Major
Public safety, including life and property	Major	Moderate	Moderate	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		None			Moderate	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,583,863		Annual dollars saved/ realized	$214,674						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$5,816,430		Annual dollars saved/ realized	$9,664						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate			Moderate		
Environmental	Major			Major			Major			Major		
Public safety, including life and property	Major			Major			Moderate			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Wildlife and Habitat Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation planning for wildlife refuges and marine sanctuaries. Conservation of critical habitats. Management of diverse migratory bird habitats, coral reef and coral communities, marine mammals, protected fish species, and trust resources.
MCA Title	Wildlife and Habitat Management
MCA ID	60495
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Virginia
Sub-Agency or Division	Virginia Department of Game and Inland Fisheries
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B	QL0B	Special Order
Update Frequency	4-5 years	4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 2 meters	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DTM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Nice to have	Nice to have	Highly desirable
Classified point cloud	Highly desirable	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Highly desirable
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Highly desirable	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Not required	Nice to have
Lease areas			Not required	Nice to have
Fixed obstructions			Nice to have	Highly desirable
Floating observation/navigation systems			Nice to have	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Nice to have
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Highly desirable	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Nice to have	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Minor	Moderate
Cost savings/cost reduction	Major	Minor	Minor	Minor
Cost avoidance	Major	Minor	Moderate	Major
Increased revenues	None	Minor	None	None
Mission-driven performance improvements	Moderate	Moderate	Moderate	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate	Minor	Minor

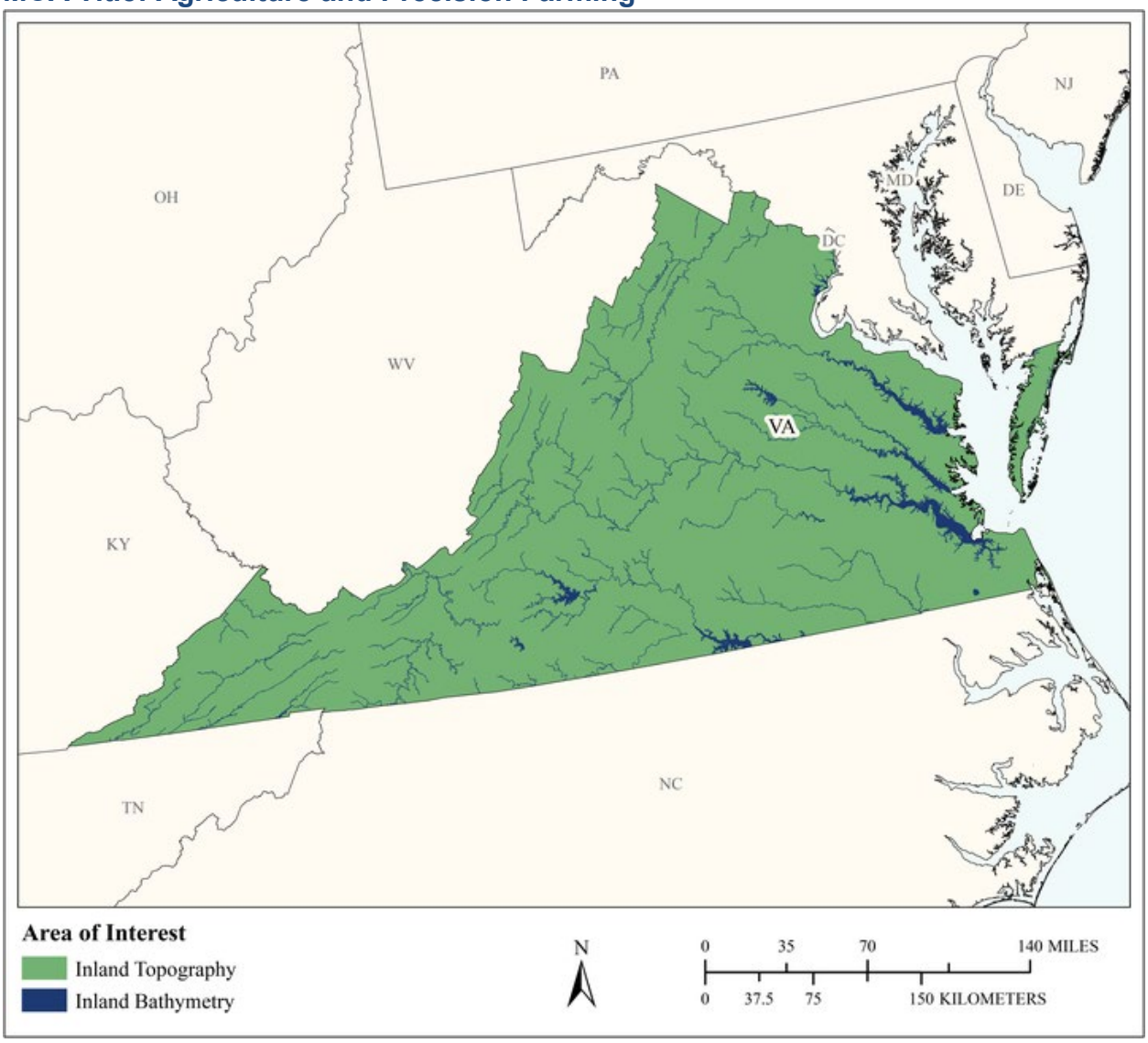
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Minor	Minor	Minor	Minor
Improved customer experience	Minor	Moderate	Minor	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Moderate	Minor	Minor
Environmental	Moderate	Moderate	Moderate	Major
Public safety, including life and property	Minor	Minor	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$9,619		Annual dollars saved/ realized	$77,088		Annual dollars saved/ realized	$1,935		Annual dollars saved/ realized	$600
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$27,782		Annual dollars saved/ realized	$46,595		Annual dollars saved/ realized	$114		Annual dollars saved/ realized	$41
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate			Moderate		
Environmental	Major			Moderate			Major			Major		
Public safety, including life and property	Moderate			Moderate			Moderate			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes			Yes
Curvature maps				
Cross sections	Yes			Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Agriculture and Precision Farming



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Farm pond design. Irrigation system design. Detailed site analysis to support precision farming. Analysis of farm sedimentation and runoff. Calibration of fertilizer application, fertilizer management, and irrigation planning. Optimized terraforming.
MCA Title	Agriculture and Precision Farming
MCA ID	60496
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Virginia
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 08 - Agriculture and Precision Farming
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Nice to have
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL4B		
Update Frequency	2-3 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 10 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 50 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required			Not required	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Not required	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Not required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level			Up to double the required TVU at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Nice to have	Nice to have		
Edited/cube XYZ		Highly desirable		
Full waveform	Nice to have	Highly desirable		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Required	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Highly desirable		
Land use/land cover	Highly desirable	Required		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Nice to have	Required		
Cultural resources	Nice to have	Highly desirable		
Coastal and riverine structures	Highly desirable	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	None		
Cost savings/cost reduction	Major	I don't know		
Cost avoidance	Major	Moderate		
Increased revenues	None	I don't know		
Mission-driven performance improvements	Moderate	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None		

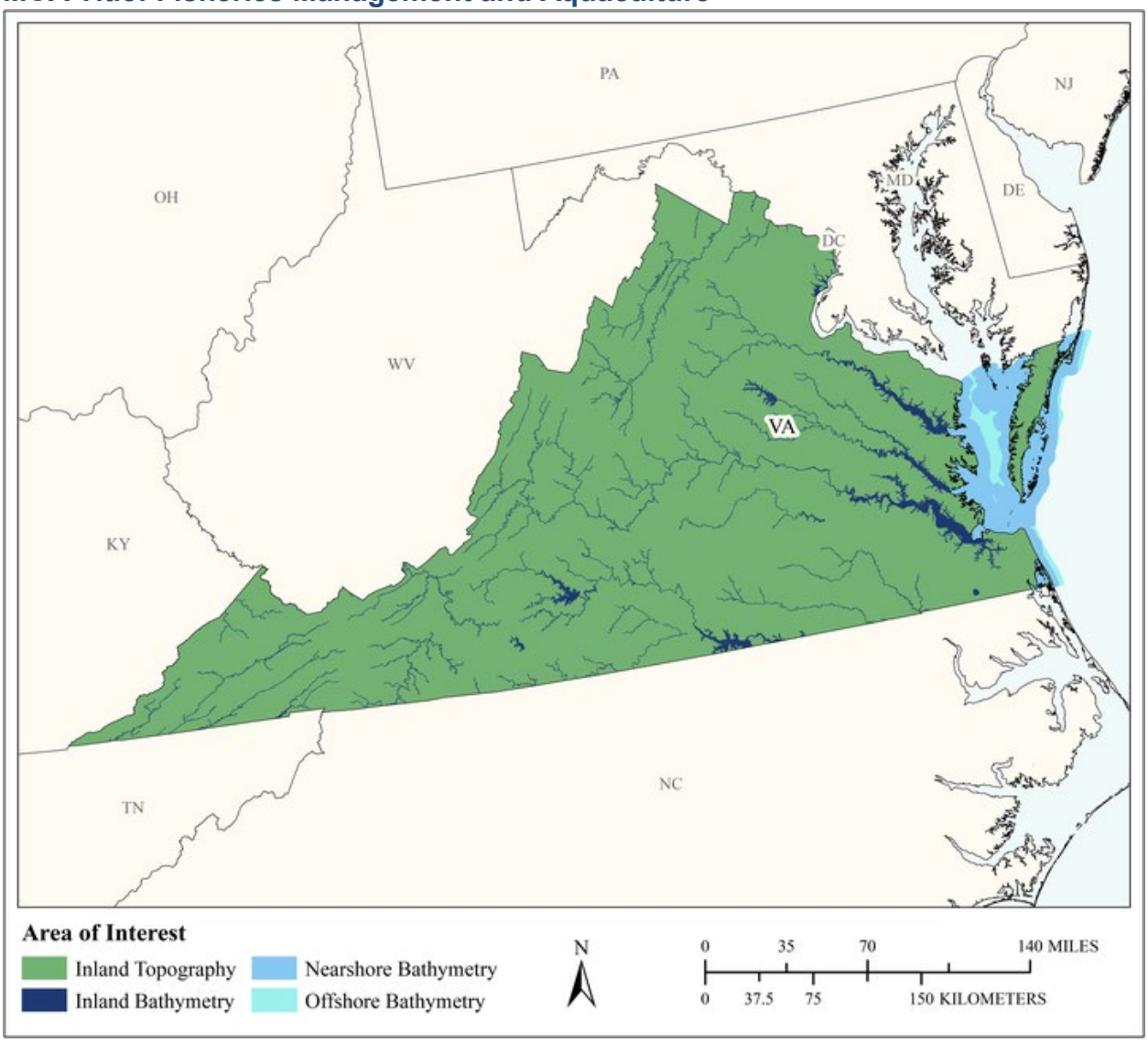
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	None		
Improved customer experience	Moderate	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	None		
Environmental	Major	I don't know		
Public safety, including life and property	Moderate	I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$46,752		Annual dollars saved/ realized	$81,911						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$37,063		Annual dollars saved/ realized	$37,063						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate								
Environmental	Major			Major								
Public safety, including life and property	Minor			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps				
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps		Yes		
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Fisheries Management and Aquaculture



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Management of fisheries. Sustainable aquaculture.
MCA Title	Fisheries Management and Aquaculture
MCA ID	60497
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Virginia
Sub-Agency or Division	Virginia Marine Resources Commission
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B	QL0B	Special Order
Update Frequency	2-3 years	6-10 years	6-10 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Nice to have	Nice to have	Required	Nice to have
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Required	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Required
DTM	Required	Highly desirable	Highly desirable	Nice to have
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Nice to have	Highly desirable	Nice to have
Classified point cloud	Highly desirable	Nice to have	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Nice to have
Tide Predictions			Not required	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Highly desirable	Required
Ground control/ground truthing	Required	Highly desirable	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Nice to have	Required
Acoustic imagery of the seafloor			Highly desirable	Required
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Required
Underwater videography			Nice to have	Highly desirable
Bottom texture			Nice to have	Required
Bottom type			Highly desirable	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Highly desirable	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Required
Floating observation/navigation systems			Nice to have	Required
Shorelines – current, historic, change rates	Required	Highly desirable	Highly desirable	
Land use/land cover	Required	Highly desirable	Nice to have	Nice to have
Wetlands	Required	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Highly desirable
Inland surface water features	Required	Required	Nice to have	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Not required	
Coastal and riverine structures	Required	Highly desirable	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	Moderate
Cost savings/cost reduction	Major	Moderate	Major	Minor
Cost avoidance	Moderate	Moderate	Minor	Minor
Increased revenues	Moderate	Moderate	Minor	None
Mission-driven performance improvements	Major	Major	Moderate	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Minor	Moderate

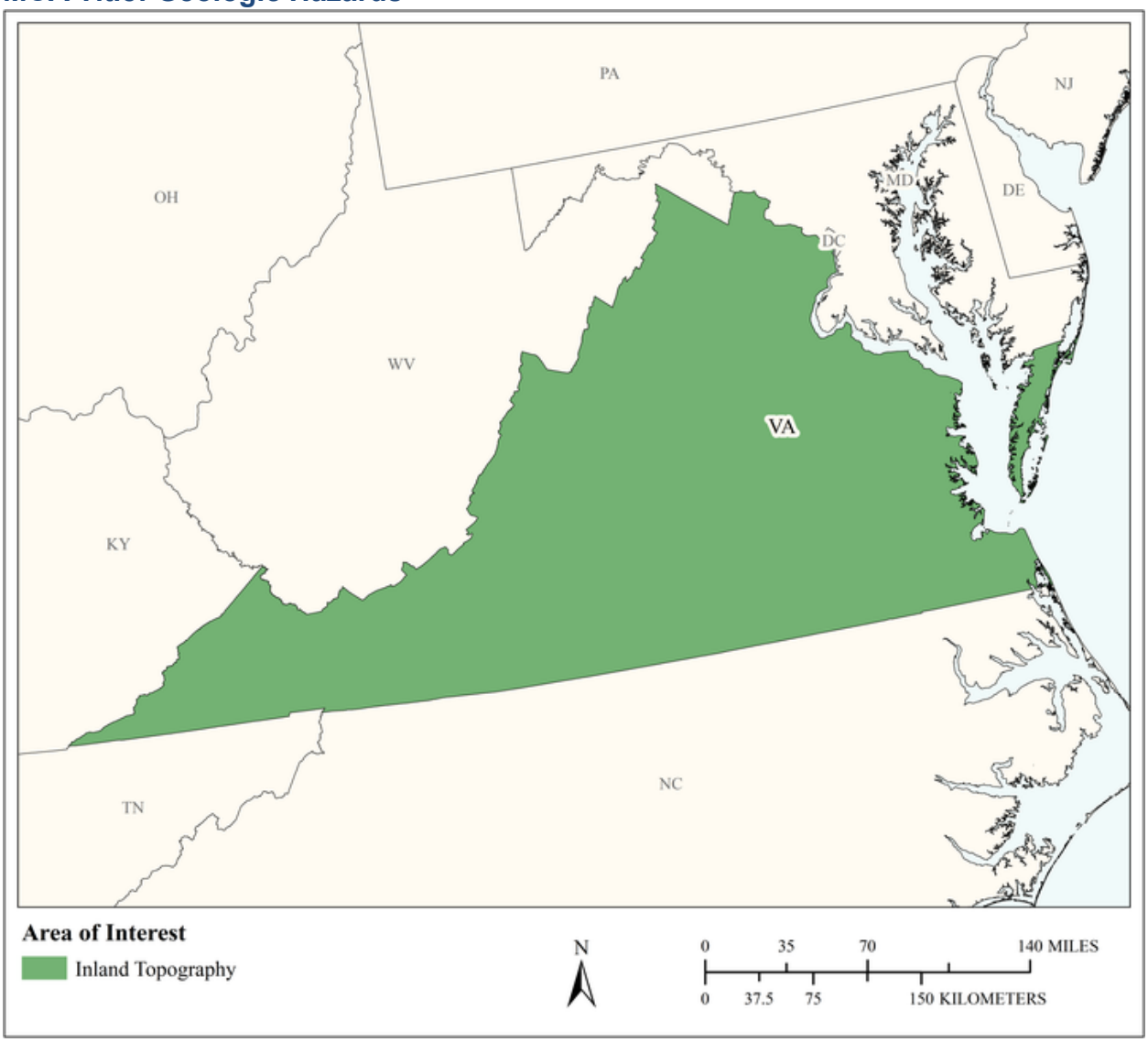
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major	Moderate	Minor
Improved customer experience	Moderate	Major	Minor	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Moderate	Moderate
Environmental	Major	Moderate	Moderate	Minor
Public safety, including life and property	Moderate	Minor	Minor	None

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		None		
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		None		
Increased revenues	Minor	Unable to provide		None			Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$41,277		Annual dollars saved/ realized	$80,798		Annual dollars saved/ realized	$307,075			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$89,658		Annual dollars saved/ realized	$36,774		Annual dollars saved/ realized	$22,552			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Moderate			Moderate		
Environmental	Moderate			Major			Major			Moderate		
Public safety, including life and property	Moderate			Moderate			Minor			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes		Yes	Yes
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic Hazards



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Geologic hazards
MCA Title	Geologic Hazards
MCA ID	1316
Organization Type	State or U.S. Territorial government
Organization Name	Virginia Department of Mines, Minerals and Energy
Sub-Agency or Division	
Organization Mission	The Virginia Department of Mines, Minerals and Energy (DMME) enhances the development and conservation of energy and mineral resources in a safe and environmentally sound manner to support a more productive economy. Within DMME, the Division of Geology and Mineral Resources (DGMR) serves as Virginia's geological survey. DGMR performs investigations aimed at reducing risk from geologic hazards and encouraging sustainable development through the wise use of mineral, land, water, and energy resources. In addition to publishing maps and reports, DGMR maintains repositories of geological and geophysical data, as well as rock, fossil, and core samples. With our staff of experienced geoscientists, we are uniquely positioned to provide expert assistance in matters pertaining to the geology and mineral resources of the Commonwealth. An additional Business Use would be BU 13 – Oil and Gas Resources.
Program Name	Division of Geology and Mineral Resources
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 11 - Geologic Resource Mining and Extraction
Tertiary Business Use	BU 12 - Renewable Energy Resources

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Landslide scar, sinkhole

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	2-3 years			
Event type(s)				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 30 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Nice to have			
Wetlands	Not required			
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL1 and QL2 Lidar DEMS, 2010-2017			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Virginia Geographic Information Network (VGIN) is the coordinator for LiDAR data in Virginia. They have an FTP site where data can be downloaded.			

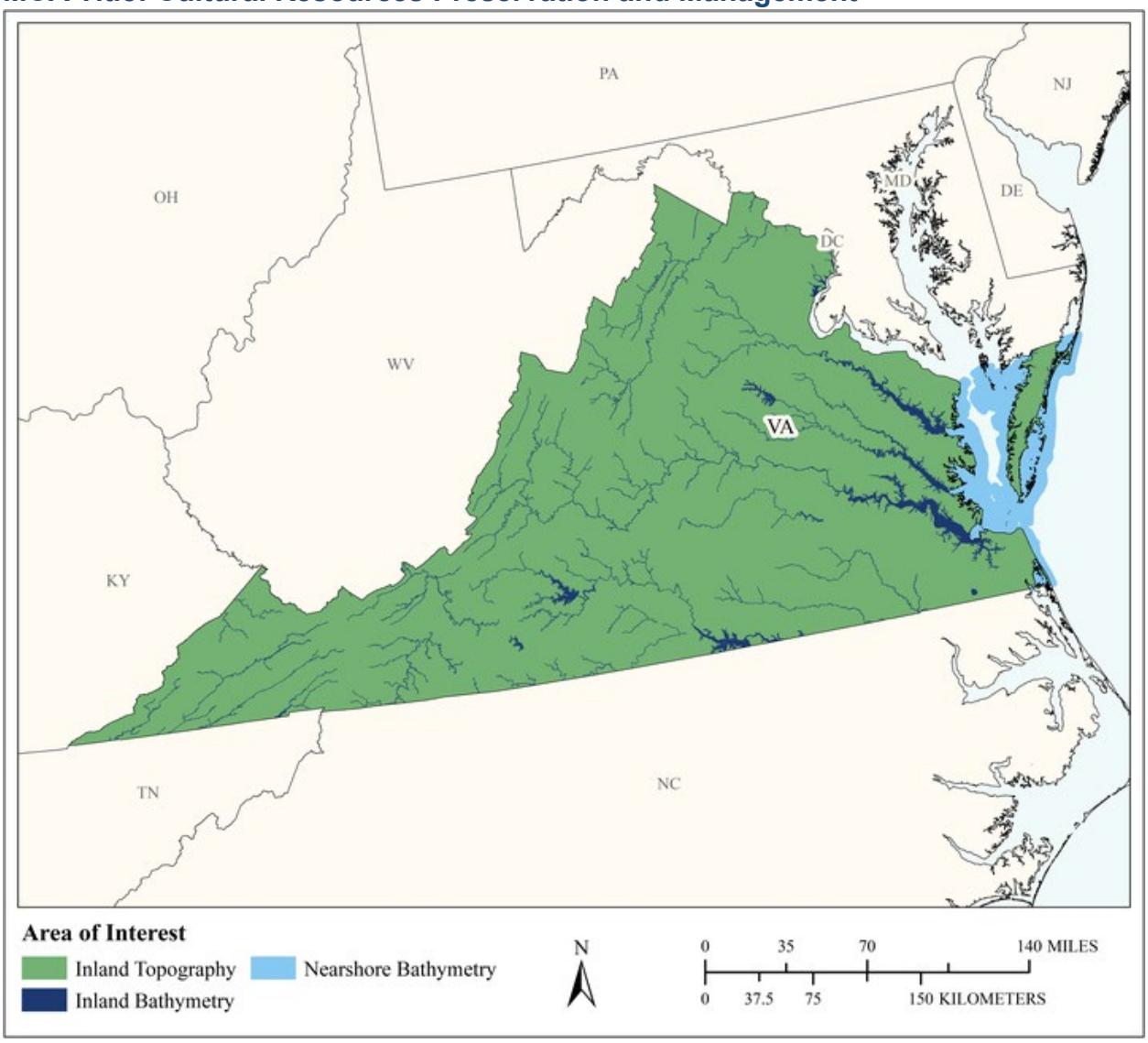
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Minor			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Minor			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$11,578									
Time savings description	Lidar is far more accurate than aerial photography for identifying features like landslides and sinkholes. Lidar hydrologic models are more accurate and make mapping faster.											
Cost savings/cost reduction	Major	Annual dollars saved/realized	$10,000									
Cost savings/cost reduction description	Amount we would spend to acquire DEM data.											
Cost avoidance	Major	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Moderate	Annual percent improvement	20%									
Mission-driven performance improvements description	With full LiDAR coverage of VA, geohazard investigations will be more efficient and accurate.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide										
Value added to products or services description	High resolution LiDAR makes maps more accurate, but how does one put a dollar amount on that?.											
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	None											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Education or outreach description	Being able to accurately model the ground surface is very educational											
Environmental	None											
Public safety, including life and property	Major											
Public safety, including life and property description	Lidar is one of the best tools for identifying landslides and sinkholes											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Cultural Resources Preservation and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Discovery and analysis of underwater archaeological and historical cultural sites. Site protection and preservation planning. Discovery and analysis of Native American and other historical cultural sites and subsistence activities.
MCA Title	Cultural Resources Preservation and Management
MCA ID	60498
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Virginia
Sub-Agency or Division	Virginia Department of Historic Resources
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	
Update Frequency	4-5 years	6-10 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Not required	Nice to have		Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	
DTM	Required	Highly desirable	Nice to have	
DEM	Required	Required	Required	
Raw point cloud data	Not required	Not required	Not required	
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Not required	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Nice to have	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	
Ground control/ground truthing	Nice to have	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Required	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Highly desirable	Highly desirable	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Highly desirable	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Highly desirable	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Required	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Required	
Land use/land cover	Nice to have	Highly desirable	Nice to have	
Wetlands	Nice to have	Highly desirable	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Nice to have	Highly desirable	Nice to have	
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Nice to have	Highly desirable	Highly desirable	
Cultural resources	Required	Highly desirable	Required	
Coastal and riverine structures	Nice to have	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	
Cost savings/cost reduction	Moderate	Minor	Minor	
Cost avoidance	Minor	Minor	Minor	
Increased revenues	None	Minor	None	
Mission-driven performance improvements	Moderate	Moderate	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor	None	

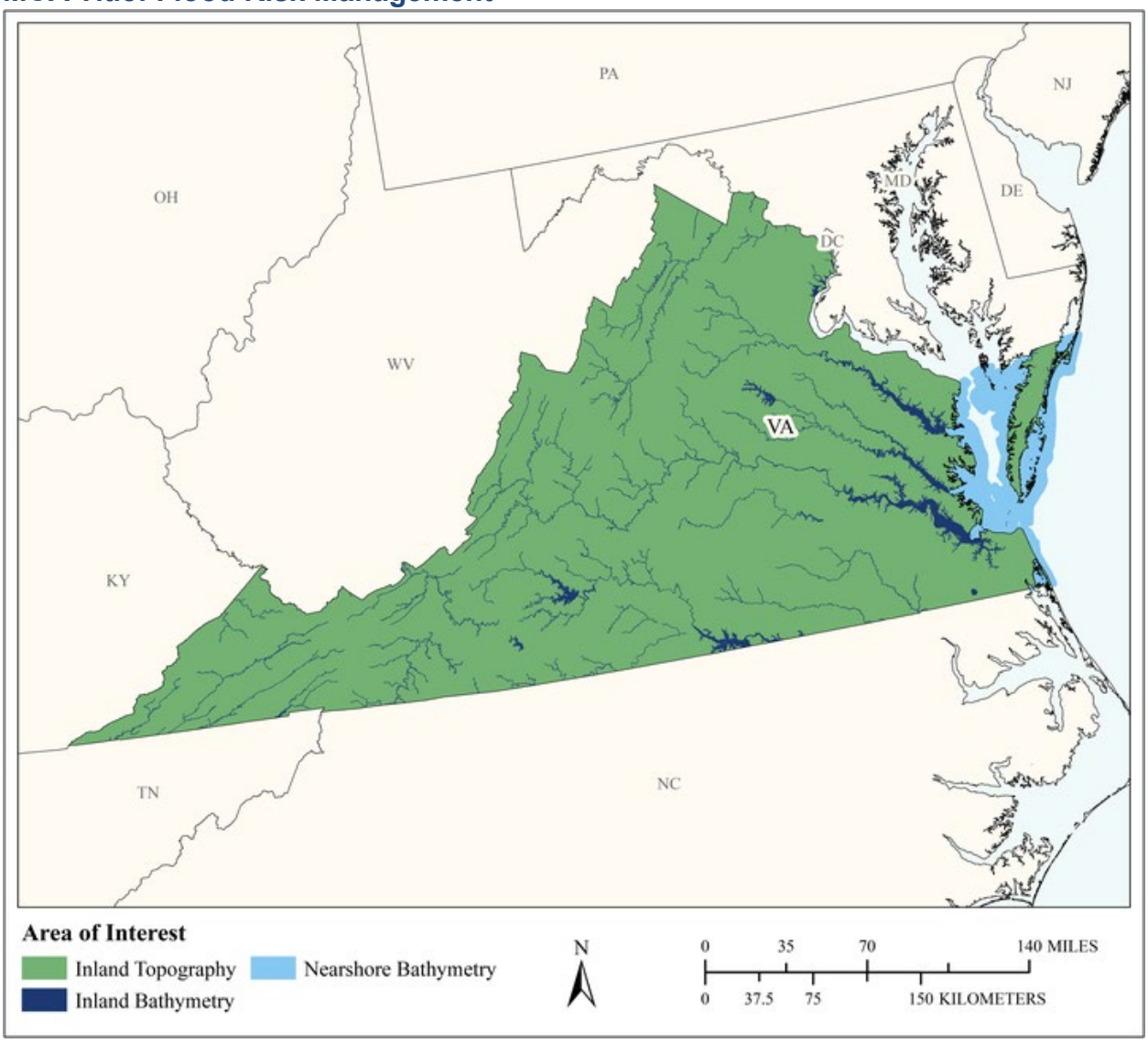
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major	Minor	
Improved customer experience	Moderate	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	Minor	
Environmental	Minor	Moderate	Minor	
Public safety, including life and property	Minor	Moderate	None	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Increased revenues	None			None			None					
Mission-driven performance improvements	Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$7,401		Annual dollars saved/ realized	$17,749		Annual dollars saved/ realized	$5,594			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$6,471									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Moderate			Minor					
Environmental	Minor			Minor			Moderate					
Public safety, including life and property	Minor			Minor			Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes	Yes	
Hillshades	Yes		Yes	
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Flood Risk Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Flood risk modeling and mapping of riverine and coastal areas. Dam/dike/levee safety analysis. Emergency management. Flood forecasts.
MCA Title	Flood Risk Management
MCA ID	60499
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Virginia
Sub-Agency or Division	Virginia Department of Conservation and Recreation
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL2B	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Highly desirable	
DTM	Required	Required	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	
Classified point cloud	Required	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Not required	
Geologic and seismic data	Nice to have	Nice to have	Not required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Highly desirable	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Not required	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Minor	
Cost savings/cost reduction	Major	Minor	Minor	
Cost avoidance	Major	Moderate	Minor	
Increased revenues	Minor	Minor	None	
Mission-driven performance improvements	Major	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Minor	

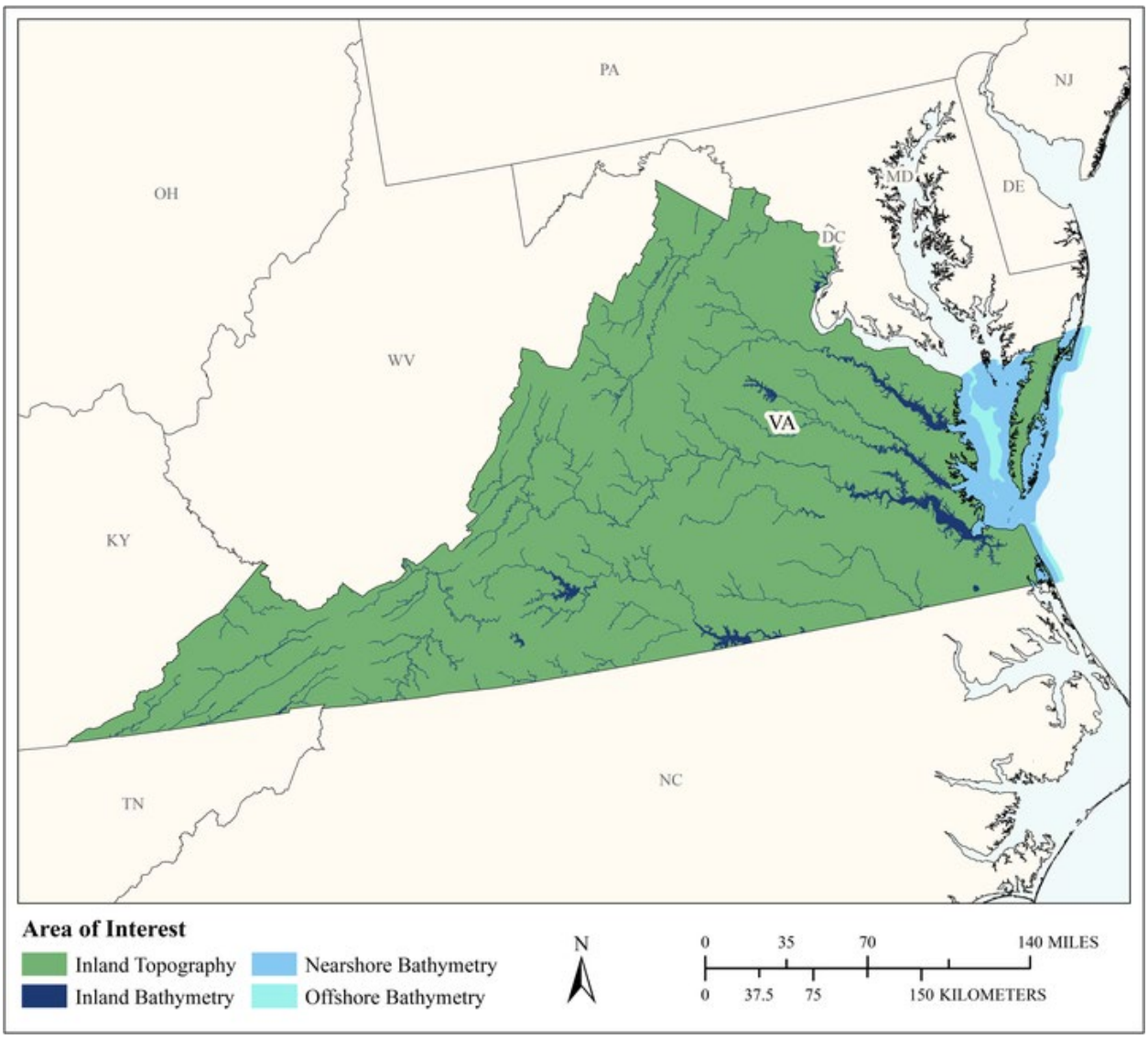
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	Minor	
Improved customer experience	Major	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor	Minor	
Environmental	Major	Moderate	Moderate	
Public safety, including life and property	Major	Moderate	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	Minor	Unable to provide		None			Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$5,669,741		Annual dollars saved/ realized	$393,859		Annual dollars saved/ realized	$370,087			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$992,027		Annual dollars saved/ realized	$442,203		Annual dollars saved/ realized	$274,287			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate			Major					
Environmental	Moderate			Moderate			Moderate					
Public safety, including life and property	Major			Major			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Sea Level Rise and Subsidence



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Modeling and mapping the effects of sea level rise or subsidence. Population and economic vulnerability assessments. Coastal inundation and infrastructure assessment.
MCA Title	Sea Level Rise and Subsidence
MCA ID	60500
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Virginia
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 16 - Sea Level Rise and Subsidence
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL1B	QL2B	Order 2
Update Frequency	4-5 years	4-5 years	2-3 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	Up to 20 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	Up to 2 meters
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Required	Required	Highly desirable	Highly desirable	Required
Entire AOI under same environmental conditions	Highly desirable	Required	Required	Highly desirable	Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Required	Required	Highly desirable	Required
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have	Highly desirable	Highly desirable
DTM	Required	Required	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Highly desirable	Nice to have	Nice to have
Classified point cloud	Required	Nice to have	Highly desirable	
Edited/cube XYZ		Not required	Not required	Not required
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Not required	Not required	Not required
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	Required
Tide Predictions			Required	Required
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Required
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Highly desirable	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Required
Nautical and/or navigation charts			Highly desirable	Required
Acoustic imagery of the seafloor			Nice to have	Not required
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Not required	Not required
Bottom texture			Not required	Not required
Bottom type			Nice to have	Nice to have
Submerged features			Nice to have	Not required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Not required
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Not required
Water column properties - Biological			Not required	Not required
Currents			Nice to have	Nice to have
Tide/wave heights			Required	Required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Required
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Not required	Not required
Lease areas			Not required	Not required
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Required	Required	Highly desirable	Highly desirable
Wetlands	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Required	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes	Yes	Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Major	Major
Cost savings/cost reduction	Major	Major	Major	Major
Cost avoidance	Major	Major	Major	Major
Increased revenues	None	Minor	Minor	None
Mission-driven performance improvements	Major	Major	Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	Major

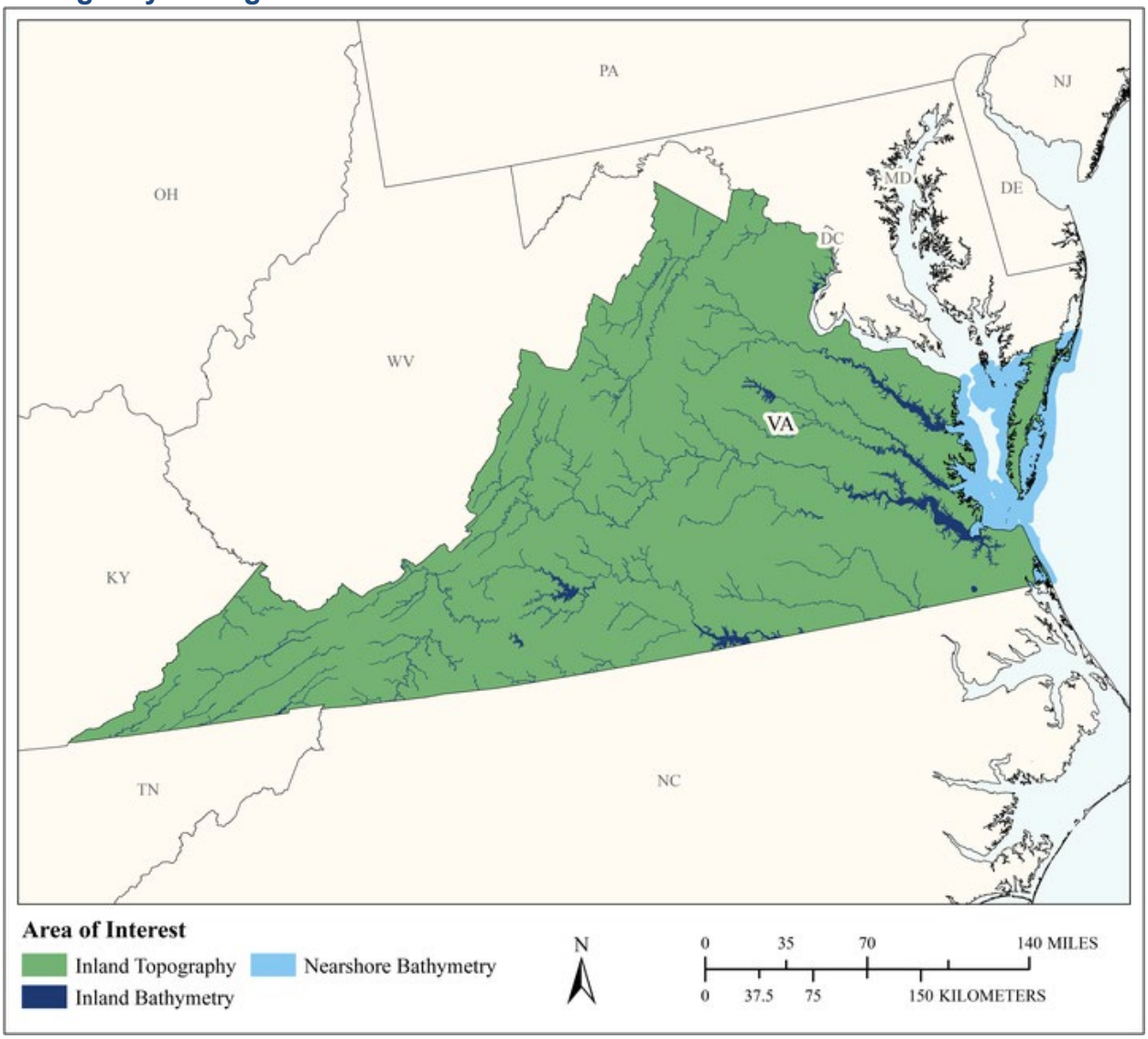
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Minor	Major	Major
Improved customer experience	Moderate	Moderate	Major	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Major	Moderate
Environmental	Moderate	Moderate	Major	Major
Public safety, including life and property	Major	Moderate	Major	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Increased revenues	Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,125,960									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Major			Major		
Environmental	Major			Major			Major			Major		
Public safety, including life and property	Major			Major			Minor			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		Yes
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Homeland Security, Law Enforcement, Disaster Response, and Emergency Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Infrastructure and border protection. Coastal search and rescue. Population dynamics. Emergency fuel supply and movement. Line of sight analysis in urban areas. Disaster response. Flood risk analysis resulting from acts of terrorism.
MCA Title	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
MCA ID	60501
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Virginia
Sub-Agency or Division	Virginia Department of Emergency Management
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B	QL1B	
Update Frequency	4-5 years	4-5 years	6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable		Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Required	
DTM	Required	Highly desirable	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Highly desirable	Highly desirable	
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Highly desirable	Highly desirable	
Full waveform	Nice to have	Nice to have	Highly desirable	
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Highly desirable	
Ground control/ground truthing	Required	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Required	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Highly desirable	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Nice to have	
Boundaries			Highly desirable	
Routes			Highly desirable	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	
Cost savings/cost reduction	Major	Major	Major	
Cost avoidance	Major	Moderate	Moderate	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	Moderate	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Minor	

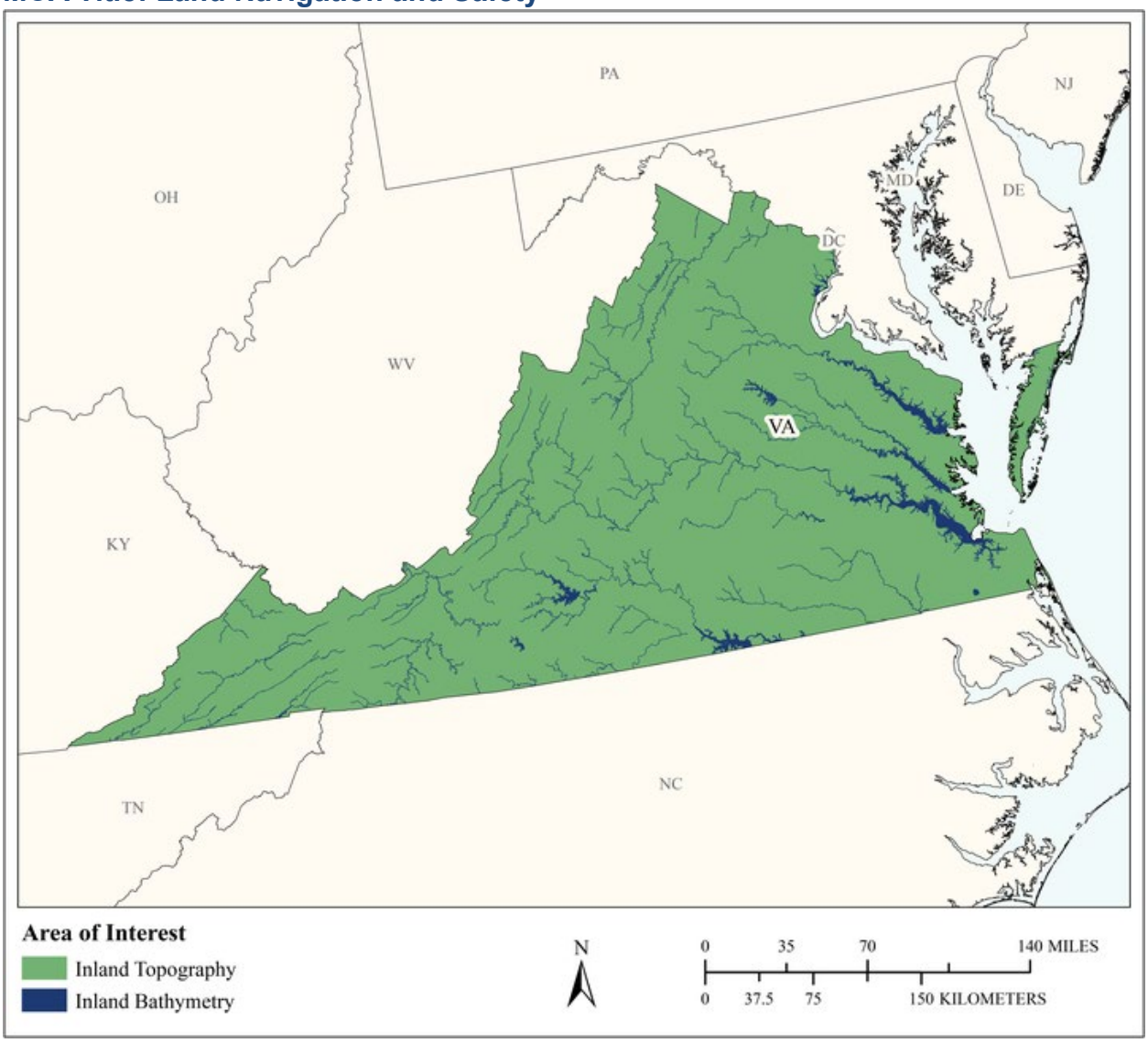
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major	Minor	
Improved customer experience	Major	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	Minor	
Environmental	Minor	Moderate	Minor	
Public safety, including life and property	Major	Major	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,191,248		Annual dollars saved/ realized	$335,486		Annual dollars saved/ realized	$18,007			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$21,054		Annual dollars saved/ realized	$21,404		Annual dollars saved/ realized	$516			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate					
Environmental	Moderate			Moderate			Moderate					
Public safety, including life and property	Major			Major			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Land Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Road and railroad route selection and maintenance. Slope analysis for autonomous cars. GPS navigation visualization.
MCA Title	Land Navigation and Safety
MCA ID	60502
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Virginia
Sub-Agency or Division	Virginia Department of Transportation
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 19 - Land Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL0B		
Update Frequency	2-3 years	2-3 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	Up to 2 meters		
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Highly desirable	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Required		
Land use/land cover	Highly desirable	Required		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	Moderate	Minor		
Increased revenues	None	None		
Mission-driven performance improvements	Major	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		

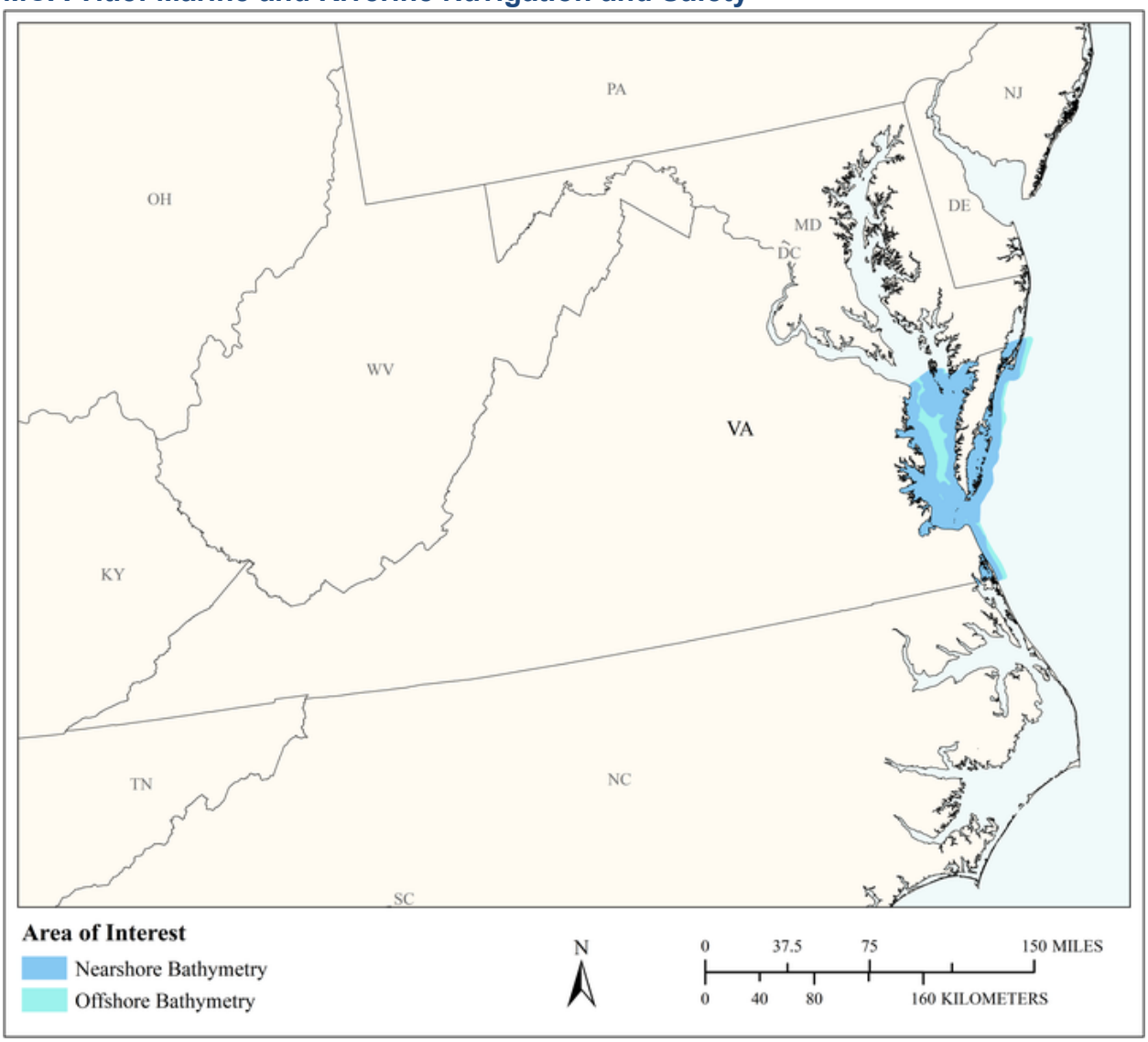
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor		
Improved customer experience	Major	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor		
Environmental	Moderate	Moderate		
Public safety, including life and property	Major	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$523,111		Annual dollars saved/ realized	$22,313						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide							
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$42,243		Annual dollars saved/ realized	$230						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor								
Environmental	Major			Moderate								
Public safety, including life and property	Major			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Marine and Riverine Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type			Required	Required
Geographic Area Requirements			Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Nautical charting. Bathymetric measurements of nearshore submerged coastal topography. Identification of hazards to navigation. Sediment management at coastal navigation projects. Precision marine navigation. Movement of goods and fishing vessels.
MCA Title	Marine and Riverine Navigation and Safety
MCA ID	60503
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Virginia
Sub-Agency or Division	Virginia Marine Resources Commission
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order			QL0B	I don't know
Update Frequency			2-3 years	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error			Up to 2 meters	I don't know
Acceptable Vertical Error			Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season			Nice to have	I don't know		Nice to have
Entire AOI under same environmental conditions			Nice to have	I don't know		Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless			Required	I don't know		Highly desirable
DEM for entire AOI needs to be seamless			Required	I don't know		Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM			Required	I don't know
DTM			Required	I don't know
DEM			Required	I don't know
Raw point cloud data			Required	I don't know
Classified point cloud			Nice to have	
Edited/cube XYZ			Highly desirable	I don't know
Full waveform			Not required	I don't know
Bathymetric Attributed Grid (BAG)			Highly desirable	I don't know
Breaklines required for standard hydro-flattening				
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	I don't know
Tide Predictions			Required	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	I don't know
Intensity imagery/sidescan imagery			Highly desirable	I don't know
Ground control/ground truthing			Highly desirable	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	I don't know
Nautical and/or navigation charts			Highly desirable	I don't know
Acoustic imagery of the seafloor			Highly desirable	I don't know
Aerial and/or satellite imagery			Highly desirable	I don't know
Underwater videography			Nice to have	I don't know
Bottom texture			Highly desirable	I don't know
Bottom type			Highly desirable	I don't know
Submerged features			Highly desirable	I don't know
Subbottom characteristics			Nice to have	I don't know
Geologic and seismic data			Nice to have	I don't know
Water column properties - Physical			Nice to have	I don't know
Water column properties - Chemical			Nice to have	I don't know
Water column properties - Biological			Nice to have	I don't know
Currents			Highly desirable	I don't know
Tide/wave heights			Highly desirable	I don't know
Sea ice conditions			Nice to have	I don't know
Habitat distribution and classification			Highly desirable	I don't know
Boundaries			Nice to have	I don't know
Routes			Required	I don't know
Offshore cadastral			Nice to have	I don't know
Lease areas			Nice to have	I don't know
Fixed obstructions			Required	I don't know
Floating observation/navigation systems			Required	I don't know
Shorelines – current, historic, change rates			Required	
Land use/land cover			Nice to have	I don't know
Wetlands			Highly desirable	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	I don't know
Inland surface water features			Highly desirable	
Bridges/culverts				
Landmark features			Nice to have	
Cultural resources			Nice to have	
Coastal and riverine structures			Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings			Minor	I don't know
Cost savings/cost reduction			Minor	I don't know
Cost avoidance			Minor	I don't know
Increased revenues			Minor	I don't know
Mission-driven performance improvements			Minor	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services			Minor	I don't know

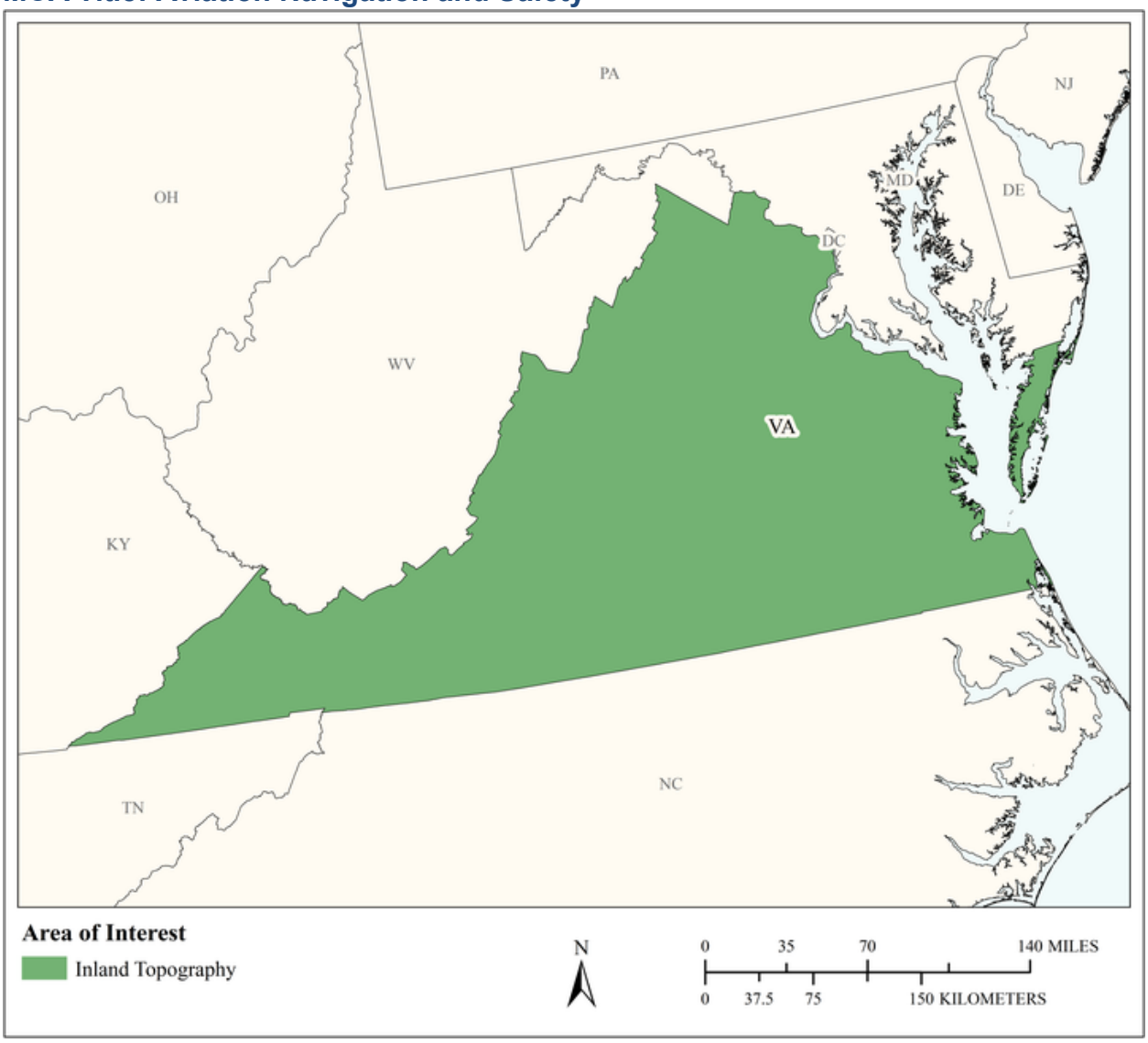
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness			Minor	I don't know
Improved customer experience			Minor	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach			Minor	I don't know
Environmental			Minor	I don't know
Public safety, including life and property			Major	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings							Moderate	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction							Moderate	Unable to provide		I don't know	Unable to provide	
Cost avoidance							Major	Unable to provide		I don't know	Unable to provide	
Increased revenues							Major	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements							Major	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation								Annual dollars saved/ realized	$1,498,381			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services							Moderate	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness							Major	Unable to provide		I don't know	Unable to provide	
Improved customer experience							Major	Unable to provide		I don't know	Unable to provide	
Future annual customer service benefits added during validation								Annual dollars saved/ realized	$50,730			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach							Minor			I don't know		
Environmental							Major			I don't know		
Public safety, including life and property							Major			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	
Contours			Yes	Yes
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections			Yes	
Height-Above-Ground maps				Yes
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)			Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				Yes

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Aviation Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of in-flight hazards and path obstructions. Aeronautical charting. Runway construction and repair.
MCA Title	Aviation Navigation and Safety
MCA ID	60504
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Virginia
Sub-Agency or Division	Virginia Department of Aviation
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 21 - Aviation Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes			
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Major			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

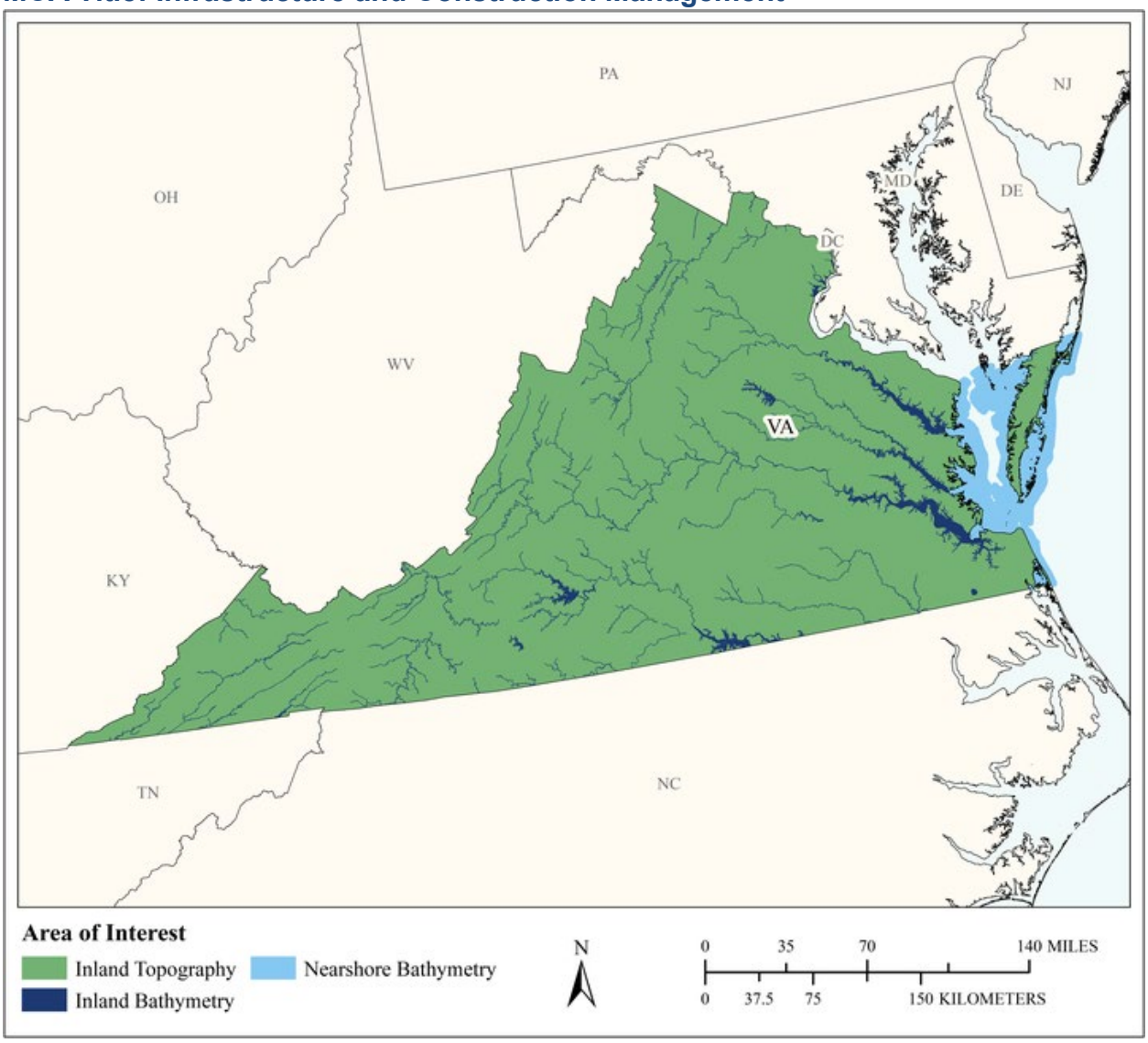
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$136,510									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$170,018									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Moderate											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Infrastructure and Construction Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Marine construction. Bridge design and construction. Engineering and construction of dams, levees, dikes, reservoirs, and coastal structures. Shipyard and port construction. Water, sewer, or power line planning and vegetation analysis. Pump, drain, and well placement. Stormwater modeling. Cut and fill analysis for earth-moving. Building site analysis. Road infrastructure. Infrastructure hardening or mitigation for climate change effects, e.g. sea level change.
MCA Title	Infrastructure and Construction Management
MCA ID	60505
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Virginia
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B	QL1B	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Highly desirable	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Nice to have	Nice to have	
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	
Ground control/ground truthing	Required	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Highly desirable	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Nice to have	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Highly desirable	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Required	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	
Cost savings/cost reduction	Major	Major	Minor	
Cost avoidance	Major	Moderate	Minor	
Increased revenues	Minor	None	None	
Mission-driven performance improvements	Moderate	Moderate	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate	Minor	

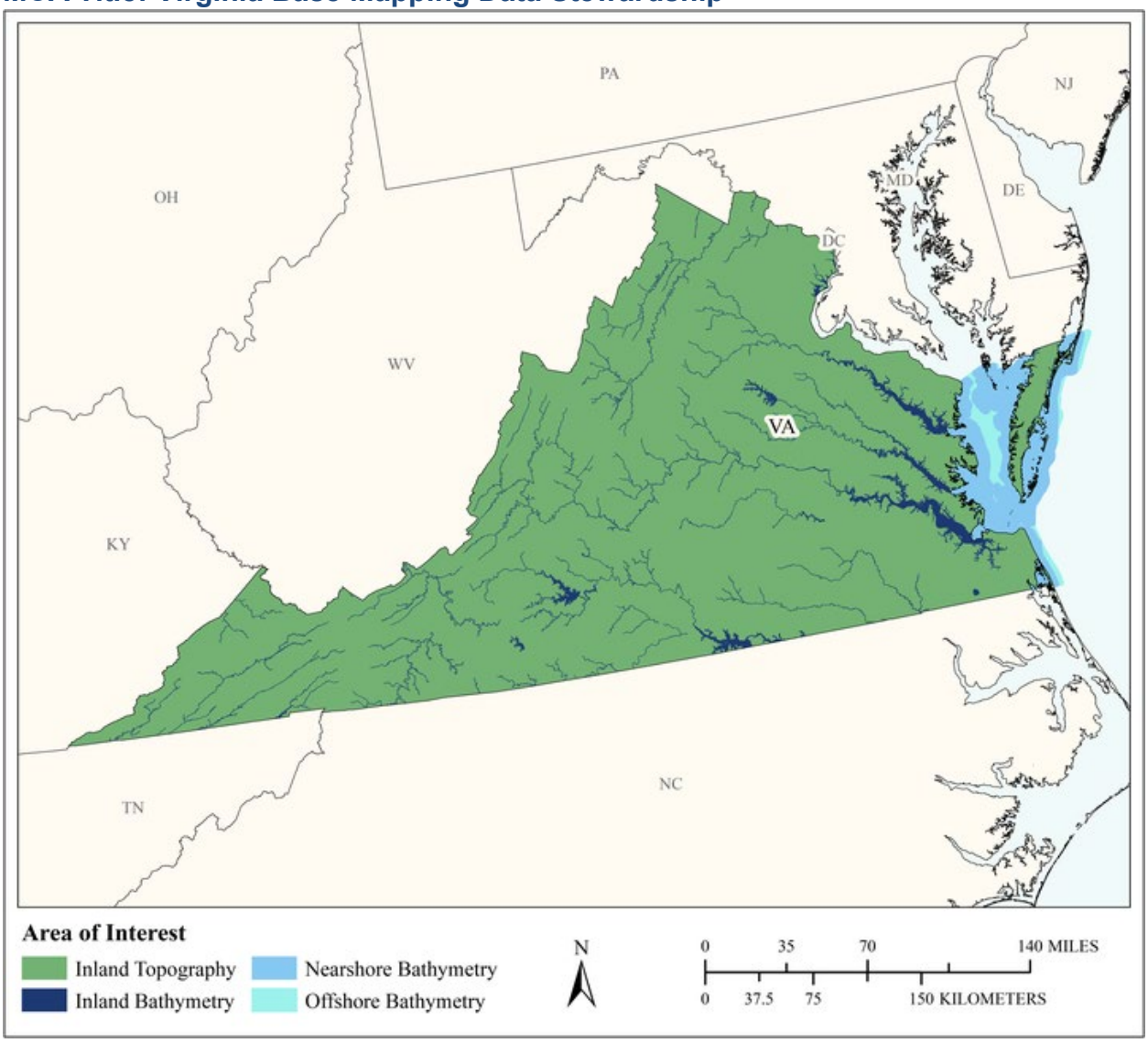
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major	Minor	
Improved customer experience	Moderate	Minor	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	Minor	
Environmental	Moderate	Minor	Minor	
Public safety, including life and property	Moderate	Moderate	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Increased revenues	None			None			Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,814,715		Annual dollars saved/ realized	$611,406		Annual dollars saved/ realized	$40,847			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$5,340,342		Annual dollars saved/ realized	$63,487		Annual dollars saved/ realized	$5,616			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			Minor					
Environmental	Moderate			Moderate			Moderate					
Public safety, including life and property	Major			Moderate			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Virginia Base Mapping Data Stewardship



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Virginia Base Mapping Data Stewardship. Support discoverability and access to GIS data resources for Virginia stakeholders (state and local government, education and community) to publically available statewide Lidar and Bathymetry data available covering the Commonwealth. Virginia stakeholders use the data for many mission critical activities including, Sea level rise analysis, road and rail, military operations, building footprints, elevation/contours, mapping of riverine and coastal areas, emergency management, infrastructure, flood risk and modeling, runoff and sediment analysis, erosion, coastal inundation, forest health analysis, conservation of marine and wildlife habitat, geologic mapping, mining, pipeline routing, cultural preservation, education, recreation planning, and telecommunications. This is not a comprehensive list but does cover many of the important mission critical activities Virginia stakeholders utilize Virginia Lidar and Bathymetry Data to accomplish through the service available on the Virginia GIS Data Clearinghouse.
MCA Title	Virginia Base Mapping Data Stewardship
MCA ID	1386
Organization Type	State or U.S. Territorial government
Organization Name	Virginia Geographic Information Network
Sub-Agency or Division	
Organization Mission	VGIN was established in 1997 in Virginia Code to "foster the creative utilization of geographic information and oversee the development of a catalog of GIS data available in the Commonwealth". Some of the core functions of VGIN are: Develop and recommend policies and guidelines required to support state and local government exchange, acquisition, storage, use, sharing and distribution of geographic or base map data and related technologies Compile a data catalog consisting of descriptions of GIS coverages maintained by individual state and local government agencies Setting priorities for the development of state digital geographic data and base maps that meet the needs of state agencies, institutions of higher education, and local governments Provide services, geographic data products, and access to the repository at rates established by the Division Source: Virginia Code § 2.2-2026 and § 2.2-2027
Program Name	Virginia Base Mapping Program
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Required
Other	Highly desirable
Other description	Shoreline information - tidal coordination

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Road (paved, unpaved) Railroad, railroad signal Road Shoulder (paved, unpaved) Road centerline Road curb Drive (paved, unpaved) Parking (paved, unpaved) Building, building (construction & ruin) Bridge, overpass, tunnel Trail Culvert Deck, patio, porch Concrete slab Pole, post Shed Steps Pool (in-ground) Wall, barrier Retaining wall Culvert Dock, pier Sidewalk (public) Tank, silo Transmission tower, line Sign, sign outline Billboard Airport features Substation Cemetery Transformer Area under construction Utility/power line pole Sport field Golf course Fence Obscured area, unknown object Stock pile Quarry Guardrail Fence, gate Manhole Catch basin, drop inlet Fire hydrant Parking meter Flag pole Water body, river, canal, stream, marsh Ditch Pier, wharf Tree/shrub line, hedge row Single tree/shrub. Submerged vegetation, oyster reefs, marine debris (abandoned crab pots), dredge spoils, channels.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B	QL2B	Cross sections and/or transects meet needs
Update Frequency	4-5 years	4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	Up to 5 meters	The best horizontal accuracy achievable for the vertical accuracy I need

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 50 cm	I don't know
How far onshore needed			To MHW	
How far down the beach profile needed	To MLLW		To MHW	
Tide correction requirement			I don't know	I don't know
Cross sections and/or transects meet needs				Yes
Cross section/transect requirement				Average accuracy

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Required	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required	Required	Highly desirable	Required
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DTM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Nice to have	Highly desirable	Highly desirable	Highly desirable
Classified point cloud	Highly desirable	Highly desirable	Required	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Required	Required	Required
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	Highly desirable

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Underwater videography			Nice to have	Nice to have
Bottom texture			Nice to have	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Highly desirable	Nice to have	Highly desirable	Nice to have
Water column properties - Physical			Highly desirable	Highly desirable
Water column properties - Chemical			Highly desirable	Highly desirable
Water column properties - Biological			Highly desirable	Highly desirable
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Required	Required
Routes			Required	Highly desirable
Offshore cadastral			Highly desirable	Highly desirable
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Required	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Highly desirable	Required	Required	
Bridges/culverts	Highly desirable	Required		
Landmark features	Nice to have	Highly desirable	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Highly desirable	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	2010 Blacksburg (VGIN) - East VA 2011 USGS-NRCS_FEMA 2012 USGS-FEMA 2013 USGS 2014 SANDY-SHEN-MultiHAZ-USGS-NRCS - QL2 2014 - Eastern Shore - QL2 2016 FEMA - QL2 2017 FEMA- NRCS - QL2 2017 VDOT-NRCS-USGS = QL2 2017 Reflown Pulaski-Montogomery-Betetourt FEMA - QL2	Current Bathymetry varies in quality level. Virginia prefers QL2 data.	Unknown	Best available from other entities including: 1. ETOPO1,2 2. GEBCO 3. TORI (Taiwan)
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast		Yes	Yes	Yes
NCEI		Yes	Yes	Yes
Open Topography				
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts		Yes	Yes	Yes

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
USGS Inland Waters server		Yes		
USGS data series		Yes		
Marine Minerals Program GIS			Yes	Yes
State Repositories	Yes	Yes		
State repositories used	VGIN Clearinghouse	VGIN Clearinghouse		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	None	I don't know
Cost savings/cost reduction	Major	Major	None	I don't know
Cost avoidance	Major	Minor	None	I don't know
Increased revenues	None	Minor	None	I don't know
Mission-driven performance improvements	Major	Moderate	None	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	I don't know	I don't know
Improved response or timeliness	Major	Moderate	I don't know	I don't know
Improved customer experience	Major	Moderate	I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major	I don't know	I don't know
Environmental	Moderate	Minor	I don't know	I don't know
Public safety, including life and property	Major	Minor	I don't know	I don't know

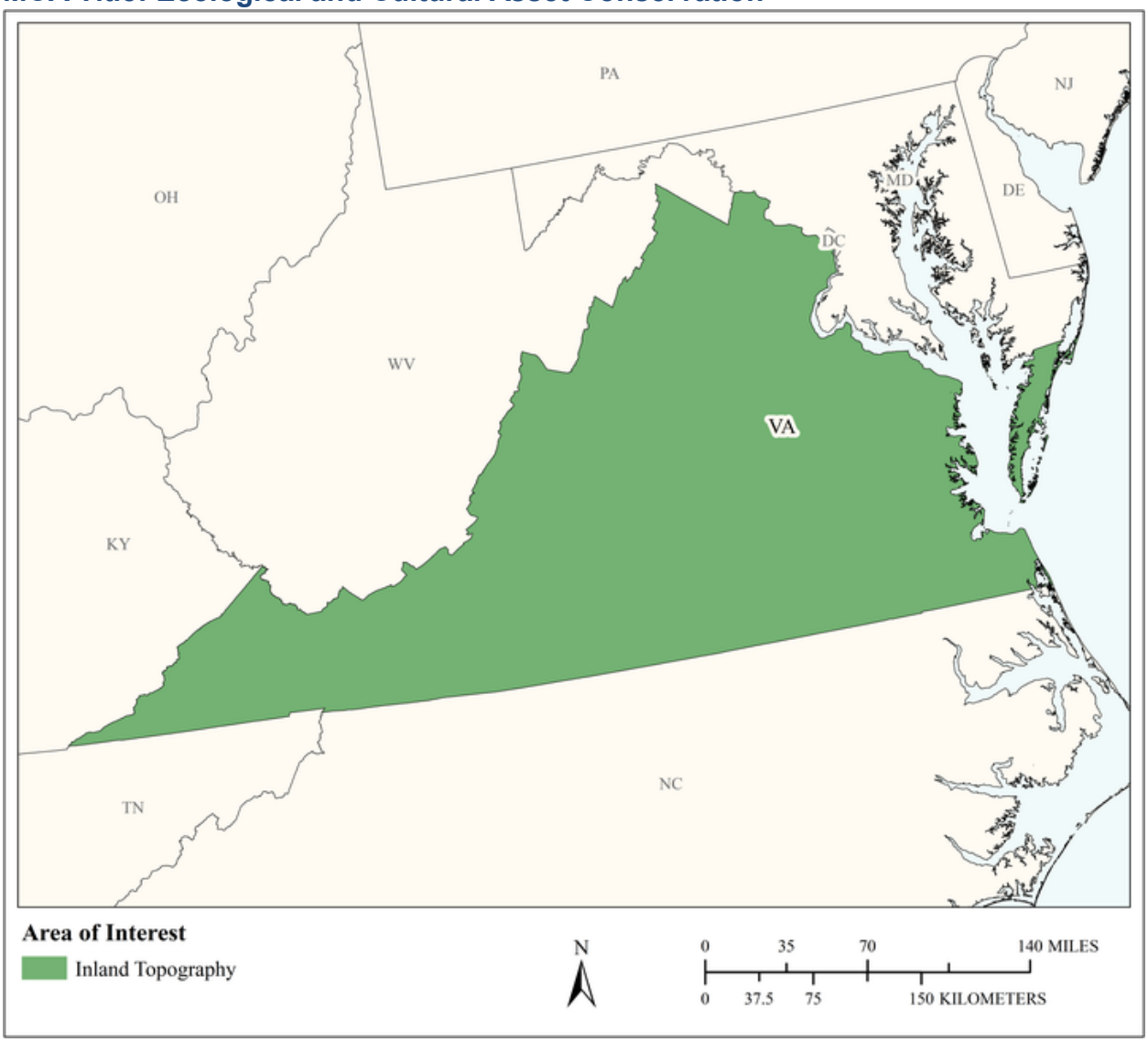
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		None			I don't know	Unable to provide		I don't know	Unable to provide	
Time savings description	VGIN Clearinghouse saves numerous hours as efficient data dissemination mechanism available to Virginia stakeholders. Quality Control and robust pre-acquisition ground control lead to accuracy.											
Cost savings/cost reduction	I don't know	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	None			None			I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues	None			None			I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements description	Statewide Lidar data will allow all stakeholders to utilize accurate and beneficial data source.											
Future annual operational benefits added during validation		Annual dollars saved/ realized	$932,489		Annual dollars saved/ realized	$442,511		Annual dollars saved/ realized	$357,753			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Value added to products or services description	VDEM partner relies on flood hazard mapping during disaster response. Customers value building footprints and hydro but 3D modeling promises to provide great opportunities.											
Improved response or timeliness	Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience description	Accuracy, Consistency, Reliability - confidence in the data source. Increased community involvement and education. Purpose of VGIN Clearinghouse - Better data stewardship.											
Other customer service benefits	Major	Unable to provide										
Other customer service benefits description	Statewide Lidar Coverage. Currently we do not have 100% Lidar coverage of VA - limiting the ability of areas not covered to make data driven decisions.											
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$627,183		Annual dollars saved/ realized	$559,815		Annual dollars saved/ realized	$377,416			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate			I don't know			I don't know		
Education or outreach description	More education on how to integrate Lidar data is needed.											
Environmental	Moderate			Moderate			I don't know			I don't know		
Environmental description	More outreach and making the public aware of how Lidar data benefits the environment is needed											

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Public safety, including life and property	Moderate	Moderate	I don't know	I don't know
Other	Unknown			
Other benefits	I don't know			

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes	Yes	
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Ecological and Cultural Asset Conservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	To assist communities in developing strategies for protecting and conserving their ecological and cultural assets through environmentally-sensitive decisions, lifestyles and planning. Urban tree canopy assessment and stormwater modeling. Assessment of community green infrastructure. Also includes state forestry requirements for which leaf-on data is needed.
MCA Title	Ecological and Cultural Asset Conservation
MCA ID	22040
Organization Type	Academic or Not-for-Profit
Organization Name	Green Infrastructure Center
Sub-Agency or Division	University of Richmond
Organization Mission	To assist communities in developing strategies for protecting and conserving their ecological and cultural assets through environmentally-sensitive decisions, lifestyles and planning.
Program Name	Community Assistance & Planning Projects
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 22 - Infrastructure and Construction Management
Tertiary Business Use	BU 15 - Flood Risk Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Small trees (>= 2m high and wide)

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm			
Acceptable Vertical Error	Up to 20 cm			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Nice to have					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Highly desirable			
Landmark features	Not required			
Cultural resources	Not required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL1 & QL2 (2008-2016), QL1 & QL2 point clouds and hydro-flattened DEMS (2014-2017), some with vegetation and buildings classified			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes			
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Virginia - VGIN North Carolina (NC Spatial Data Download),			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Cost savings/cost reduction	Major			
Cost avoidance	None			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Moderate			

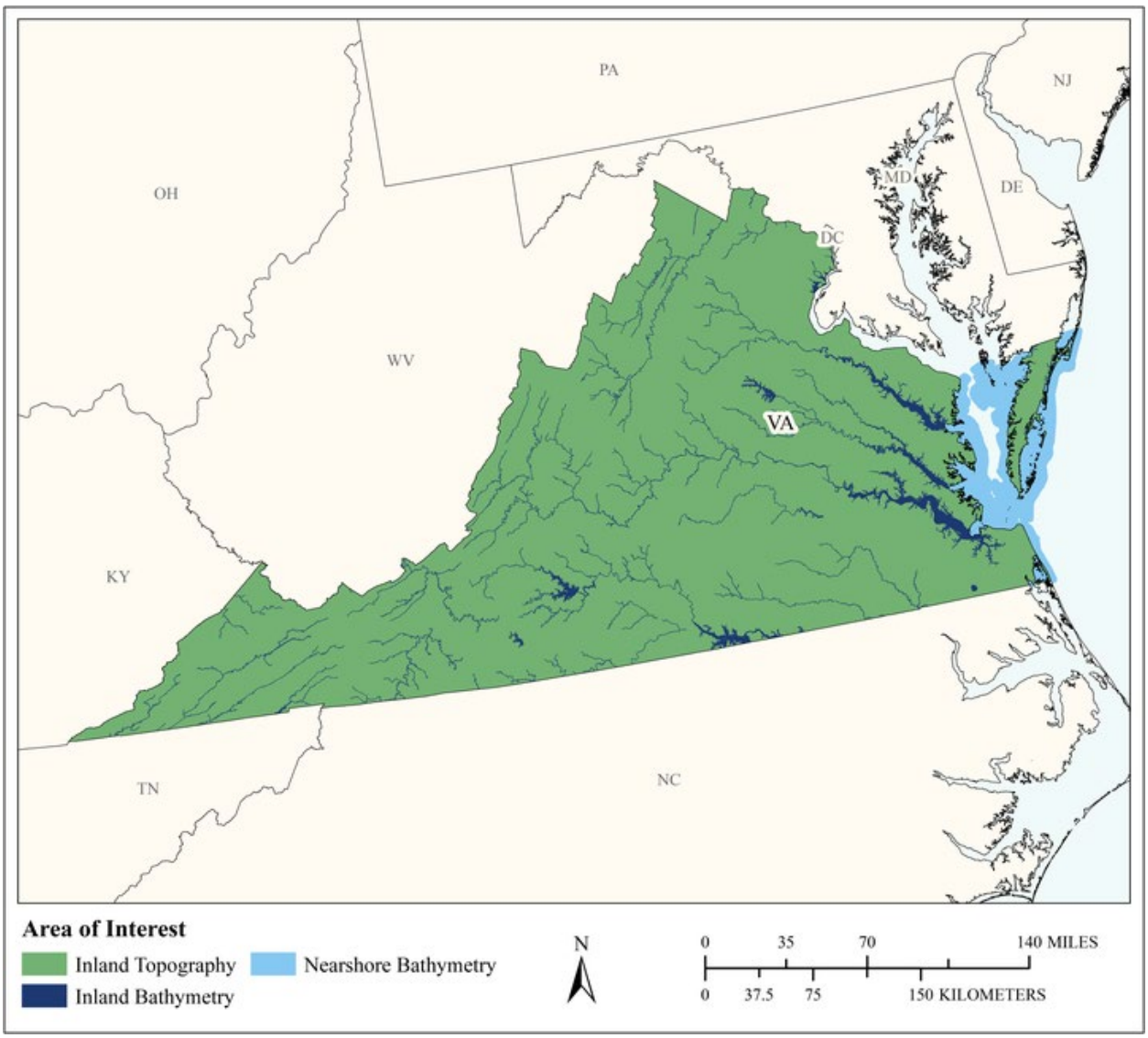
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$50,652									
Time savings description	Reduced manual correction of land cover and tree canopy products. Reduced analysis time. Reduced data preparation time.											
Cost savings/cost reduction	Major	Unable to provide										
Cost savings/cost reduction description	Would not be able to afford data collections.											
Cost avoidance	Major	Annual dollars saved/realized	$100,800									
Cost avoidance description	Less time spent on manual corrections, labor savings. Reduced flooding and storm damage,. Quicker and better classifications.											
Increased revenues	None											
Mission-driven performance improvements	Major	Annual percent improvement	58%									
Future annual operational benefits added during validation		Annual dollars saved/ realized	$782,078									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Value added to products or services description	Urban tree canopy assessments and maps,.											
Improved response or timeliness	Moderate	Unable to provide										
Improved response or timeliness description	Improved flood risk assessments,. Easier assessment of tree canopy damages after disasters,. More frequent urban tree canopy assessments,.											
Improved customer experience	Major	Unable to provide										
Improved customer experience description	Better accuracy and visualizations.											
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$627,183									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Education or outreach description	Better public understanding of green infrastructure value, Greater public knowledge of the roles and functions of green infrastructure											
Environmental	Major											
Environmental description	Expanded and improved green infrastructure in partner communities, Improved and enhanced community green infrastructure											
Public safety, including life and property	Moderate											

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Public safety, including life and property description	Recued flood risk, healthier safer communities arising from improved green infrastructure			

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Health and Human Services



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Health emergency response. Habitat modeling and disease prevention. Defining boundaries for health advisories for swimming and fishing. Marine-based bioproducts and pharmaceuticals. Public health and safety. Prevention of waterborne diseases.
MCA Title	Health and Human Services
MCA ID	60506
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Virginia
Sub-Agency or Division	Virginia Department of Health Environmental Division and Division of Shellfish Safety
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 24 - Health and Human Services
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	I don't know
Rivers and Streams	
Less than 10 ft	I don't know
10 - 50 ft	I don't know
51 - 100 ft	I don't know
101 - 500 ft	I don't know
501 - 2,500 ft	I don't know
Greater than 2,500 ft	I don't know
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	I don't know
½ - 1 acre	I don't know
1.1 – 2 acres	I don't know
2.1 – 5 acres	I don't know
5.1 – 10 acres	I don't know

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	I don't know

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	I don't know	I don't know	
Update Frequency	6-10 years	I don't know	I don't know	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	I don't know	I don't know	
Acceptable Vertical Error	Up to 20 cm	I don't know	I don't know	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					I don't know	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	I don't know	I don't know		I don't know	I don't know
Entire AOI under same environmental conditions	Not required	I don't know	I don't know		I don't know	I don't know
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	I don't know	I don't know		I don't know	I don't know
DEM for entire AOI needs to be seamless	Highly desirable	I don't know	I don't know		I don't know	I don't know
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	I don't know	I don't know	
DTM	Required	I don't know	I don't know	
DEM	Highly desirable	I don't know	I don't know	
Raw point cloud data	Highly desirable	I don't know	I don't know	
Classified point cloud	Highly desirable	I don't know	I don't know	
Edited/cube XYZ		I don't know	I don't know	
Full waveform	Highly desirable	I don't know	I don't know	
Bathymetric Attributed Grid (BAG)		I don't know	I don't know	
Breaklines required for standard hydro-flattening	Not required	I don't know		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			I don't know	
Tide Predictions			I don't know	
Tidal Constituent And Residual Interpolation (TCARI)			I don't know	
Intensity imagery/sidescan imagery	Nice to have	I don't know	I don't know	
Ground control/ground truthing	Nice to have	I don't know	I don't know	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			I don't know	
Nautical and/or navigation charts			I don't know	
Acoustic imagery of the seafloor			I don't know	
Aerial and/or satellite imagery	Highly desirable	I don't know	I don't know	
Underwater videography			I don't know	
Bottom texture			I don't know	
Bottom type			I don't know	
Submerged features			I don't know	
Subbottom characteristics			I don't know	
Geologic and seismic data	Nice to have	I don't know	I don't know	
Water column properties - Physical			I don't know	
Water column properties - Chemical			I don't know	
Water column properties - Biological			I don't know	
Currents			I don't know	
Tide/wave heights			I don't know	
Sea ice conditions			I don't know	
Habitat distribution and classification			I don't know	
Boundaries			I don't know	
Routes			I don't know	
Offshore cadastral			I don't know	
Lease areas			I don't know	
Fixed obstructions			I don't know	
Floating observation/navigation systems			I don't know	
Shorelines – current, historic, change rates	Not required	I don't know	I don't know	
Land use/land cover	Nice to have	I don't know	I don't know	
Wetlands	Not required	I don't know	I don't know	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			I don't know	
Inland surface water features	Not required	I don't know	I don't know	
Bridges/culverts	Nice to have	I don't know		
Landmark features	Nice to have	I don't know	I don't know	
Cultural resources	Nice to have	I don't know	I don't know	
Coastal and riverine structures	Not required	I don't know	I don't know	
Overhead structures			I don't know	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	I don't know	I don't know	
Cost savings/cost reduction	Major	I don't know	I don't know	
Cost avoidance	Major	I don't know	I don't know	
Increased revenues	None	I don't know	I don't know	
Mission-driven performance improvements	Major	I don't know	I don't know	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	I don't know	I don't know	

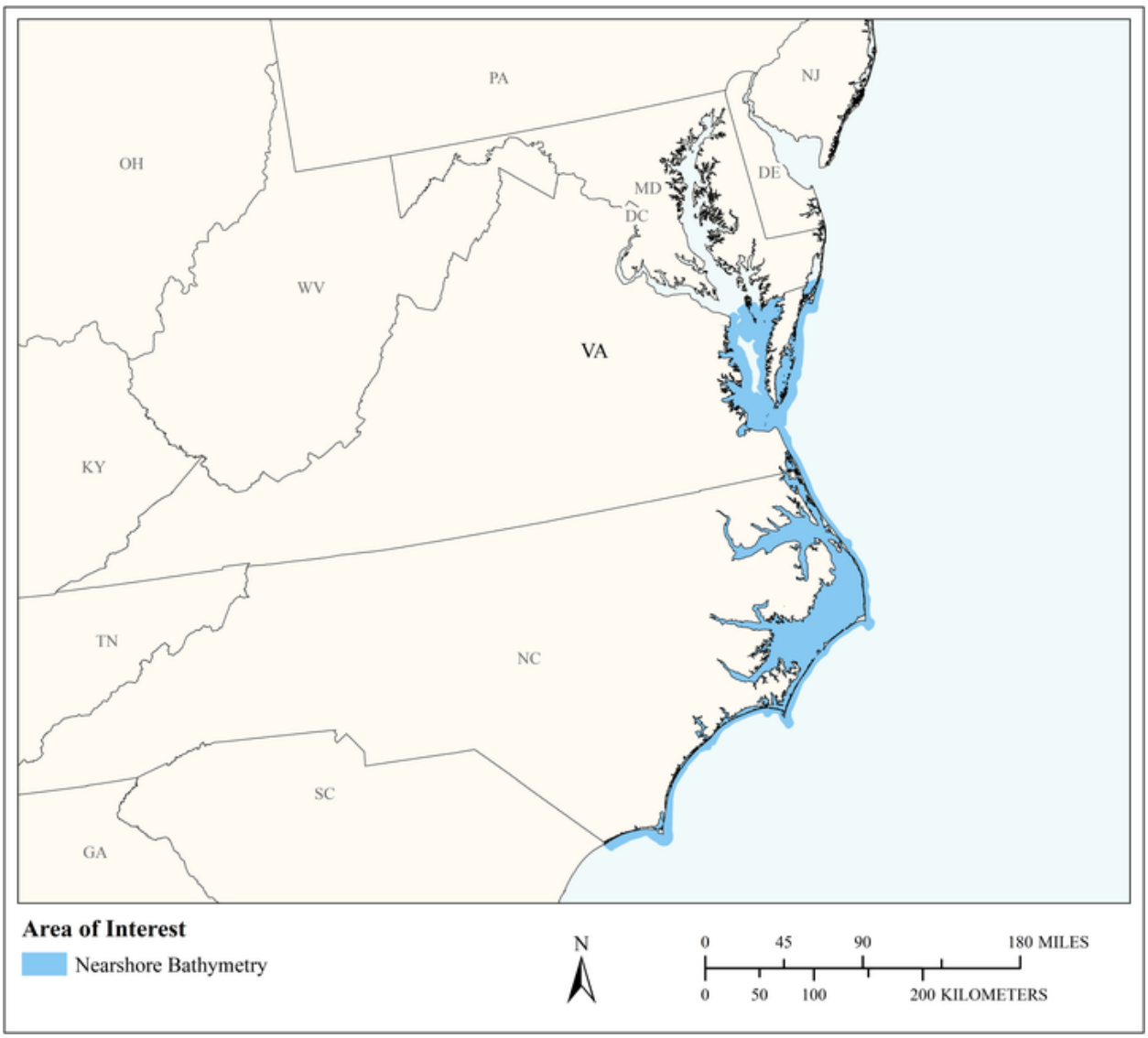
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor	I don't know	I don't know	
Improved customer experience	Minor	I don't know	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	I don't know	I don't know	
Environmental	Moderate	I don't know	I don't know	
Public safety, including life and property	Major	I don't know	I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost savings/cost reduction	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Increased revenues	None			I don't know	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$14,408									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness	Minor	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved customer experience	Minor	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			I don't know			I don't know					
Environmental	Moderate			I don't know			I don't know					
Public safety, including life and property	Major			I don't know			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Risk Assessment for Coastal Hazards



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type			Required	
Geographic Area Requirements			Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Risk assessment for coastal hazards (storm surge, tidal inundation, rainfall and hydrologic runoff, and risk assessments.)
MCA Title	Risk Assessment for Coastal Hazards
MCA ID	1199
Organization Type	Academic or Not-for-Profit
Organization Name	Old Dominion University, VA
Sub-Agency or Division	
Organization Mission	Research and education Research focus of my department vis-à-vis 3DN is GIS, remote sensing, and coastal-marine hazards and environmental resources Education focuses on GIS, terrain analysis, LiDAR and hazards and environmental applications
Program Name	Old Dominion University, VA
Total Annual Program Budget	
Primary Business Use	BU 26 - Education K12 and Beyond, Basic Research
Secondary Business Use	BU 03 - Coastal Zone Management
Tertiary Business Use	BU 16 - Sea Level Rise and Subsidence

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Coastal engineering structures, e.g., sea walls, revetments, groins or jetties

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order			QL2B	
Update Frequency			4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error			Up to 2 meters	
Acceptable Vertical Error			Up to 30 cm	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed			To MLLW	
Tide correction requirement			No requirement for tide correction	
Cross sections and/or transects meet needs			Partial	
Cross section/transect requirement			Transect data are acceptable except for channels of navigable waterways	

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season			Highly desirable			
Entire AOI under same environmental conditions			Highly desirable			
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless			Highly desirable			
DEM for entire AOI needs to be seamless			Required			
Amount of acceptable vertical manipulation to achieve spatial seamlessness			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM			Nice to have	
DTM			Highly desirable	
DEM			Required	
Raw point cloud data			Required	
Classified point cloud			Highly desirable	
Edited/cube XYZ			Nice to have	
Full waveform			Nice to have	
Bathymetric Attributed Grid (BAG)			Nice to have	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening				
Additional breaklines for hydro-enforcement of culverts				
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery			Not required	
Ground control/ground truthing			Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery			Required	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data			Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Required	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates			Required	
Land use/land cover			Highly desirable	
Wetlands			Required	
Estuaries			Required	
Inland surface water features			Required	
Bridges/culverts				
Landmark features			Highly desirable	
Cultural resources			Highly desirable	
Coastal and riverine structures			Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used			Very coarse gridded data from VIMS, multibeam and single beam echosounding data from NOAA NCEI/NGDC interpolated to bathymetric grids; beginning to create our own digital bathymetry from Hydrone ASV using an ecohsounder (for shallow, enclosed lagoons and rivers)	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	
NCEI			Yes	
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				

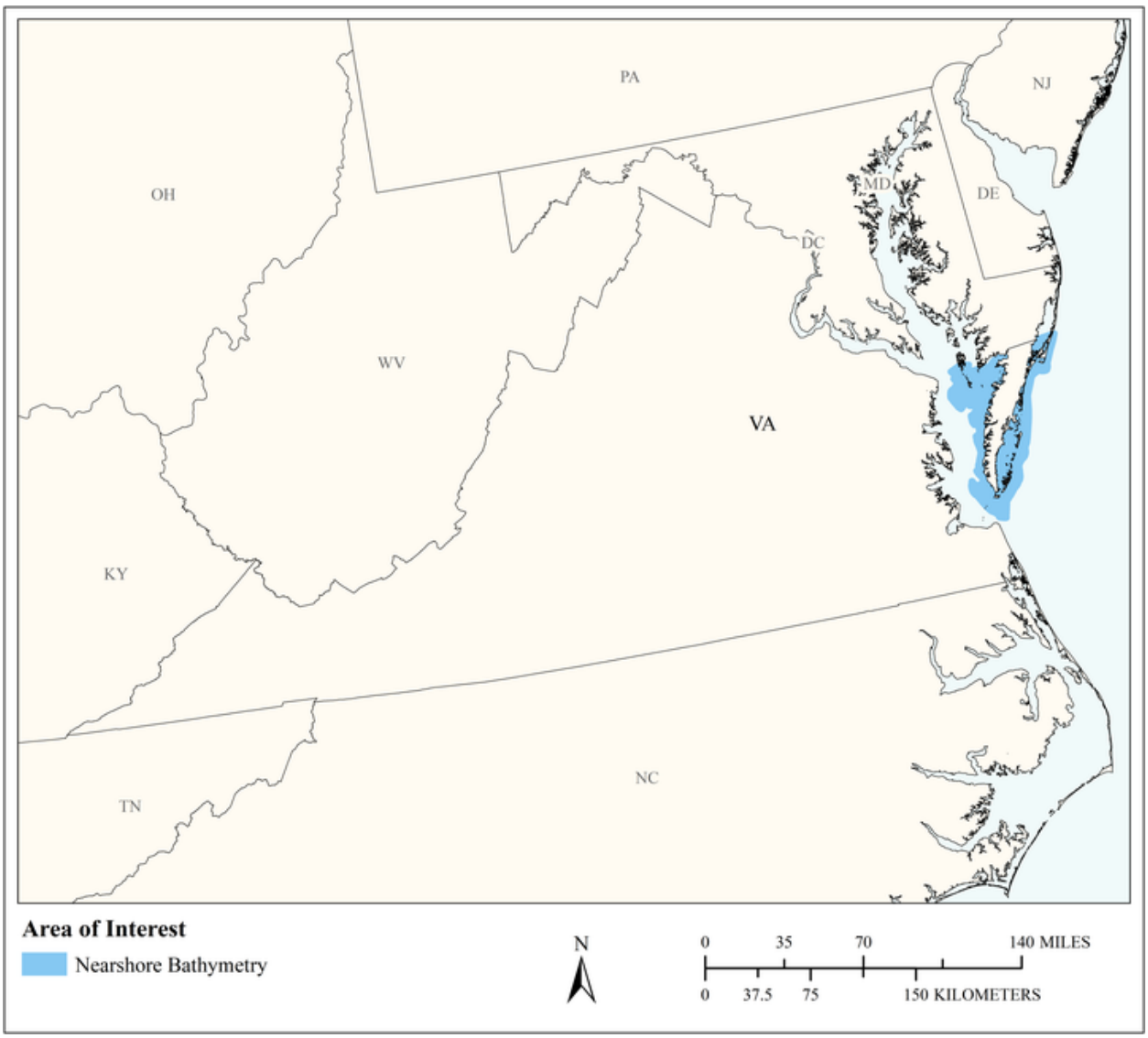
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
USGS data series				
Marine Minerals Program GIS				
State Repositories			Yes	
State repositories used			Virginia Institute for Marine Science (VIMS)	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings			Major	
Cost savings/cost reduction			Moderate	
Cost avoidance			Major	
Increased revenues			None	
Mission-driven performance improvements			Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services			Moderate	
Improved response or timeliness			None	
Improved customer experience			Moderate	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach			Major	
Environmental			Minor	
Public safety, including life and property			None	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings							Major	Annual dollars saved/realized	$9,045			
Cost savings/cost reduction							I don't know	Unable to provide				
Cost avoidance							I don't know	Unable to provide				
Increased revenues							I don't know	Unable to provide				
Mission-driven performance improvements							Moderate	Annual percent improvement	18%			
Other operational benefits							Major	Unable to provide				
Other operational benefits description							Improved modeling and habitat mapping.					
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services							Moderate	Unable to provide				
Value added to products or services description							Improved modeling capability to estimate benthic habitat changes.					
Improved response or timeliness							Moderate	Unable to provide				
Improved response or timeliness description							Data could reduce uncertainty in bathymetric change, landforms, and habitats from storms and sea level rise.					
Improved customer experience							Moderate	Annual dollars saved/realized	$302			
Improved customer experience description							Improved confidence in wave modeling, erosion, and habitat suitability.					
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach							Moderate					
Education or outreach description							Availability would improve GIS and environmental analysis instruction					
Environmental							Minor					
Public safety, including life and property							Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	
Contours			Yes	
Hillshades			Yes	
Slope maps			Yes	
Aspect maps			Yes	
Curvature maps			Yes	
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness			Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Coastal Research



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type			Required	
Geographic Area Requirements			Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements			Accomack and Northampton Counties, VA	

MCA Description	Response
Mission Critical Activity	Coastal research. In coastal systems where a change of only 10 cm in vertical relief can lead to biome level differences in vegetation (e.g., from salt marsh to shrub land, or tidal flat to marsh) topographic and bathymetric data are a key component that need to be integrated into our analyses and models. Without that baseline data it is impossible to develop a predictive understanding of the environmental systems.
MCA Title	Coastal Research
MCA ID	21631
Organization Type	Academic or Not-for-Profit
Organization Name	UVA Environmental Sciences
Sub-Agency or Division	
Organization Mission	Advancing understanding of the environment through interdisciplinary scientific research and education.
Program Name	Virginia Coast Reserve Long-Term Ecological Research project
Total Annual Program Budget	
Primary Business Use	BU 26 - Education K12 and Beyond, Basic Research
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Small tidal creeks and vegetation features (shrubs, trees)

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order			QL0B	
Update Frequency			4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error			Up to 2 meters	
Acceptable Vertical Error			Less than 10 cm	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed			To cover the beach slope	
How far down the beach profile needed			Below MLLW	
Tide correction requirement			MSL	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season			Highly desirable			
Entire AOI under same environmental conditions			Nice to have			
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless			Highly desirable			
DEM for entire AOI needs to be seamless			Required			
Amount of acceptable vertical manipulation to achieve spatial seamlessness			Up to double the required TVU at the 95% confidence level			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM			Highly desirable	
DTM			Highly desirable	
DEM			Required	
Raw point cloud data			Highly desirable	
Classified point cloud			Highly desirable	
Edited/cube XYZ			Nice to have	
Full waveform			Nice to have	
Bathymetric Attributed Grid (BAG)			Highly desirable	
Breaklines required for standard hydro-flattening				
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery			Highly desirable	
Ground control/ground truthing			Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery			Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data			Nice to have	
Water column properties - Physical			Highly desirable	
Water column properties - Chemical			Highly desirable	
Water column properties - Biological			Highly desirable	
Currents			Highly desirable	
Tide/wave heights			Nice to have	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Nice to have	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates			Required	
Land use/land cover			Required	
Wetlands			Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features			Nice to have	
Bridges/culverts				
Landmark features			Nice to have	
Cultural resources			Nice to have	
Coastal and riverine structures			Nice to have	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used			Bathymetry data is highly variable for the shallow bays of the Delmarva Peninsula. We have conducted bathymetric surveys from boats with digital depth sounders coupled to GPS for several of the bays that have uneven horizontal spacings varying from ~1 m to > 100 m.	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				

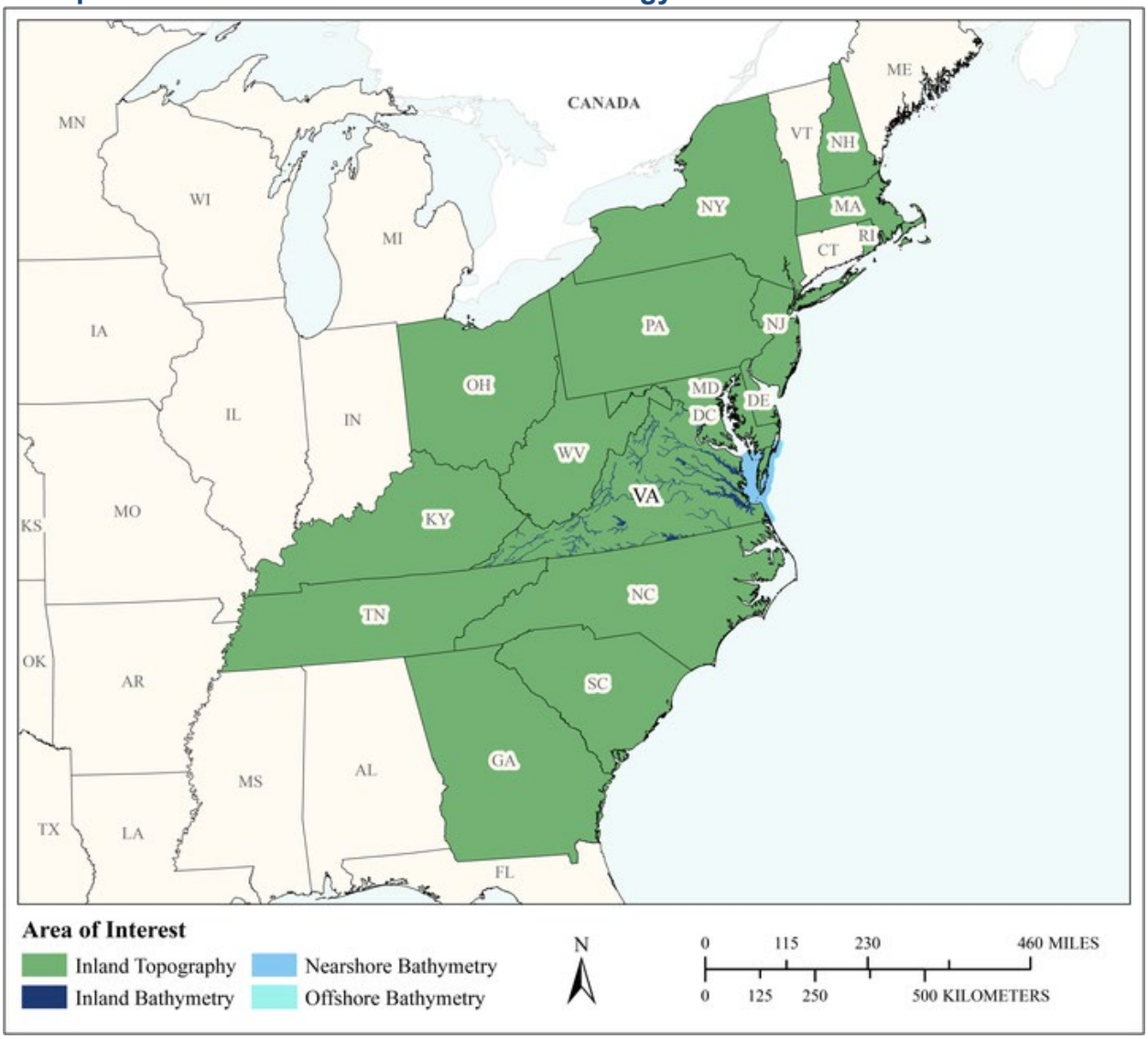
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other			Yes	
Other description			Locally generated	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings			Minor	
Cost savings/cost reduction			None	
Cost avoidance			None	
Increased revenues			None	
Mission-driven performance improvements			Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services			Major	
Improved response or timeliness			Minor	
Improved customer experience			I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach			Major	
Environmental			Major	
Public safety, including life and property			Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings							Major	Annual dollars saved/realized	$12,060			
Time savings description							Obtaining adequate data to drive our models is a constant concern. Field surveys are difficult and time-consuming.					
Cost savings/cost reduction							Major	Annual dollars saved/realized	$20,000			
Cost savings/cost reduction description							Personnel and boat time, plus improved efficiency in analysis.					
Cost avoidance							Major	Annual dollars saved/realized	$5,000			
Cost avoidance description							Having experts in 3D processing create the data products is critical. We usually work only with products that have had basic processing completed.					
Increased revenues							Moderate	Unable to provide				
Mission-driven performance improvements							Major	Unable to provide				
Other operational benefits							Major	Unable to provide				
Other operational benefits description							Improved scientific research.					
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services							I don't know	Unable to provide				
Improved response or timeliness							Major	Unable to provide				
Improved customer experience							Major	Annual dollars saved/realized	$603			
Other customer service benefits							Major	Unable to provide				
Other customer service benefits description							More consistent scientific results.					
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach							Major					
Education or outreach description							Bathymetric data helps "set the frame" for so many coastal processes					
Environmental							Major					
Environmental description							Environmental management must be based on scientific understanding to be fully successful					
Public safety, including life and property							Minor					
Other							Basic scientific research					
Other benefits							Major					
Other description							Bathymetric data helps "set the frame" for the coastal processes we are studying					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	
Contours			Yes	
Hillshades			Yes	
Slope maps			Yes	
Aspect maps				
Curvature maps				
Cross sections			Yes	
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids			Yes	
Hydrologic Flow Accumulation Grids			Yes	
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)			Yes	
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Interdisciplinary Research to Develop Advanced Applications of Geospatial Information Science and Technology for Societal Benefit



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Interdisciplinary research to develop advanced applications of geospatial information science and technology for societal benefit
MCA Title	Interdisciplinary Research to Develop Advanced Applications of Geospatial Information Science and Technology for Societal Benefit
MCA ID	21659
Organization Type	Academic or Not-for-Profit
Organization Name	Virginia Tech Center for Geospatial Information Technology
Sub-Agency or Division	
Organization Mission	CGIT is an interdisciplinary center engaging with citizens, academia, government, and the private sector to research and develop advanced applications of geospatial information science and technology.
Program Name	Geospatial Informatics and Visualization
Total Annual Program Budget	
Primary Business Use	BU 26 - Education K12 and Beyond, Basic Research
Secondary Business Use	BU 23 - Urban and Regional Planning
Tertiary Business Use	BU 08 - Agriculture and Precision Farming

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Stream bank studies requiring surface roughness estimates, so small pebbles are typically accepted as the sweet spot. This is a fractal scaling problem, so more detail results the better our models. Precision agriculture projects benefit from sub-leaf (1-5cm) scale for phenological and morphological modeling and simulation. Most of our applications require 1-2 ft post spacing from lidar for sufficient feature extraction.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required

Inland Bathy Feature Size Requirements	Response
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B	QL3B	Order 1b
Update Frequency	2-3 years	2-3 years	Annually	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	Up to 2 meters	Up to 1 meter	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm	Up to 20 cm	Up to 20 cm	Up to 5 meters
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed	To MLLW		To MLLW	
Tide correction requirement			MSL	No requirement for tide correction
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Nice to have	Not required	Required	Nice to have
Entire AOI under same environmental conditions	Required	Nice to have	Nice to have	Not required	Highly desirable	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Nice to have	Nice to have	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Nice to have	Nice to have	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Up to double the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	Nice to have
DTM	Required	Highly desirable	Highly desirable	Nice to have
DEM	Nice to have	Required	Required	Required
Raw point cloud data	Required	Required	Highly desirable	Highly desirable
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Not required	Nice to have
Full waveform	Highly desirable	Nice to have	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	Highly desirable

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Required	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Highly desirable
Intensity imagery/sidescan imagery	Required	Nice to have	Not required	Nice to have
Ground control/ground truthing	Highly desirable	Required	Required	Required
Other	Highly desirable			
Other description	Angular information for each point for advanced processing of lidar			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Nice to have
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Nice to have	Highly desirable	Not required
Underwater videography			Nice to have	Not required
Bottom texture			Highly desirable	Nice to have
Bottom type			Highly desirable	Nice to have
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Highly desirable	Nice to have
Water column properties - Physical			Highly desirable	Nice to have
Water column properties - Chemical			Highly desirable	Nice to have
Water column properties - Biological			Highly desirable	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Nice to have	Not required
Habitat distribution and classification			Highly desirable	Nice to have
Boundaries			Required	Highly desirable
Routes			Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Offshore cadastral			Highly desirable	Nice to have
Lease areas			Required	Highly desirable
Fixed obstructions			Required	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Required	Nice to have	Highly desirable	Nice to have
Wetlands	Highly desirable	Nice to have	Highly desirable	Nice to have
Estuaries			Highly desirable	Nice to have
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Highly desirable	Required		
Landmark features	Required	Highly desirable	Highly desirable	
Cultural resources	Required	Highly desirable	Highly desirable	
Coastal and riverine structures	Required	Required	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Lidar data from state collections and USGS data; NOAA coastal service center data; UAS based lidar (yellowscan); Photogrammetrically derived DSM and DTMs from orthophotos (Virginia VGIN or USDA NAIP, or commercial satellite. We have also used InSAR from GeoSAR and Radarsat-2	Few sources are available; sonar from research projects; USGS data; NCEI	NCEI, NOAA, Digital Coast	Digital coast, NCEI
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	Yes

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
NCEI		Yes	Yes	Yes
Open Topography				
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts				
USGS Inland Waters server		Yes		
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Virginia Geographic Information Network geospatial data repository.			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Minor	None
Cost savings/cost reduction	Major	Minor	None	None
Cost avoidance	Major	None	None	None
Increased revenues	Major	None	None	None
Mission-driven performance improvements	Major	None	None	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	None	Minor
Improved response or timeliness	Major	None	None	None
Improved customer experience	Major	None	None	None
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	None	Minor	Minor
Environmental	Moderate	Minor	Minor	Minor
Public safety, including life and property	Moderate	Minor	Minor	Minor

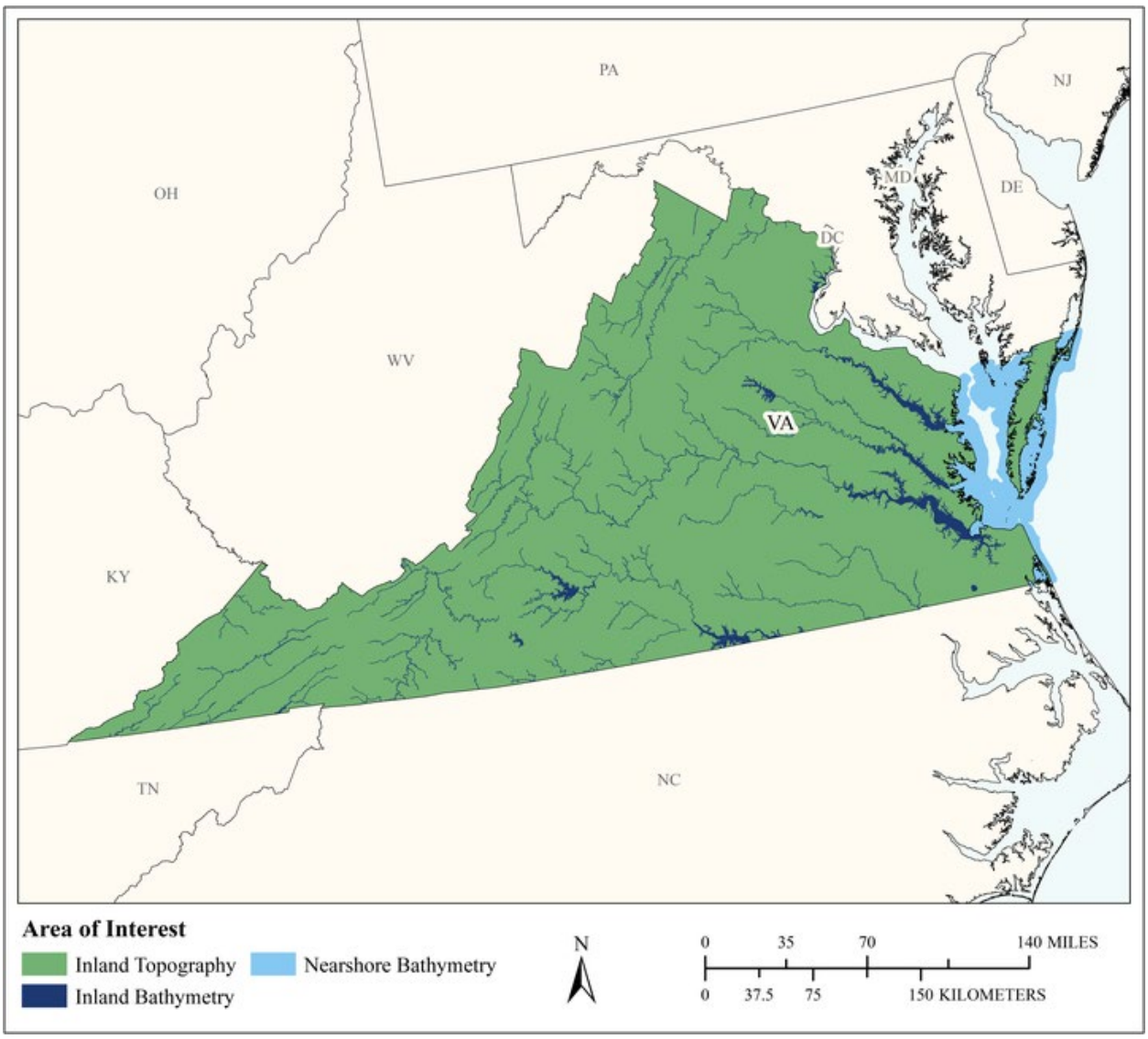
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$331,650	Major	Annual dollars saved/realized	$4,522	Major	Annual dollars saved/realized	$3,015	Minor	Annual dollars saved/realized	$1,206
Time savings description	Confidence in data would allow streamlined planning in office. Hazard mitigation plan updates where lidar is available allow us to automate the processing of DEM for flood modeling, landslide hazards, etc. Site assessment applications for ag, telecom, renewable energy facility siting, hazard mitigation. Enable fusion of multi-source data for next generation applications. Higher quality would allow more time on products instead of QAQC and searching for bad data coverage and errors. Precision agriculture applications save countless field visits and enable new applications at unprecedented scales.			Modeling for stream bank erosion, hazard, transportation. A statewide inland bathy dataset would fill gaps for many clients and projects. Renewable energy facility siting benefits. Searches and planning is brief or we do not conduct projects since data availability is so limited. Consistent spatial data infrastructure benefits.			Spatial data infrastructure for mod-sim.					
Cost savings/cost reduction	Major	Annual dollars saved/realized	$250,000	Moderate	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction description	This would be enormous for Integrated Pest Management and Precision Ag applications. Staff and time to produce data would be saved.											
Cost avoidance	Major	Annual dollars saved/realized	$50,000	Moderate	Unable to provide		Moderate	Unable to provide		None		
Cost avoidance description	One person year dedicated to these tasks would be saved.											
Increased revenues	Major	Annual dollars saved/realized	$10,000,000	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Increased revenues description	Translation of research applications to commercial applications.											
Mission-driven performance improvements	Major	Annual percent improvement	75%	Major	Annual percent improvement	25%	Moderate	Annual percent improvement	15%	Minor	Annual percent improvement	12%
Mission-driven performance improvements description	Some clients cannot meet needs with current data. Major impacts in telecom, ag, forestry, hazard modeling/mitigation. Ability to leverage our advantage in advanced spatial data infrastructure and applications.			This would fill a portion of gaps in our research and applied missions.								
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$25,000,000	I don't know	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Value added to products or services description	Flood mapping to replace expensive and time consuming field surveys; most communities can't afford this currently, and high fidelity data would be highly automated to produce value for local and state governments. We are making due with current generation, but it is not convincing to most clients.											
Improved response or timeliness	Major	Annual dollars saved/realized	$60,300	Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Improved response or timeliness description	Semi-automation of EIS and visual simulation alone would save thousands of hours. Campus wide emergency planning and facility planning would greatly benefit.											
Improved customer experience	Major	Annual dollars saved/realized	$301,500	Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved customer experience description	Faculty and students, as well as research clients would benefit from access to this data, instead of using sub-standard data after lengthy searching of many sources.			
Societal Benefits	**Benefits**	**Benefits**	**Benefits**	**Benefits**
Education or outreach	Major	Major	Major	Minor
Education or outreach description	Ability to have data at the human scale activities on a higher temporal frequency would provide major benefits for students and the public, as well as commercial customers		Improved education and outreach for students and public	
Environmental	Major	Major	Moderate	Minor
Environmental description	Improved planning and resource management			
Public safety, including life and property	Major	Moderate	Minor	Minor
Public safety, including life and property description	Better base maps for future of NG911 and interfaces, evacuation zones, situational awareness			

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Recreation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Planning and development of recreational facilities such as rafting, boating, swimming, diving, and fishing areas; ski slopes; and golf courses. Location- based products and services such as maps and guides. Tourism. Trail and vista site planning. Orienteering.
MCA Title	Recreation
MCA ID	60507
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Virginia
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 27 - Recreation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required	Highly desirable		Not required	Not required
Entire AOI under same environmental conditions	Required	Not required	Highly desirable		Not required	Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Nice to have		Nice to have	Not required
DEM for entire AOI needs to be seamless	Required	Nice to have	Nice to have		Nice to have	Not required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	
DTM	Nice to have	Highly desirable	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Nice to have	Not required	
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Nice to have	
Full waveform	Not required	Nice to have	Not required	
Bathymetric Attributed Grid (BAG)		Highly desirable	Nice to have	
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Not required	Nice to have	Not required	
Ground control/ground truthing	Nice to have	Nice to have	Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required	Required	Not required	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Not required	Highly desirable	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Not required	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Not required	Highly desirable	Highly desirable	
Land use/land cover	Nice to have	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Not required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Minor	
Cost savings/cost reduction	Moderate	Minor	Minor	
Cost avoidance	Major	Minor	Minor	
Increased revenues	None	Minor	Minor	
Mission-driven performance improvements	Major	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor	Minor	

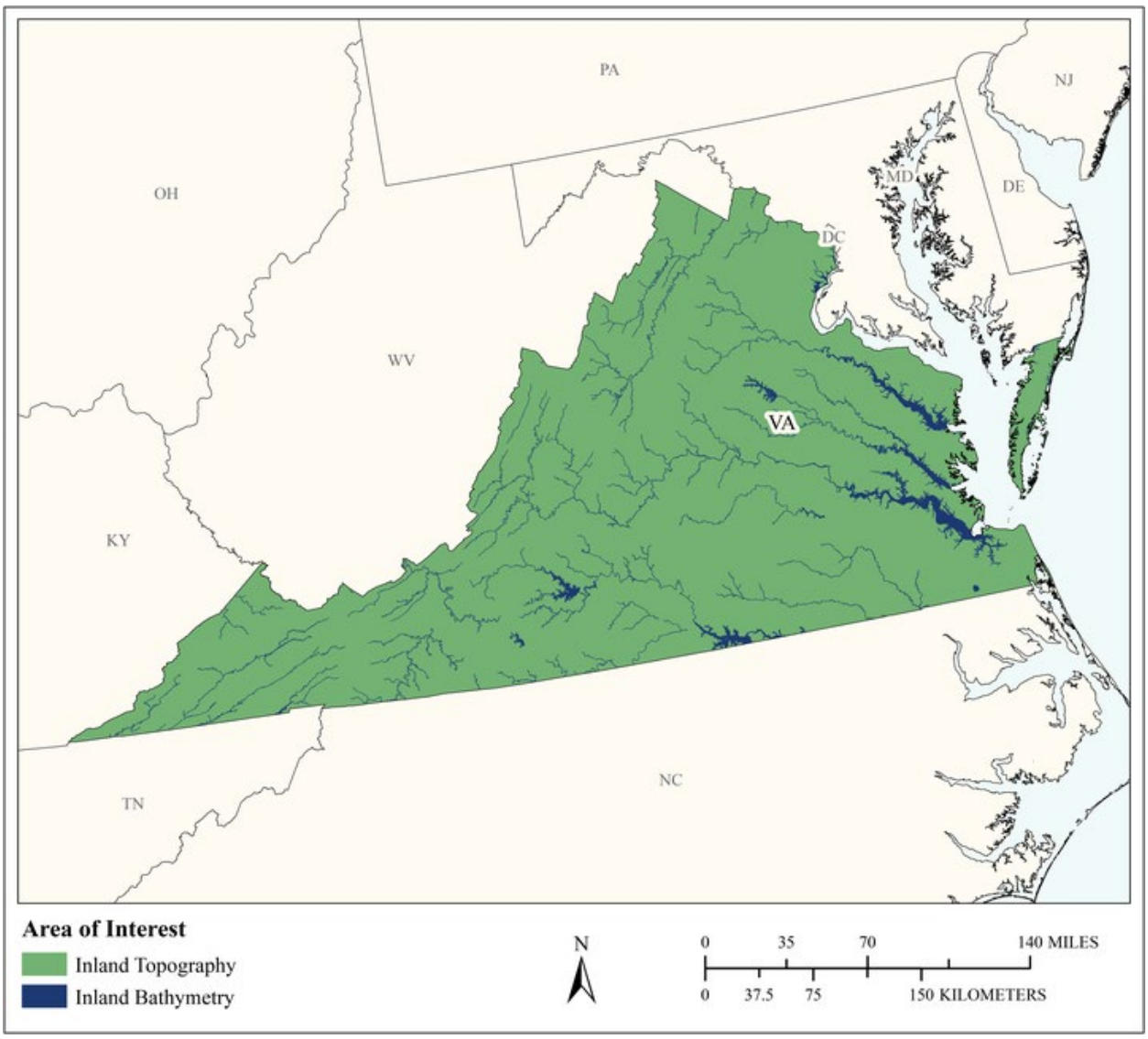
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Minor	Minor	
Improved customer experience	Moderate	Minor	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	
Environmental	Major	Minor	Minor	
Public safety, including life and property	Major	Minor	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	None			Moderate	Unable to provide		Moderate	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$9,265		Annual dollars saved/ realized	$5,580		Annual dollars saved/ realized	$252,968			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Major					
Environmental	Moderate			Major			Major					
Public safety, including life and property	Moderate			Moderate			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes		
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Telecommunications



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Telecommunication tower site selection. Design of radio and radar systems. Interference analysis. Path profiles. Undersea telecommunication route selection and deployment.
MCA Title	Telecommunications
MCA ID	60508
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Virginia
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 28 - Telecommunications
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Not required			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Nice to have	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have		
DTM	Highly desirable	Nice to have		
DEM	Highly desirable	Nice to have		
Raw point cloud data	Highly desirable	Nice to have		
Classified point cloud	Required	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Highly desirable	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Not required		
Ground control/ground truthing	Highly desirable	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Highly desirable		
Bridges/culverts	Required	Highly desirable		
Landmark features	Required	Highly desirable		
Cultural resources	Required	Highly desirable		
Coastal and riverine structures	Required	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI		Yes		
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Major		
Increased revenues	None	None		
Mission-driven performance improvements	Major	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		

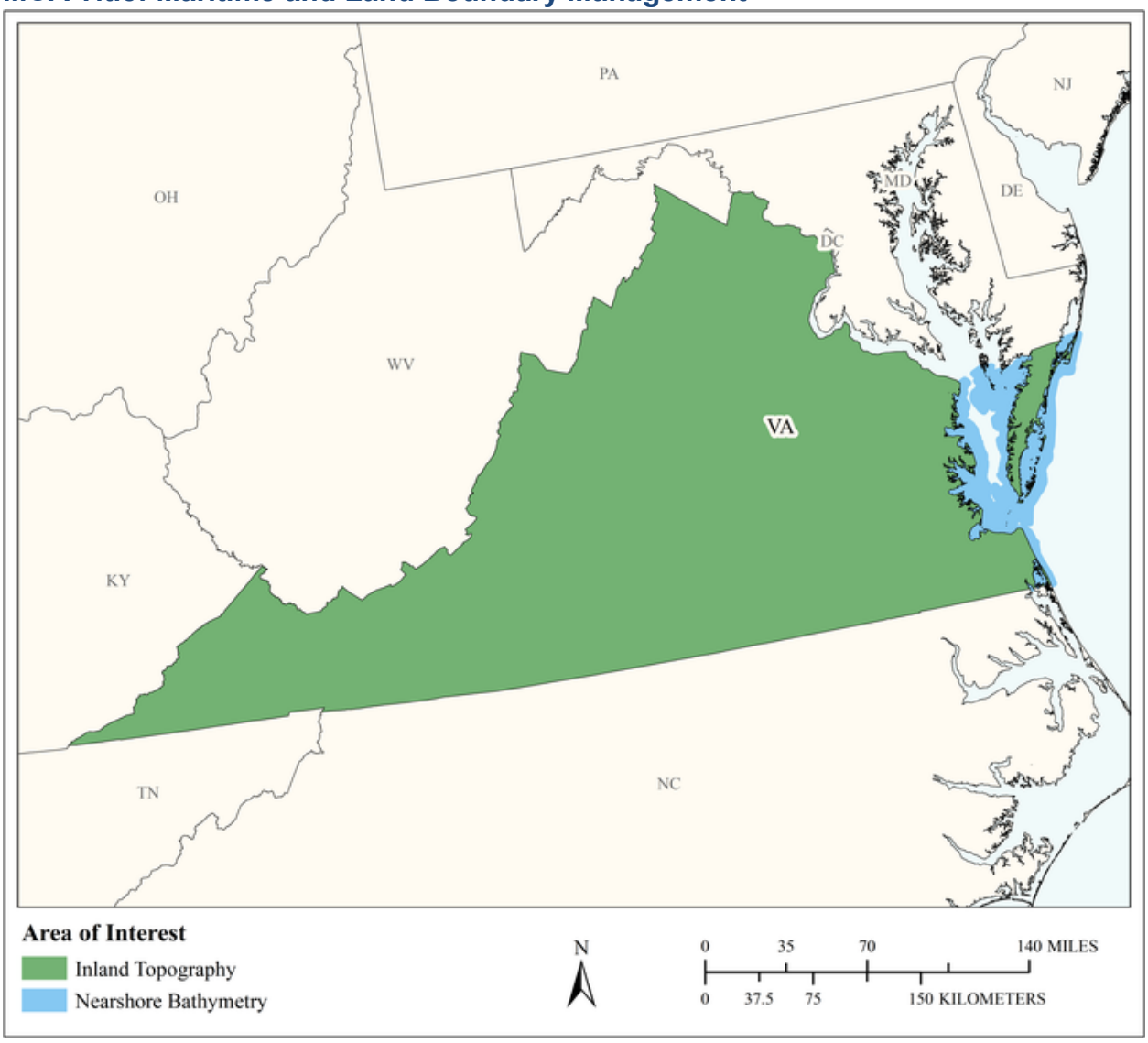
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major		
Improved customer experience	Major	Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor		
Environmental	Minor	Minor		
Public safety, including life and property	Major	Major		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know								
Environmental	I don't know			I don't know								
Public safety, including life and property	I don't know			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Maritime and Land Boundary Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Delimitation of legal and other coastal boundaries, inland boundaries, and ordinary high water lines (OHWL).
MCA Title	Maritime and Land Boundary Management
MCA ID	60509
Organization Type	State or U.S. Territorial government
Organization Name	Commonwealth of Virginia
Sub-Agency or Division	Virginia Marine Resources Commission
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 30 - Maritime and Land Boundary Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1		QL0B	
Update Frequency	6-10 years		2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter		Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm		Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have		Nice to have			Nice to have
Entire AOI under same environmental conditions	Highly desirable		Nice to have			Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable		Highly desirable			Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable		Highly desirable			Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable		Required	
DTM	Required		Required	
DEM	Highly desirable		Required	
Raw point cloud data	Nice to have		Required	
Classified point cloud	Highly desirable		Required	
Edited/cube XYZ			Nice to have	
Full waveform	Not required		Not required	
Bathymetric Attributed Grid (BAG)			Not required	
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Nice to have		Not required	
Ground control/ground truthing	Highly desirable		Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required		Highly desirable	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Nice to have		Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Highly desirable	
Routes			Nice to have	
Offshore cadastral			Highly desirable	
Lease areas			Highly desirable	
Fixed obstructions			Required	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Required		Highly desirable	
Land use/land cover	Highly desirable		Highly desirable	
Wetlands	Required		Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required		Highly desirable	
Bridges/culverts	Required			
Landmark features	Highly desirable		Highly desirable	
Cultural resources	Nice to have		Highly desirable	
Coastal and riverine structures	Required		Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate		None	
Cost savings/cost reduction	Moderate		Minor	
Cost avoidance	Moderate		Minor	
Increased revenues	Minor		None	
Mission-driven performance improvements	Major		Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		None	

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major		Minor	
Improved customer experience	Major		Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate		Minor	
Environmental	Major		Minor	
Public safety, including life and property	Moderate		Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					Major	Unable to provide				
Cost savings/cost reduction	Moderate	Unable to provide					Moderate	Unable to provide				
Cost avoidance	Moderate	Unable to provide					Moderate	Unable to provide				
Increased revenues	Minor	Unable to provide					None					
Mission-driven performance improvements	Moderate	Unable to provide					Moderate	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$45,439					Annual dollars saved/ realized	$449,001			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide					Major	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide					Moderate	Unable to provide				
Improved customer experience	Moderate	Unable to provide					Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$174,217									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate						Moderate					
Environmental	Minor						Major					
Public safety, including life and property	None						Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	
Contours	Yes		Yes	
Hillshades	Yes		Yes	
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes		Yes	
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

Washington

Introduction

Washington State has a geographically diverse and spectacular landscape that is divided east and west by the volcanic mountains of the Cascade Range. The state covers over 71,000 square miles, with approximately 60 percent of the population in western Washington; whereas population in the east is largely dispersed with a few growing urban centers. Washington is also situated along the west coast, adjacent to the Pacific Ocean and the complex inland waterway of Puget Sound, with major shipping and transportation industries. Other major industries include forestry, agriculture, fisheries and aquaculture, technology, and aggregate mining. The landscape is geologically active, with earthquake faults traversing the state along with other natural hazards such as landslides, tsunamis, and volcanoes that could create impacts to the land and people. The climate is varied, with high precipitation on the west side of the state with seasonal flooding, while a drier climate is found east of the mountains. Due to the mountainous terrain across the state, the dominant vegetation is primarily coniferous forests, which are prone to frequent seasonal fires. Critical applications that support state industries and address these critical issues depend on accurate, high-resolution elevation data that provide a highly detailed three-dimensional (3D) model of the Earth's surface.

Current status of elevation data for Washington

Washington State has access to a number of elevation data sources, from statewide 10-meter topographic data, various bathymetric surveys, to lidar surveys. Many of the higher resolution data sources are variable or inconsistent across the state. Recently, more concerted focus on statewide lidar collection is taking place through the Washington State Lidar Program, managed by the Washington Department of Natural Resources through their Washington Geological Survey (WGS). The State Lidar Program was created in 2016 in response to the need for consistent, high-quality lidar data for hazards identification and to fulfill a mandate to publicly distribute the data. A State Lidar Plan was developed in 2019 to guide the State Lidar activities. Given that lidar data have a wide range of benefits and applications in addition to hazards identification, this State Lidar Plan has several aims: 1) to build upon the State Lidar Program mandate; 2) to support different application and business needs; 3) to standardize collection and quality control procedures; and 4) to incorporate new technologies for elevation data collection where appropriate. The ultimate goal of the program is to provide complete statewide coverage at a high resolution and to have a plan for refreshing the data moving forward. The State of Washington works with federal, state, local, and tribal partners to build cooperation and funding for lidar collections. Currently, the State Lidar Program submits proposals for new collection through the USGS 3D Elevation Program or uses a state contract to acquire consistent, high-quality lidar.

Importance of elevation data to Washington

As a geologically active state, some of the most widely recognized uses for elevation data are to identify and map faults, landslides, and hazards zones for emergency management, mitigation and land use planning. The state's forestry industry has also long used elevation data, and in particular lidar data, to understand tree stand height and volume. Forest health is a growing application, to help define wildfire hazards as well as plan possible mitigation measures. Wildlife and habitat management applications require elevation data, particularly for understanding critical salmon habitat across the state and enacting habitat restoration plans. It is recognized that bathymetric data plays a critical role in coastal zone management, especially for population centers. Bathymetric data is also used for navigation, aquaculture management, and riverine ecosystem and land use management. Other important uses of elevation data across the state are: oil spill prevention, spill contingency planning, and spill response; river channel migration and flooding analysis; alluvial fan identification; landslide and debris flow hazard analysis;

management of state-owned aquatic lands; management and health of state trust forest resources; conserve and protect native fish and wildlands; addressing and assignment of tax parcel numbers and geospatial support for tribal departments; flood risk reduction and mitigation; and road and bridge infrastructure, maintenance, design, and construction.

High-level summary of elevation data requirements

There is a pressing need for higher resolution elevation data in Washington State. A challenge on the horizon for Washington is the need for updated elevation coverage in areas where the existing data are older and will no longer meet the needs of most users and stakeholders. Despite the diverse geography of Washington, Quality Level 1 (QL1) data are now required for all areas across the state. It is especially important in those areas that are heavily forested and over complex terrain and where geologic fault mapping and other geologic hazards may be found. It is also becoming increasingly important in less vegetated areas of the state to support engineering and surveying projects as well as hydrologic studies. For areas with bathymetric requirements, QL1B or QL0B data is required for inland and nearshore environments and Order 1a for offshore areas. All data types should be updated every 4-5 years.

High-level summary of benefits that would come from higher resolution elevation data

Current elevation data greatly improves the ability to map, assess, and identify hazards, critical areas, and requirements. Access to high-resolution elevation data allows work to move toward mitigation, modeling, detailed planning, and implementation. For example, high-resolution elevation data not only identifies critical salmon habitat in Washington, it also allows for design of culvert removals and log jam placement to enhance access to salmon bearing streams and improve habitat quality overall. Much of this work can now be done in less time and with less field exploration, saving time and money. Higher resolution elevation data has also been critical for identifying and completing detailed mapping of landslides across the state, many of which are under dense vegetation. This has increased the understanding of landslide susceptibly and hazard mitigation. Higher resolution bathymetric data would be critical for modeling coastal inundation and flooding, as well as potential erosion rates along bluffs and beaches. Similarly, bathymetric data for the numerous medium to large riverine systems in Washington is necessary for accurate flood inundation and erosion modeling. These are just a few examples and access to high-resolution elevation data would similarly benefit every application in Washington State.

Additional comments

A future national elevation data program should revisit the areas containing QL2 or lower data and capture the data as QL1 or higher.

Throughout Washington there is also increased interest in bathymetric data to support river and stream restoration, salmon habitat management, and coastal management. Washington recommends for a future national elevation data program that expands into bathymetric collection.

To access the Washington State Lidar Plan, visit: https://www.dnr.wa.gov/lidar#the-washington-state-lidar-plan.

A companion, interactive, story map is located at: https://wadnr.maps.arcgis.com/apps/Cascade/index.html?appid=b93c17aa1ef24669b656dbaea009b5ce.

To access the Washington Lidar Portal, through which lidar data is distributed, visit: https://lidarportal.dnr.wa.gov/.

The State of Washington has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Added by NOAA for WA consideration to use:

Washington conducted a project to prioritize spatial data needs along Washington's Pacific Coast, including bathymetric data. The results of that effort are posted online at:

https://maps.coastalscience.noaa.gov/wasp/wasp.html

https://www.msp.wa.gov/wp-content/uploads/2015/03/NCCOS_SeafloorMappingReport.pdf

A number of locations along the nearshore region appear to have lower quality data at the time of this survey effort.

The West Coast was also the focus for a seafloor data prioritization effort in 2019 for the entire EEZ:

https://coastalscience.noaa.gov/project/prioritizing-areas-for-future-seafloor-mapping-research-and-exploration-offshore-of-california-oregon-and-washington/

Results of that work are posted online at:

https://gis.ngdc.noaa.gov/arcgis/rest/services/nccos/BiogeographicAssessments_WestCoastPrioritizationResults/MapServer

https://www.arcgis.com/home/webmap/viewer.html?url=https%3A%2F%2Fgis.ngdc.noaa.gov%2Farcgis%2Frest%2Fservices%2Fnccos%2FBiogeographicAssessments_WestCoastPrioritizationResults%2FMapServer&source=sd

The data show a high-priority need for bathymetry/backscatter data just offshore from Ocean Shores to the Quinault Reservation (centered at Copalis Beach) and in the vicinity of Cape Flattery. Additionally, a band of high priority areas were identified about 25-80 kilometers offshore.

Preparations are underway by JALBTCX to collect high-resolution topobathymetric data for Washington's coastline along the Pacific Ocean (Neah Bay to the Columbia River) in 2020. This effort is a part of the five-year cycle associated with the National Coastal Mapping Program. The data extent will be from 500 meters onshore to 1000 meters offshore.

The State of Washington (Ecology) has indicated that topobathymetric data for the Grays Harbor and Willapa Bay regions would be helpful for improving characterization of the shoreline there and other projects.

The Washington State Marine Spatial Plan also lists previous effort for bathymetric data collection and needs:

https://fortress.wa.gov/ecy/publications/documents/1706027.pdf

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	Washington State Department of Ecology, Spills Prevention, Preparedness & Response	22430	Oil Spill Prevention, Spill Contingency Planning, and Spill Response	Inland Topo	QL2	4-5 years	$374,581	$100,333	Moderate	Major	Moderate
				Inland Bathy	QL1B	2-3 years	$1,620,471	$169,345	None	Moderate	Moderate
				Nearshore Bathy	QL1B	2-3 years	$50,520	$83,227	None	Minor	Moderate
				Offshore Bathy	Order 1a	2-3 years	$2,834	$14,170	None	Minor	Moderate
BU 02 – Riverine Ecosystem Management	Skagit River System Cooperative	1420	Salmon Habitat Research, Restoration, and Protection	Inland Topo	(a) QL1 (b) QL2	6-10 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	I don't know
BU 02 – Riverine Ecosystem Management	Quinault Indian Nation	22149	River Channel Analysis in Support of Salmon Habitat Assessments	Inland Bathy	QL0B	Annually	$150,000	$6,030	Major	Major	Major
BU 02 – Riverine Ecosystem Management	State of Washington	60510	Riverine Ecosystem Management	Inland Topo	QL1 HD	6-10 years	$103,405	$10,328	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$55,046	$3,881	Major	Major	Major
				Nearshore Bathy	QL0B	2-3 years	$153,217	$117,082	Moderate	Moderate	Moderate
BU 03 – Coastal Zone Management	Washington Department of Natural Resources	21642	Management of State-Owned Aquatic Lands	Inland Bathy	QL1B	>10 years	$4,341	Unable to quantify	Moderate	Minor	Moderate
				Nearshore Bathy	QL0B	>10 years	$4,341	Unable to quantify	Moderate	Minor	Moderate
				Offshore Bathy	Cross sections and/or transects meet needs	>10 years	Unable to quantify	Unable to quantify	Minor	Minor	Minor
BU 03 – Coastal Zone Management	State of Washington	60001	Coastal Zone Management	Inland Topo	QL1	4-5 years	$1,180,128	$206,310	Major	Major	Major
				Inland Bathy	QL1B	4-5 years	$506,422	$296,889	Minor	Moderate	Moderate
				Nearshore Bathy	QL0B	4-5 years	$343,092	$580,381	Moderate	Major	Major
				Offshore Bathy	Order 1b	6-10 years	$177,479	$35,433	Minor	Moderate	Moderate
BU 04 – Forest Resource Management	Washington Department of Natural Resources	21695	Management and Health of State Trust Forest Resources	Inland Topo	QL0	6-10 years	$501,595	$387,207	Major	Major	Major
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL2B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	I don't know

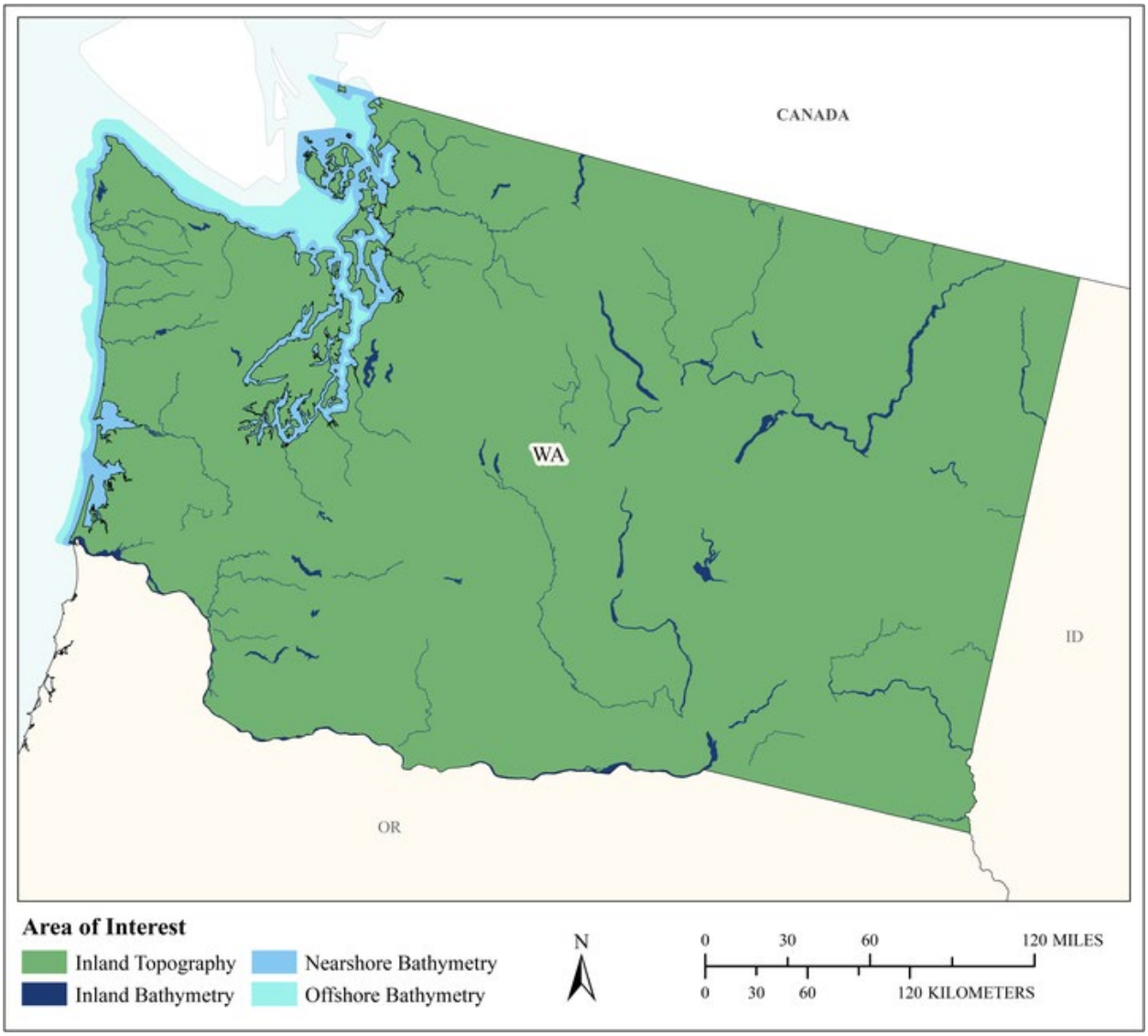
MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 06 – Natural Resource Management	State of Washington	60511	Natural Resources Conservation	Inland Topo	QL1 HD	4-5 years	$2,649,809	$9,730,907	Major	Major	Major
				Inland Bathy	QL0B	6-10 years	$359,151	$16,168	Major	Major	Major
				Nearshore Bathy	QL1B	6-10 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate
				Offshore Bathy	Cross sections and/or transects meet needs	4-5 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
BU 07 – Wildlife and Habitat Management	State of Washington	60512	Wildlife and Habitat Management	Inland Topo	QL2	4-5 years	$16,092	$46,480	Moderate	Major	Moderate
				Inland Bathy	QL2B	4-5 years	$128,969	$77,954	Moderate	Moderate	Moderate
				Nearshore Bathy	QL0B	4-5 years	$1,516	$89	Moderate	Major	Moderate
				Offshore Bathy	Special Order	4-5 years	$2,235	$155	Moderate	Major	Major
BU 08 – Agriculture	State of Washington	60513	Agriculture and Precision Farming	Inland Topo	QL2	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Minor
				Inland Bathy	QL4B	4-5 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
BU 09 – Fisheries Management and Aquaculture	Washington Department of Fish and Wildlife	21551	Fish and Wildlife Conservation and Protection	Inland Topo	QL2	2-3 years	$69,057	$149,998	I don't know	Moderate	Moderate
				Inland Bathy	QL1B	6-10 years	$135,176	$61,524	I don't know	Major	I don't know
				Nearshore Bathy	QL0B	I don't know, depends on frequency of change in features.	$240,645	$17,673	Major	Major	I don't know
				Offshore Bathy	Special Order	I don't know yet the features of interest are not likely to change frequently (i.e. rocky reefs)	Unable to quantify	Unable to quantify	Major	Major	Major
BU 10 – Geologic Assessment	Washington State Emergency Management Division	1173	Tsunami, Landslide, and Other Hazard Risk Management	Inland Topo	QL1	>10 years	$7,130,374	$125,173	Major	Moderate	Major
				Inland Bathy	QL1B	>10 years	$94,385	$103,714	Major	None	Major
				Nearshore Bathy	QL2B	>10 years	$59,073	$95,046	Major	Major	Major

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 10 – Geologic Assessment	Washington Department of Natural Resources	21543	Geological Mapping and Geologic Hazard Identification	Inland Topo	QL1	6-10 years	$110,759,290	$890,450	Major	Major	Major
				Inland Bathy	QL2B	>10 years	$94,385	$103,714	Major	Major	Major
				Nearshore Bathy	QL2B	>10 years	$59,097	$95,046	Major	Major	Major
				Offshore Bathy	Special Order	>10 years	$3,385,941	Unable to quantify	Major	Major	Major
BU 11 – Geologic Resource Extraction	Washington Department of Natural Resources	60514	Geologic Resource Mining and Extraction	Inland Topo	QL1	2-3 years	$16,502	$10,946	Minor	Major	Major
				Inland Bathy	QL0B	4-5 years	Unable to quantify	$1,128	None	Minor	Minor
BU 12 – Renewable Energy Resources	State of Washington	60515	Renewable Energy Resources	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	None
				Inland Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 14 – Cultural Resource Management	Swinomish Indian Tribal Community	1432	Swinomish Indian Tribal Community Land and Water Resources Management	Inland Topo	QL0	2-3 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
				Inland Bathy	QL0B	2-3 years	$15,000	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	QL2B	4-5 years	Unable to quantify	Unable to quantify	Minor	Moderate	Moderate
BU 14 – Cultural Resource Management	State of Washington	60516	Cultural Resources Preservation and Management	Inland Topo	QL1	4-5 years	$12,382	$10,826	Minor	Minor	Minor
				Inland Bathy	QL0B	6-10 years	$29,694	Unable to quantify	Moderate	Minor	Minor
				Nearshore Bathy	QL0B	4-5 years	$4,384	Unable to quantify	Minor	Moderate	Minor
				Offshore Bathy	Order 1a	6-10 years	$5,503	Unable to quantify	Minor	Moderate	Minor
BU 15 – Flood Risk Management	Washington State Dept. of Ecology	22404	Flood Risk Reduction	Inland Topo	QL1	4-5 years	$9,485,497	$1,659,665	Moderate	Moderate	Moderate
				Inland Bathy	QL1B	4-5 years	$658,928	$739,807	I don't know	I don't know	I don't know
				Nearshore Bathy	QL2B	4-5 years	$290,026	$214,950	I don't know	I don't know	I don't know
				Offshore Bathy	Special Order	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 16 – Sea Level Rise and Subsidence	State of Washington	60517	Sea Level Rise and Subsidence	Inland Topo	QL1 HD	4-5 years	$3,556,739	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Minor
				Offshore Bathy	Order 2	6-10 years	Unable to quantify	Unable to quantify	Major	Major	Moderate
BU 17 – Wildfire Management	Washington Department of Natural Resources	21708	Forest Health for Wildfire Mitigation and Management	Inland Topo	QL1	>10 years	$1,018,090	Unable to quantify	Major	Major	Major
				Inland Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Major

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 18 – Homeland Security	State of Washington	60518	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management	Inland Topo	QL2	4-5 years	$1,992,963	$35,224	Major	Moderate	Major
				Inland Bathy	QL0B	4-5 years	$561,269	$35,809	Major	Moderate	Major
				Nearshore Bathy	QL1B	6-10 years	$14,111	$405	Moderate	Moderate	Major
				Offshore Bathy	Order 2	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 19 – Land Navigation	State of Washington	60519	Land Navigation and Safety	Inland Topo	QL0	2-3 years	$875,167	$70,674	Minor	Major	Major
				Inland Bathy	QL0B	2-3 years	$37,329	$386	Minor	Moderate	Moderate
				Nearshore Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	None	Moderate	Moderate
				Offshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	None	Moderate	Moderate
BU 20 – Marine and Riverine Navigation	State of Washington	60520	Marine and Riverine Navigation and Safety	Inland Topo	QL0 HD	2-3 years	Unable to quantify	Unable to quantify	None	None	Minor
				Inland Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
				Nearshore Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	Minor	Major	Major
				Offshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 22 – Infrastructure Management	Kittitas County Public Works	1185	Road and Bridge Infrastructure, Maintenance, Design and Construction	Inland Topo	Cross sections and/or transects meet needs	2-3 years	$120,049	$34,069	Major	Minor	Major
				Inland Bathy	Cross sections and/or transects meet needs	2-3 years	$176,712	$9,045	Major	Minor	I don't know
BU 22 – Infrastructure Management	State of Washington	60521	Infrastructure and Construction Management	Inland Topo	QL0 HD	4-5 years	$3,036,025	$8,934,410	Minor	Moderate	Major
				Inland Bathy	QL0B	4-5 years	$1,022,885	$106,214	Minor	Moderate	Moderate
				Nearshore Bathy	QL1B	4-5 years	$32,010	$4,401	Minor	Moderate	Major
				Offshore Bathy	Cross sections and/or transects meet needs	2-3 years	Unable to quantify	Unable to quantify	Minor	Major	Moderate
BU 23 – Urban and Regional Planning	State of Washington	60522	Urban and Regional Planning	Inland Topo	QL1	4-5 years	$18,177,146	$2,098,559	Moderate	Major	Major
				Inland Bathy	QL1B	6-10 years	$740,323	$936,573	Moderate	Moderate	Major
				Nearshore Bathy	QL2B	4-5 years	$280,360	$295,769	Moderate	Moderate	Moderate
				Offshore Bathy	Cross sections and/or transects meet needs	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 24 – Health and Human Services	State of Washington	60523	Health and Human Services	Inland Topo	QL1	6-10 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Major

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 25 – Real Estate, Banking, and Insurance	Washington Surveying and Rating Board (WSRB)	22353	Situational Analysis for Real Property	Inland Topo	QL1 HD	2-3 years	$2,347,319	Unable to quantify	Major	Minor	Major
				Nearshore Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	Major	Moderate	Major
BU 30 – Maritime and Land Boundary Management	State of Washington	60524	Maritime and Land Boundary Management	Inland Topo	QL1	6-10 years	$76,020	$291,466	Moderate	Minor	None
				Inland Bathy	QL2B	6-10 years	$57,050	Unable to quantify	Major	Major	Moderate
				Nearshore Bathy	QL0B	2-3 years	$351,868	Unable to quantify	Moderate	Major	Moderate
				Offshore Bathy	I don't know	2-3 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate

MCA Title: Oil Spill Prevention, Spill Contingency Planning, and Spill Response



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Oil spill prevention, spill contingency planning, and spill response. Future use of bathymetry for analysis and modeling and to inform where to place resources – spill response resources, planning, and protection of natural resources, For the Spills Prevention, Preparedness, and Response Program, bathymetry data from nearshore areas is important to understanding risk from vessels striking fixed objects or running aground. The information may also prove useful when trying to identify locations where oil that sinks or submerges may naturally collect. Additionally, improved bathymetry data can help identify local factors that influence the potential for spills in specific waterways. The Spills Prevention, Preparedness, and Response Program sees great value in a national effort to coordinate and prioritize mapping activities. A national effort should limit the duplication of efforts and ultimately result in a standardized dataset with a wide range of practical applications.
MCA Title	Oil Spill Prevention, Spill Contingency Planning, and Spill Response
MCA ID	22430
Organization Type	State or U.S. Territorial government
Organization Name	Washington State Department of Ecology, Spills Prevention, Preparedness & Response
Sub-Agency or Division	
Organization Mission	The program's mission is to protect Washington's environment, public health, and safety through a comprehensive spill prevention, preparedness, and response program.
Program Name	Spills Prevention, Preparedness, and Response
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 03 - Coastal Zone Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Interested in mapping sea floor with a high degree of accuracy for oil spill modeling

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL1B	Order 1a
Update Frequency	4-5 years	2-3 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				Nice to have Vancouver B.C. waters, farther out than state
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter	Up to 1 meter	Up to 1 meter
Acceptable Vertical Error	Up to 20 cm	Up to 50 cm	Up to 50 cm	Less than 1 meter
How far onshore needed			To Mean Higher High Water (MHHW)	
How far down the beach profile needed			To MLLW	
Tide correction requirement			MSL	MSL
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required	Not required	Not required	Nice to have	Not required
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Nice to have	Nice to have	Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have	Nice to have	Nice to have
DTM	Required	Nice to have	Nice to have	Nice to have
DEM	Required	Required	Required	Required
Raw point cloud data	Nice to have	Nice to have	Nice to have	Nice to have
Classified point cloud	Highly desirable	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Nice to have

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Not required	Not required
Nautical and/or navigation charts			Nice to have	Nice to have
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required	Not required	Nice to have	Nice to have
Underwater videography			Nice to have	Nice to have
Bottom texture			Nice to have	Highly desirable
Bottom type			Nice to have	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Nice to have	Not required	Nice to have	Nice to have
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Highly desirable	Highly desirable
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Nice to have	Highly desirable
Routes			Highly desirable	Highly desirable
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have	Not required	Highly desirable	
Land use/land cover	Highly desirable	Not required	Not required	Not required
Wetlands	Highly desirable	Not required	Not required	Not required
Estuaries			Not required	Nice to have
Inland surface water features	Required	Nice to have	Nice to have	
Bridges/culverts	Highly desirable	Not required		
Landmark features	Nice to have	Not required	Nice to have	
Cultural resources	Nice to have	Highly desirable	Highly desirable	
Coastal and riverine structures	Highly desirable	Nice to have	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used		Bathymetric surveys from NOAA. Varying data quality and date.	Bathymetric surveys from NOAA. Varying data quality and date.	Bathymetric surveys from NOAA. Varying data quality and date.
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	Yes
NCEI		Yes	Yes	Yes
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	None	Minor	None
Cost savings/cost reduction	Major	None	None	None

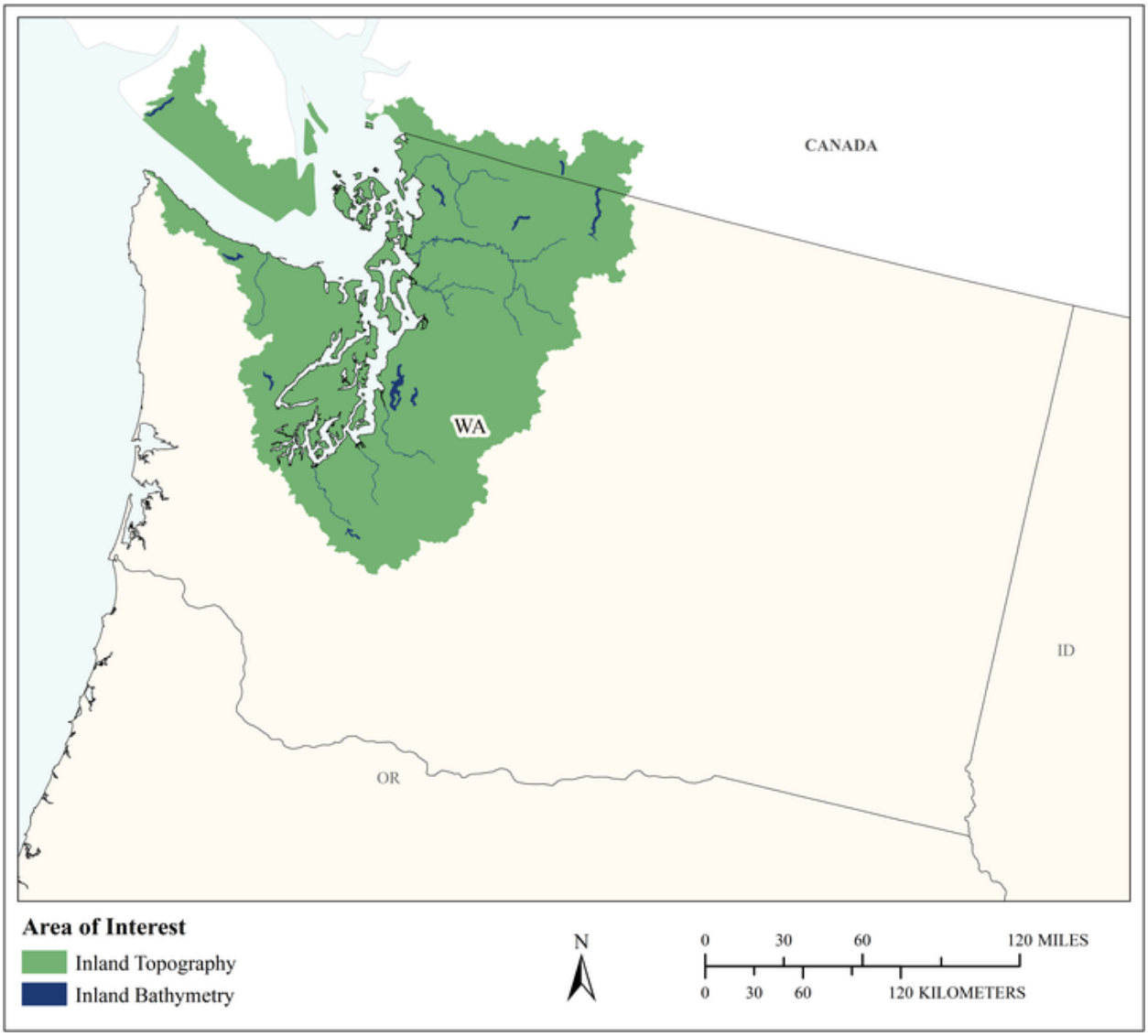
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Cost avoidance	Major	None	None	None
Increased revenues	Minor	None	None	None
Mission-driven performance improvements	Major	Minor	Moderate	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Minor	Moderate
Improved response or timeliness	Major	Moderate	Moderate	Moderate
Improved customer experience	Major	None	None	None
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	None	None	None
Environmental	Major	Moderate	Minor	Minor
Public safety, including life and property	Major	Moderate	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		None			None			None		
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		None			None			Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$374,581		Annual dollars saved/ realized	$1,620,471		Annual dollars saved/ realized	$50,520		Annual dollars saved/ realized	$2,834
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$100,333		Annual dollars saved/ realized	$169,345		Annual dollars saved/ realized	$83,227		Annual dollars saved/ realized	$14,170
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			None			None			None		
Environmental	Major			Moderate			Minor			Minor		
Public safety, including life and property	Moderate			Moderate			Moderate			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes	Yes	Yes
Hydrologic Flow Accumulation Grids	Yes	Yes	Yes	Yes
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Salmon Habitat Research, Restoration, and Protection



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Area split by varying quality level or update frequency	One or more Hydrologic Units (HUC4s)		
Sub Area Requirements	HUC4 1711			

MCA Description	Response
Mission Critical Activity	Salmon habitat research, restoration, and protection
MCA Title	Salmon Habitat Research, Restoration, and Protection
MCA ID	1420
Organization Type	Tribal government
Organization Name	Skagit River System Cooperative
Sub-Agency or Division	
Organization Mission	Off-reservation natural resources (fisheries) protection for two tribes: the Swinomish Indian Tribal Community and the Sauk-Suiattle Indian Tribe
Program Name	Environmental Services (protection) Restoration
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	BU 06 - Natural Resources Conservation
Tertiary Business Use	BU 09 - Fisheries Management and Aquaculture

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Large wood in streams; in both open channels and with full canopy closure

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	(a) QL1 (b) QL2	QL1B		
Update Frequency	6-10 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI	Need higher frequency and higher point density (QL1) on floodplains and river channels. Can use SFHAs to map these areas.			
Acceptable Horizontal Error	Up to 30 cm	Less than 50 cm		
Acceptable Vertical Error	Up to 20 cm	Up to 20 cm		
How far onshore needed				
How far down the beach profile needed	Below MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Required			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Required			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable		
DTM	Required	Required		
DEM	Highly desirable	Required		
Raw point cloud data	Not required	Required		
Classified point cloud	Required	Required		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Nice to have	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Highly desirable		
Land use/land cover	Nice to have	Highly desirable		
Wetlands	Nice to have	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have	Highly desirable		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Mostly QL1 3DEP some riverine bathymetric	Skagit topobathy collected April 2017 >6 points per s quare meter		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Washington DNR Puget Sound LiDAR Consortium University of Washington (Harvey Greenberg)			
Other	Yes	Yes		
Other description	Direct contract with vendor (QSCI)	Direct contract		
Data that meet my needs are not available				

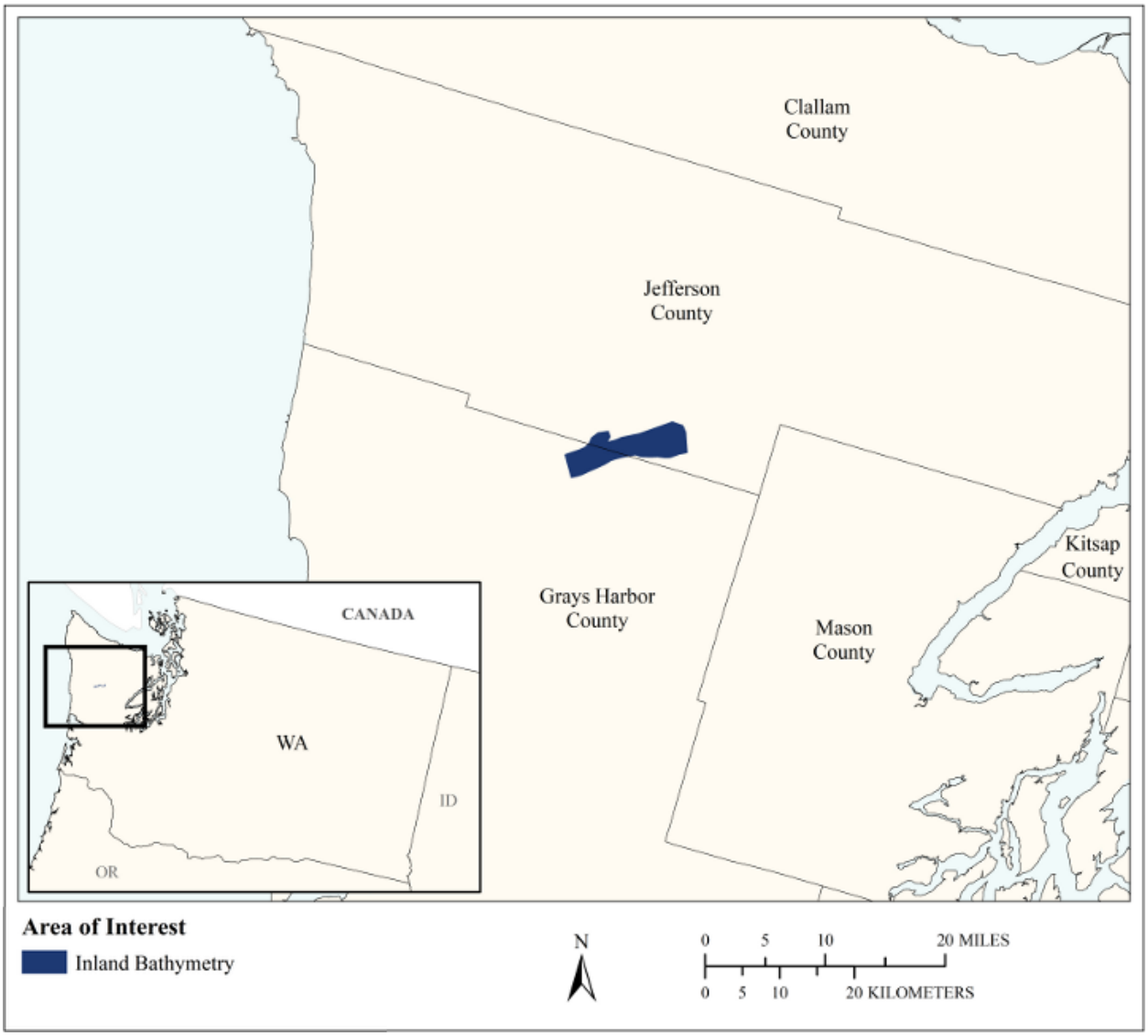
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	I don't know		
Cost savings/cost reduction	Moderate	I don't know		
Cost avoidance	Moderate	I don't know		
Increased revenues	Moderate	I don't know		
Mission-driven performance improvements	Major	I don't know		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	I don't know		
Improved response or timeliness	I don't know	I don't know		
Improved customer experience	I don't know	I don't know		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	I don't know		
Environmental	Major	I don't know		
Public safety, including life and property	I don't know	I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide							
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide							
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Other operational benefits	Major	Unable to provide		Major	Unable to provide							
Other operational benefits description	We are able to conduct studies and planning that would be impossible without LiDAR.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	I don't know	Unable to provide		Moderate	Unable to provide							
Other customer service benefits				Moderate	Unable to provide							
Other customer service benefits description												
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			Major								
Environmental	I don't know			Major								
Public safety, including life and property	I don't know			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness		Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	1
Update frequency	3

MCA Title: River Channel Analysis in Support of Salmon Habitat Assessments



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type		Required		
Geographic Area Requirements		Respondent provided own shapefile, KML, or geodatabase		
Sub Area Requirements		Upper Quinault River Channel		

MCA Description	Response
Mission Critical Activity	River channel and analysis in support of salmon habitat assessments - e.g., the placement of engineered log jams to protect, stabilize and enhance spawning and rearing habitat of the Quinault River sockeye salmon, a historically and culturally cherished resource of the Quinault peoples.
MCA Title	River Channel Analysis in Support of Salmon Habitat Assessments
MCA ID	22149
Organization Type	Tribal government
Organization Name	Quinault Indian Nation
Sub-Agency or Division	
Organization Mission	The mission of the government of the Quinault Indian Nation is to promote the welfare and interests of the Quinault peoples and to protect the sovereign rights conveyed from its treaty with the United States government.
Program Name	Quinault Department of Fisheries
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	BU 06 - Natural Resources Conservation
Tertiary Business Use	BU 09 - Fisheries Management and Aquaculture

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required
Other	Required
Other description	Other: riverine bathymetry

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	The granular roughness of the river bottom. The ability to discern tree stumps or other such subsurface habitat features.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order		QL0B		
Update Frequency		Annually		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error		Less than 50 cm		
Acceptable Vertical Error		Up to 20 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season		Not required				
Entire AOI under same environmental conditions		Required				
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless		Highly desirable				
DEM for entire AOI needs to be seamless		Required				
Amount of acceptable vertical manipulation to achieve spatial seamlessness		I don't know				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM		Required		
DTM		Required		
DEM		Required		
Raw point cloud data		Required		
Classified point cloud		Required		
Edited/cube XYZ		Not required		
Full waveform		Highly desirable		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening		Highly desirable		
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery		Highly desirable		
Ground control/ground truthing		Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery		Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data		Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates		Highly desirable		
Land use/land cover		Highly desirable		
Wetlands		Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features		Highly desirable		
Bridges/culverts		Highly desirable		
Landmark features		Highly desirable		
Cultural resources		Highly desirable		
Coastal and riverine structures		Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used		Not submitted to USGS for quality review. One flight, flown in 2014 Products: All returns in LAS v1.2; 3 ft ESRI grids of combined topobathymetric bare earth model and highest hit model; 1.5 ft geotiffs of intensity images for a) all bathymetric returns and b) bathymetric first returns. Vector Products included site boundary, Lidar Tile index, DEM Tile index, water's edge polyline, submerged topographic density		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				

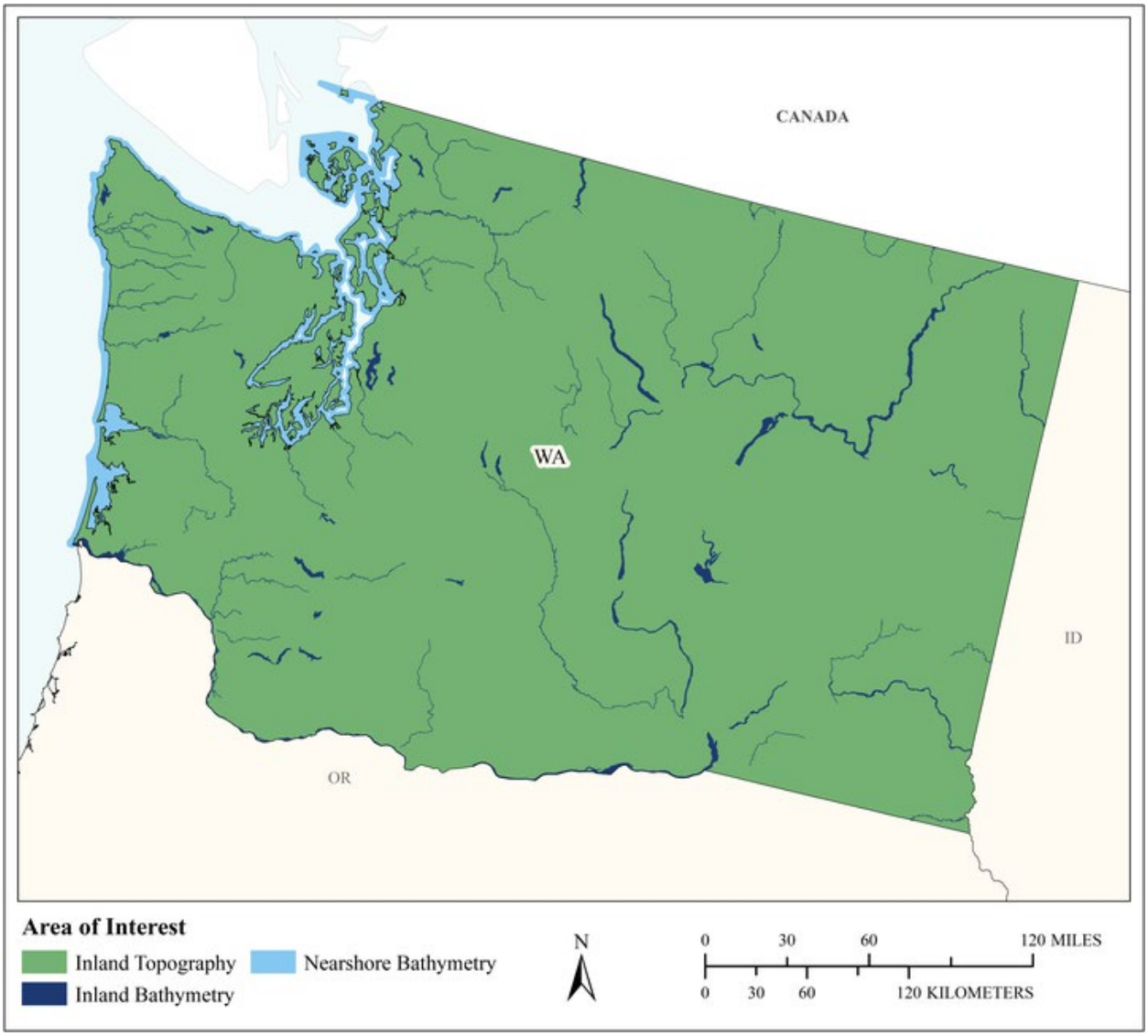
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other		Yes		
Other description		Data flown by Quantum Spatial as deliverable to QIN contractor		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings		I don't know		
Cost savings/cost reduction		I don't know		
Cost avoidance		I don't know		
Increased revenues		I don't know		
Mission-driven performance improvements		I don't know		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services		I don't know		
Improved response or timeliness		I don't know		
Improved customer experience		I don't know		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach		I don't know		
Environmental		I don't know		
Public safety, including life and property		I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings				Major	Unable to provide							
Cost savings/cost reduction				Major	Annual dollars saved/realized	$75,000						
Cost avoidance				Major	Annual dollars saved/realized	$75,000						
Increased revenues				I don't know	Unable to provide							
Mission-driven performance improvements				I don't know	Unable to provide							
Other operational benefits				Major	Unable to provide							
Other operational benefits description				Precise DEM's to inform engineered logjam designs.								
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services				Major	Unable to provide							
Improved response or timeliness				Moderate	Unable to provide							
Improved customer experience				Major	Annual dollars saved/realized	$6,030						
Other customer service benefits				I don't know	Unable to provide							
Other customer service benefits description				Increased efficiency.								
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach				Major								
Education or outreach description				Create visualizations that highlight the project goals								
Environmental				Major								
Environmental description				Stabilizing the river reaches so as to protect remaining spawning and rearing habitat								
Public safety, including life and property				Major								
Public safety, including life and property description				Model the extent of flood events								
Other				Improved ecological functioning								
Other benefits				Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours		Yes		
Hillshades		Yes		
Slope maps				
Aspect maps				
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness		Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	1
Update frequency	3

MCA Title: Riverine Ecosystem Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Stream channel analysis and mapping. Stream bank erosion analysis. Aquatic and terrestrial species habitat management. Environmental management.
MCA Title	Riverine Ecosystem Management
MCA ID	60510
Organization Type	State or U.S. Territorial government
Organization Name	State of Washington
Sub-Agency or Division	Washington State Department of Ecology, Watershed Health Monitoring Program
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B	QL0B	
Update Frequency	6-10 years	4-5 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable		Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Required		Highly desirable	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Required	Required		Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	
DTM	Required	Highly desirable	Required	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Nice to have	Nice to have	
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Not required	Nice to have	
Full waveform	Nice to have	Nice to have	Highly desirable	
Bathymetric Attributed Grid (BAG)		Not required	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Nice to have	
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Highly desirable	Required	
Underwater videography			Not required	
Bottom texture			Highly desirable	
Bottom type			Required	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Nice to have	Nice to have	Not required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates	Nice to have	Nice to have	Highly desirable	
Land use/land cover	Highly desirable	Nice to have	Required	
Wetlands	Highly desirable	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have	Not required	
Cultural resources	Nice to have	Nice to have	Not required	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	
Cost savings/cost reduction	Moderate	Minor	Moderate	
Cost avoidance	Moderate	None	None	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	None	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Minor	

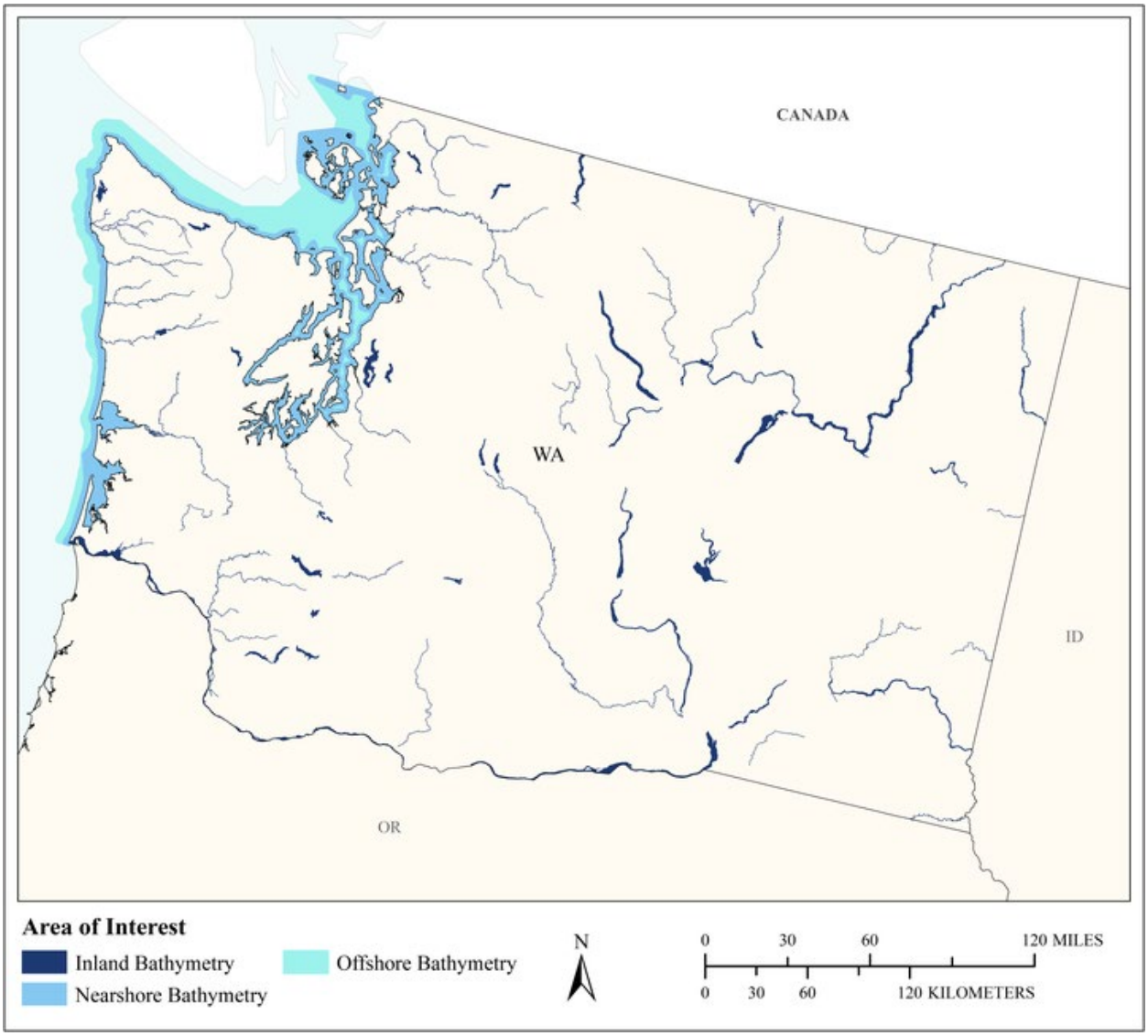
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Moderate	Minor	
Improved customer experience	Major	Minor	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Minor	
Environmental	Major	Major	Moderate	
Public safety, including life and property	Major	Moderate	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$103,405		Annual dollars saved/ realized	$55,046		Annual dollars saved/ realized	$153,217			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$10,328		Annual dollars saved/ realized	$3,881		Annual dollars saved/ realized	$117,082			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate					
Environmental	Major			Major			Moderate					
Public safety, including life and property	Major			Major			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps			Yes	
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints			Yes	
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Management of State-Owned Aquatic Lands



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type		Required	Required	Required
Geographic Area Requirements		One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Management of state-owned aquatic lands. Bathymetry is needed to manage eel grass, geoduck farms, aquatic habitat restoration, aquatic leases (fish and clam farms), facilities, terminals (oil and gas export terminals). Nearshore lidar at low tide is also needed in critical habitat areas.
MCA Title	Management of State-Owned Aquatic Lands
MCA ID	21642
Organization Type	State or U.S. Territorial government
Organization Name	Washington Department of Natural Resources
Sub-Agency or Division	
Organization Mission	In partnership with citizens and governments, the Washington State DNR provides innovative leadership and expertise to ensure environmental protection, public safety, perpetual funding for schools and communities, and a rich quality of life.
Program Name	Washington Department of Natural Resources Aquatics Division
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 02 - Riverine Ecosystem Management
Tertiary Business Use	BU 09 - Fisheries Management and Aquaculture

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Small submerged features, included submerged docks or pillars.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Not required
51 - 100 ft	Nice to have
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order		QL1B	QL0B	Cross sections and/or transects meet needs
Update Frequency		>10 years	>10 years	>10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI			Outer coast and bays do not require the same quality level as the Puget Sound and Salish Sea – QL0B for Puget Sound and Salish Sea, lower quality elsewhere	Offshore requirements would be different in the Puget Sound and Salish Sea areas
Acceptable Horizontal Error		The best horizontal accuracy achievable for the vertical accuracy I need	Up to 1 meter	Up to 2 meters
Acceptable Vertical Error		Up to 20 cm	Up to 20 cm	Up to 2 meters
How far onshore needed			To Mean Higher High Water (MHHW)	
How far down the beach profile needed			Extreme low tide (USACE defined)	
Tide correction requirement			MLLW	MLLW
Cross sections and/or transects meet needs		Partial	Partial	Yes

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross section/transect requirement		Vertical Accuracy: < 5cm, sampling density: every 50-100ft on rivers and small lakes	Vertical accuracy: 10cm Sampling density: 1 meter. Transect requirements are needed in areas of natural or man-made armored areas, or areas with a slow rate of change. Rocky cliffs and steep plunging shorelines as well as coastal barriers.	Vertical accuracy: 2 meters, horizontal accuracy: 2 meters, not sure of longitudinal spacing requirements

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season		Not required	Nice to have	Not required		Not required
Entire AOI under same environmental conditions		Nice to have	Not required	Not required		Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless		Not required	Highly desirable	Nice to have		Nice to have
DEM for entire AOI needs to be seamless		Highly desirable	Highly desirable	Nice to have		Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM		Nice to have	Nice to have	Nice to have
DTM		Nice to have	Nice to have	Nice to have
DEM		Highly desirable	Highly desirable	Highly desirable
Raw point cloud data		Not required	Not required	Not required
Classified point cloud		Not required	Not required	
Edited/cube XYZ		Nice to have	Nice to have	Not required
Full waveform		Nice to have	Not required	Not required
Bathymetric Attributed Grid (BAG)		Required	Required	Required

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening		Nice to have		
Additional breaklines for hydro-enforcement of culverts				
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Nice to have
Tide Predictions			Nice to have	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery		Highly desirable	Highly desirable	Nice to have
Ground control/ground truthing		Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	Nice to have
Nautical and/or navigation charts			Nice to have	Nice to have
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery		Highly desirable	Nice to have	Not required
Underwater videography			Highly desirable	Highly desirable
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Not required	Not required
Geologic and seismic data		Not required	Nice to have	Not required
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Nice to have	Nice to have
Currents			Not required	Not required
Tide/wave heights			Not required	Not required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Not required	Not required
Routes			Not required	Not required
Offshore cadastral			Nice to have	Nice to have
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Not required	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates		Highly desirable	Highly desirable	
Land use/land cover		Nice to have	Highly desirable	Highly desirable
Wetlands		Nice to have	Nice to have	Nice to have
Estuaries			Highly desirable	Highly desirable
Inland surface water features		Nice to have	Nice to have	
Bridges/culverts		Not required		
Landmark features		Not required	Not required	
Cultural resources		Not required	Not required	
Coastal and riverine structures		Highly desirable	Highly desirable	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings				
Other				Highly desirable
Other description				Habitat maps

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used		All of NOAA's hydrographic data, bathymetric lidar	All NCEI datasets for Washington state, DNR collected multibeam, single beam sonar, GNSS transects, bathymetric and topographic lidar. Newest available as well as historical datasets, highest quality available for the areas of interest.	All NCEI data available, including all qualities and dates. Also any data available from the Washington Dept. of Ecology
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI		Yes	Yes	Yes
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				

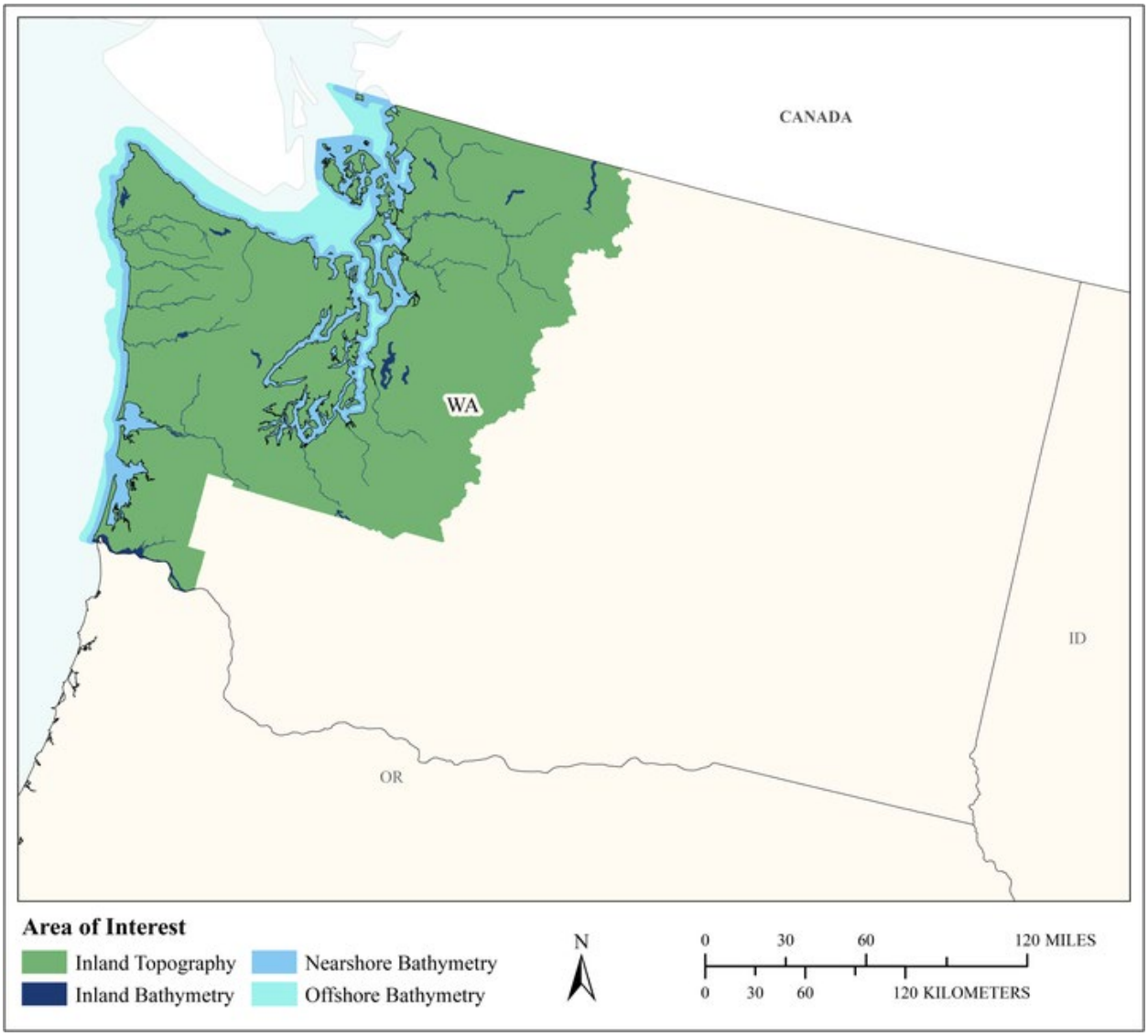
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories		Yes	Yes	
State repositories used		Washington Department of Ecology lake bathymetry	DNR nearshore data - single and multibeam sonar. Washington Department of Ecology GNSS profiles.	
Other				Yes
Other description				Washington Dept. of Ecology
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings		Minor	Major	Moderate
Cost savings/cost reduction		I don't know	I don't know	I don't know
Cost avoidance		I don't know	I don't know	I don't know
Increased revenues		I don't know	I don't know	I don't know
Mission-driven performance improvements		Minor	Major	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services		None	Moderate	Minor
Improved response or timeliness		None	Moderate	Minor
Improved customer experience		None	Minor	None
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach		I don't know	None	Minor
Environmental		Minor	Moderate	Minor
Public safety, including life and property		Moderate	Major	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings				Moderate	Annual dollars saved/realized	$4,342	Moderate	Annual dollars saved/realized	$4,342	Minor	Unable to provide	
Time savings description				Land managers may be able to skip a field visit when a visit would be otherwise required. Policy staff spend a significant amount of time working with land management and survey staff to determine navigability and ownership where data is poor. The process would not change, but it could take less time to arrive at a determination. Better inland bathymetry can better estimate location of state-owned aquatic lands. We could have a better idea of depth and channel widths, improving our ability to determine navigability.			Policy staff spend significant time working with land management and survey staff to determine navigability and ownership where data is poor. The process would not change, but it could take less time to arrive at a determination. Land managers may be able to skip a field visit when a visit would be otherwise required. Better inland bathymetry can better estimate location of state-owned aquatic lands. We would have a better idea of depth and channel widths, improving our ability to determine navigability.			Land managers may be able to skip a field visit when a visit would be otherwise required. Better inland bathymetry can better estimate location of state-owned aquatic lands. We would have a better idea of depth and channel widths, improving our ability to determine navigability.		
Cost savings/cost reduction				None			None			None		
Cost avoidance				None			None			None		
Increased revenues				None			None			Minor	Unable to provide	
Mission-driven performance improvements				Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services				Moderate	Unable to provide		Moderate	Unable to provide		None		
Improved response or timeliness				Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Improved customer experience				None			None			None		
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach				Moderate			Moderate			Minor		
Education or outreach description				Largest benefits will be in planning for new ocean uses - benefits in all 3 categories			Largest benefits will be in planning for new ocean uses - benefits in all 3 categories			Largest benefits will be in planning for new ocean uses - benefits in all 3 categories		
Environmental				Minor			Minor			Minor		
Public safety, including life and property				Moderate			Moderate			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes	Yes	Yes
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes	Yes	
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Coastal Zone Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements	Coastal Counties of Washington	Coastal Counties of Washington		

MCA Description	Response
Mission Critical Activity	Analysis of coastal erosion and inundation. Hurricane storm surge and wind damage modeling and assessment. Coastal hazard modeling and mapping. Coastal hazard mitigation. Tsunami modeling. Land use and environmental planning. Coastal resiliency. Oil spill modeling. Littoral zone management including dunes and beaches.
MCA Title	Coastal Zone Management
MCA ID	60001
Organization Type	State or U.S. Territorial government
Organization Name	State of Washington
Sub-Agency or Division	Washington State Department of Ecology, Coastal Zone Management Program
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL0B	Order 1b
Update Frequency	4-5 years	4-5 years	4-5 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable	Nice to have	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Nice to have	Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable	Highly desirable	Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Nice to have	Highly desirable
DTM	Required	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Nice to have	Nice to have	Nice to have	Highly desirable
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Nice to have
Tide Predictions			Highly desirable	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Highly desirable	Required	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Required
Nautical and/or navigation charts			Nice to have	Nice to have
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Highly desirable
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Highly desirable	Nice to have
Tide/wave heights			Highly desirable	Nice to have
Sea ice conditions			Not required	Nice to have
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Nice to have
Wetlands	Required	Highly desirable	Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Nice to have
Inland surface water features	Highly desirable	Highly desirable	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Highly desirable	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Moderate	Moderate
Cost savings/cost reduction	Moderate	Moderate	Moderate	Moderate
Cost avoidance	Major	Minor	Moderate	Minor
Increased revenues	None	None	None	None
Mission-driven performance improvements	Major	Moderate	Moderate	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Moderate	Minor

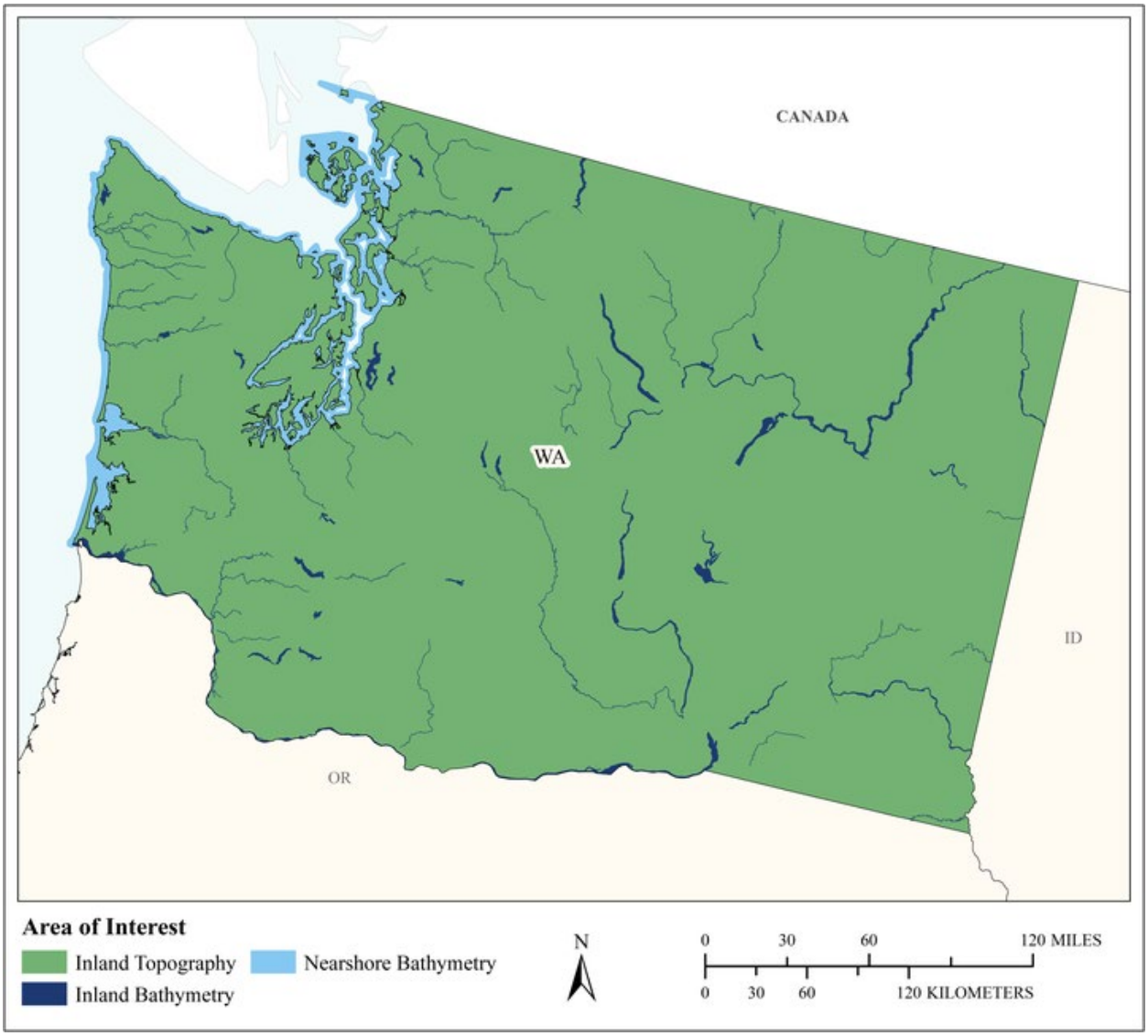
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	Moderate	Minor
Improved customer experience	Major	Moderate	Moderate	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Moderate	Minor
Environmental	Major	Moderate	Moderate	Moderate
Public safety, including life and property	Major	Moderate	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Increased revenues	None			None			Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,180,128		Annual dollars saved/ realized	$506,422		Annual dollars saved/ realized	$343,092		Annual dollars saved/ realized	$177,479
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$206,310		Annual dollars saved/ realized	$296,889		Annual dollars saved/ realized	$580,381		Annual dollars saved/ realized	$35,433
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Minor			Moderate			Minor		
Environmental	Major			Moderate			Major			Moderate		
Public safety, including life and property	Major			Moderate			Major			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Management and Health of State Trust Forest Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Management and health of state trust forest resources. DNR manages all forested lands (both for timber sales and health). DEM and DSM are needed to calculate stand height and volume, DEMs are needed for assessment of slope stability, road placement, and siting of bridges and culverts. May be able to identify species (future goal). Timber sales on state owned lands fund school construction. BU 26 – Education K12 and Beyond, Basic Research would be an additional Business Use.
MCA Title	Management and Health of State Trust Forest Resources
MCA ID	21695
Organization Type	State or U.S. Territorial government
Organization Name	Washington Department of Natural Resources
Sub-Agency or Division	
Organization Mission	In partnership with citizens and governments, the Washington State DNR provides innovative leadership and expertise to ensure environmental protection, public safety, perpetual funding for schools and communities, and a rich quality of life.
Program Name	Washington Department of Natural Resources Forest Resources Division
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	BU 07 - Wildlife and Habitat Management
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Individual trees

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL1B	QL2B	
Update Frequency	6-10 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Up to 2 meters	Up to 5 meters	
Acceptable Vertical Error	Less than 5 cm	Up to 30 cm	Up to 40 cm	
How far onshore needed				
How far down the beach profile needed	Below MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Not required		Highly desirable	Nice to have
Entire AOI under same environmental conditions	Required	Required	Highly desirable		Required	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Preference is to not manipulate datasets to fit others	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Not required	Not required	
DTM	Required	Not required	Not required	
DEM	Required	Required	Required	
Raw point cloud data	Required	Highly desirable	Required	
Classified point cloud	Required	Highly desirable	Required	
Edited/cube XYZ		Not required	Not required	
Full waveform	Nice to have	Nice to have	Not required	
Bathymetric Attributed Grid (BAG)		Nice to have	Not required	
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Not required	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Required	Highly desirable	Not required	
Ground control/ground truthing	Required	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Not required	
Subbottom characteristics			Not required	
Geologic and seismic data	Highly desirable	Not required	Not required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Not required	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Required	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Required	Required	Required	
Wetlands	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Nice to have	Not required	
Cultural resources	Required	Nice to have	Not required	
Coastal and riverine structures	Highly desirable	Required	Not required	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Best available lidar datasets, QL1 or better. Most recent dates available.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Washington lidar repository, Washington Geological Survey lidar portal			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	I don't know	
Cost savings/cost reduction	Major	Major	I don't know	

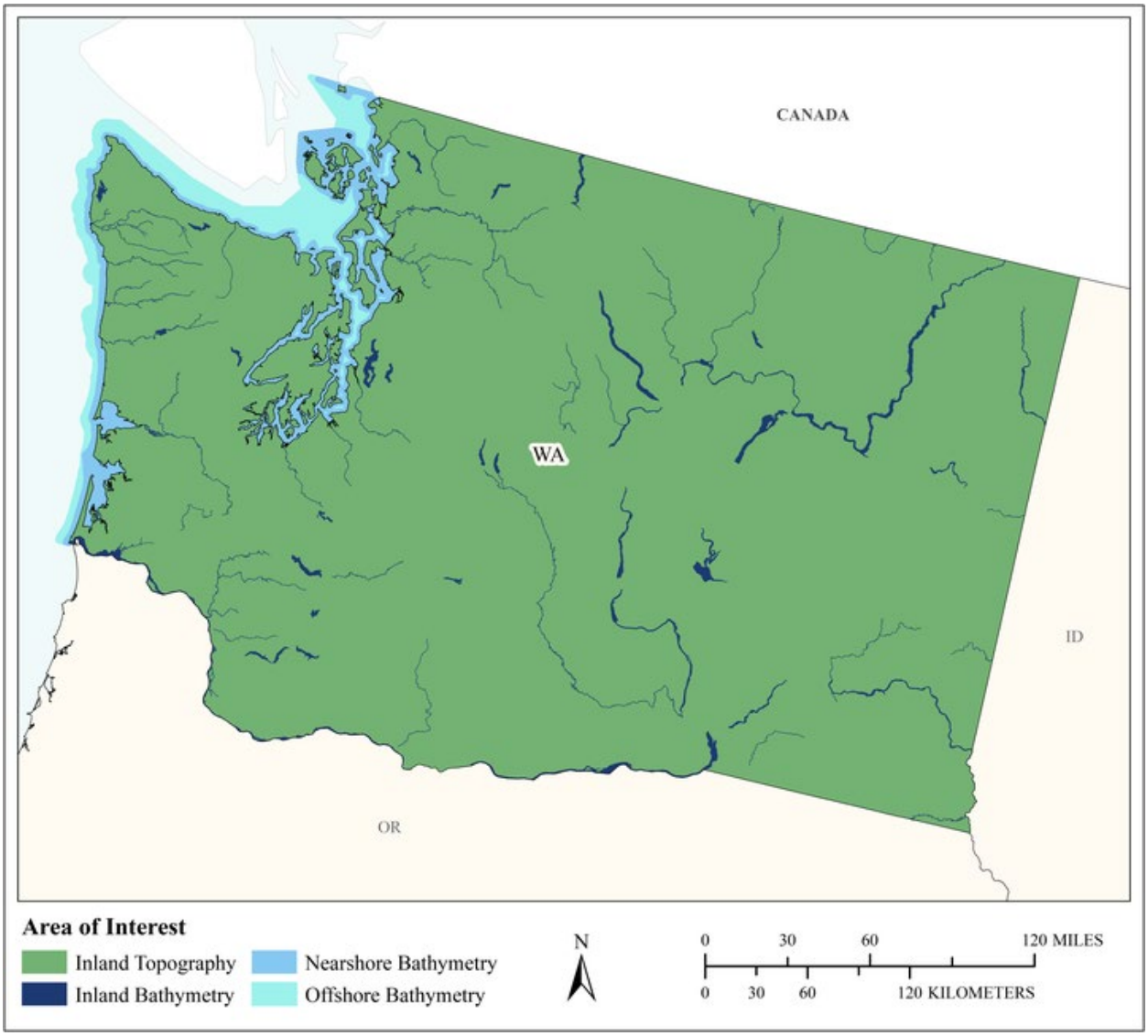
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost avoidance	Major	Major	I don't know	
Increased revenues	Major	Moderate	I don't know	
Mission-driven performance improvements	Major	Major	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	I don't know	
Improved response or timeliness	Major	Major	I don't know	
Improved customer experience	Major	Major	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major	Major	
Environmental	Major	Major	Major	
Public safety, including life and property	Major	Major	I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues description	For example: 3D topography leads to more accurate estimates of forest stand volumes for timber sales (to support trust lands).											
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Mission-driven performance improvements description	For example: 3D topography data (lidar) is already providing better decision-making tools for state trust lands with regards to timber sales.											
Future annual operational benefits added during validation		Annual dollars saved/ realized	$501,595									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Value added to products or services description	For example: potentially better maps for recreation on state trust lands, increased accuracy of state trust land boundaries and timber stands.											
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience description	For example: potentially better maps for recreation on state trust lands.											
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$387,207									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major					
Environmental	Major			Major			Major					
Public safety, including life and property	Major			Major			I don't know					
Public safety, including life and property description	For example: increased awareness and understanding of natural hazards on state trust lands											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes	Yes	
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes		Yes	
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Natural Resources Conservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation engineering. Soils and wetlands mapping and characterization. Modeling of biological and ecological systems. Erosion control. Rainfall penetration studies, impervious surfaces. Assessment of blue carbon stocks.
MCA Title	Natural Resources Conservation
MCA ID	60511
Organization Type	State or U.S. Territorial government
Organization Name	State of Washington
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	BU 05 - Rangeland Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B	QL1B	Cross sections and/or transects meet needs
Update Frequency	4-5 years	6-10 years	6-10 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				Yes
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Highly desirable	Required	Required	Required	Required
Entire AOI under same environmental conditions	Required	Required	Required	Required	Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Required	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Required	Required	Required	Required
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Highly desirable	Required	Highly desirable
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Nice to have	Highly desirable
Ground control/ground truthing	Required	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Nice to have	Required
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Highly desirable
Underwater videography			Nice to have	Highly desirable
Bottom texture			Nice to have	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Highly desirable	Highly desirable
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Nice to have	Highly desirable
Habitat distribution and classification			Required	Highly desirable
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Highly desirable
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates	Highly desirable	Required	Highly desirable	
Land use/land cover	Required	Required	Highly desirable	Nice to have
Wetlands	Required	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Highly desirable
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Nice to have	Highly desirable	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	Major
Cost savings/cost reduction	Major	Major	Minor	Major
Cost avoidance	Major	Moderate	Minor	I don't know
Increased revenues	Minor	Minor	None	I don't know
Mission-driven performance improvements	Major	Major	Moderate	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Moderate	Major

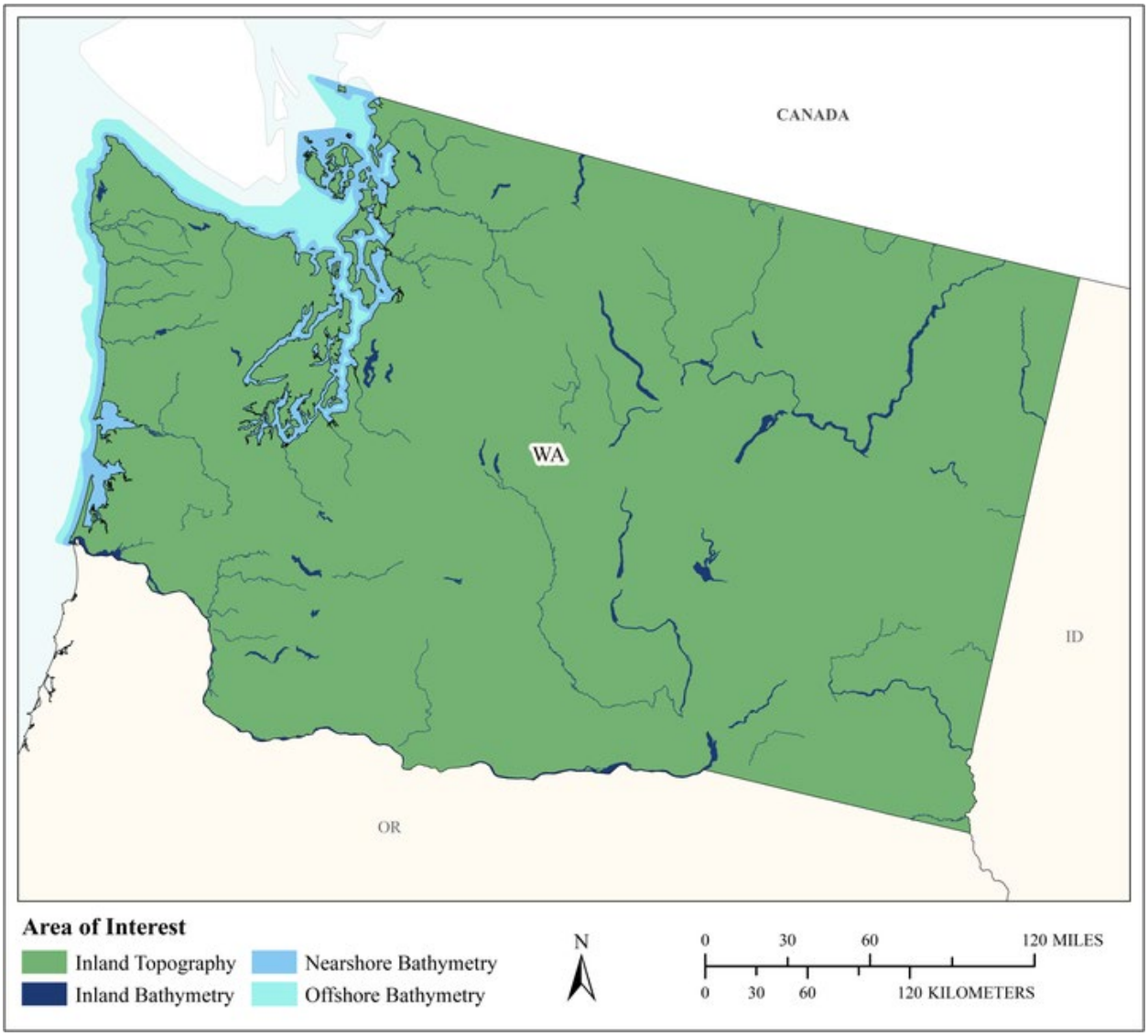
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major	Moderate	Major
Improved customer experience	Major	Moderate	Minor	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Moderate	Major
Environmental	Major	Major	Major	Major
Public safety, including life and property	Major	Moderate	Moderate	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		None			Moderate	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,649,809		Annual dollars saved/ realized	$359,151						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$9,730,907		Annual dollars saved/ realized	$16,168						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate			Moderate		
Environmental	Major			Major			Major			Major		
Public safety, including life and property	Major			Major			Moderate			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Wildlife and Habitat Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation planning for wildlife refuges and marine sanctuaries. Conservation of critical habitats. Management of diverse migratory bird habitats, coral reef and coral communities, marine mammals, protected fish species, and trust resources.
MCA Title	Wildlife and Habitat Management
MCA ID	60512
Organization Type	State or U.S. Territorial government
Organization Name	State of Washington
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B	QL0B	Special Order
Update Frequency	4-5 years	4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 2 meters	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DTM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Nice to have	Nice to have	Highly desirable
Classified point cloud	Highly desirable	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Highly desirable
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Highly desirable	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Not required	Nice to have
Lease areas			Not required	Nice to have
Fixed obstructions			Nice to have	Highly desirable
Floating observation/navigation systems			Nice to have	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Nice to have
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Highly desirable	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Nice to have	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Minor	Moderate
Cost savings/cost reduction	Major	Minor	Minor	Minor
Cost avoidance	Major	Minor	Moderate	Major
Increased revenues	None	Minor	None	None
Mission-driven performance improvements	Moderate	Moderate	Moderate	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate	Minor	Minor

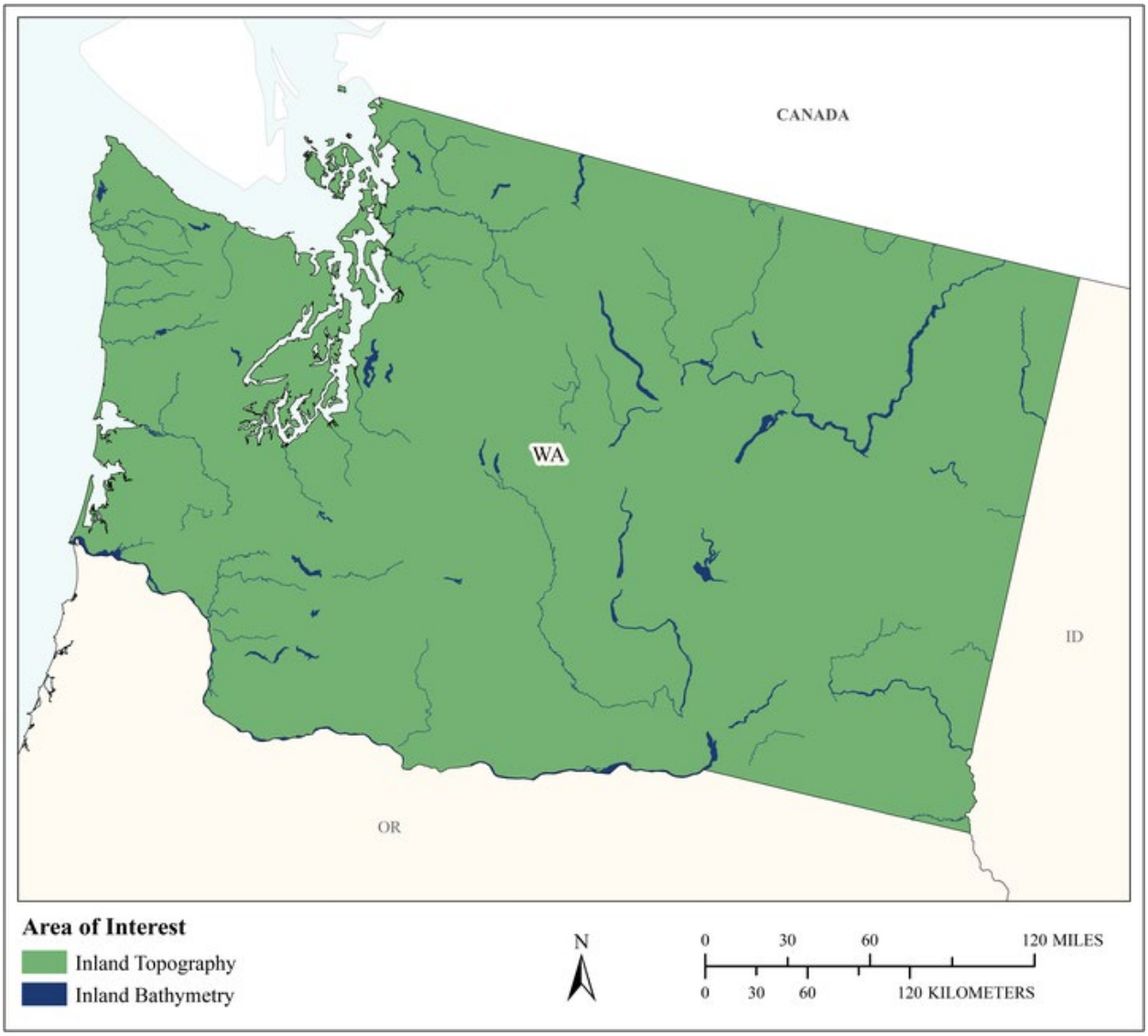
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Minor	Minor	Minor	Minor
Improved customer experience	Minor	Moderate	Minor	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Moderate	Minor	Minor
Environmental	Moderate	Moderate	Moderate	Major
Public safety, including life and property	Minor	Minor	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$16,092		Annual dollars saved/ realized	$128,969		Annual dollars saved/ realized	$1,516		Annual dollars saved/ realized	$2,235
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$46,480		Annual dollars saved/ realized	$77,954		Annual dollars saved/ realized	$89		Annual dollars saved/ realized	$155
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate			Moderate		
Environmental	Major			Moderate			Major			Major		
Public safety, including life and property	Moderate			Moderate			Moderate			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes			Yes
Curvature maps				
Cross sections	Yes			Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Agriculture and Precision Farming



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Farm pond design. Irrigation system design. Detailed site analysis to support precision farming. Analysis of farm sedimentation and runoff. Calibration of fertilizer application, fertilizer management, and irrigation planning. Optimized terraforming.
MCA Title	Agriculture and Precision Farming
MCA ID	60513
Organization Type	State or U.S. Territorial government
Organization Name	State of Washington
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 08 - Agriculture and Precision Farming
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Nice to have
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL4B		
Update Frequency	2-3 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 10 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 50 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required			Not required	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Not required	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Not required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level			Up to double the required TVU at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Nice to have	Nice to have		
Edited/cube XYZ		Highly desirable		
Full waveform	Nice to have	Highly desirable		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Required	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Highly desirable		
Land use/land cover	Highly desirable	Required		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Nice to have	Required		
Cultural resources	Nice to have	Highly desirable		
Coastal and riverine structures	Highly desirable	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	None		
Cost savings/cost reduction	Major	I don't know		
Cost avoidance	Major	Moderate		
Increased revenues	None	I don't know		
Mission-driven performance improvements	Moderate	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None		

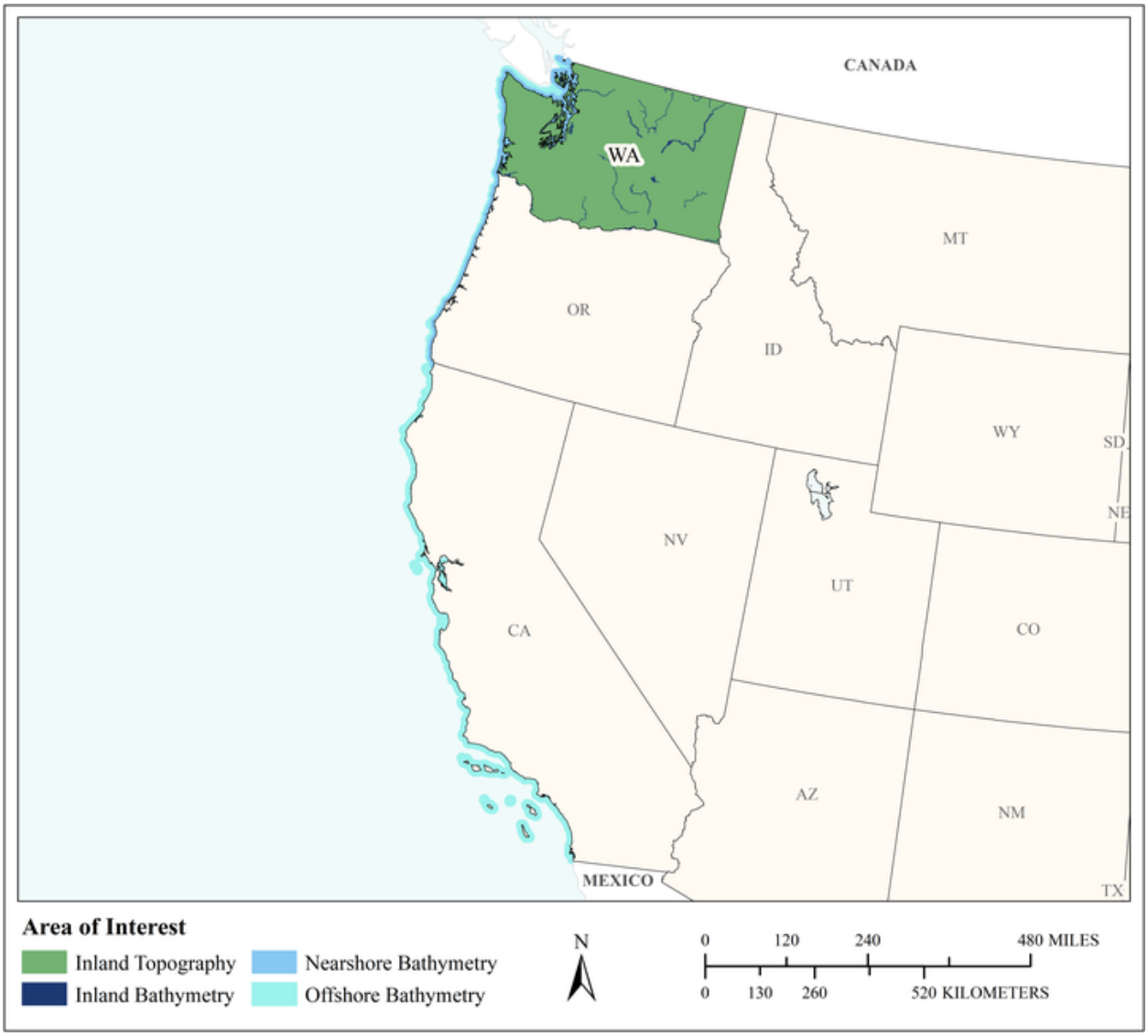
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	None		
Improved customer experience	Moderate	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	None		
Environmental	Major	I don't know		
Public safety, including life and property	Moderate	I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate								
Environmental	Major			Major								
Public safety, including life and property	Minor			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps				
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps		Yes		
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Fish and Wildlife Conservation and Protection



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Custom description	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements			HUC2 17	

MCA Description	Response
Mission Critical Activity	Washington Department of Fish and Wildlife (WDFW) has a wide range of mission critical activities. We: Conserve and protect native fish and wildlife. Provide sustainable fishing, hunting, and other wildlife-related recreational and commercial experiences. Promote a healthy economy, protect community character, maintain an overall high quality of life, and deliver high-quality customer service. WDFW has a broad mission that covers the state's lands, rivers and waterbodies, and nearshore and offshore areas plus the areas outside the state that are have an influence on animals and their habitats.
MCA Title	Fish and Wildlife Conservation and Protection
MCA ID	21551
Organization Type	State or U.S. Territorial government
Organization Name	Washington Department of Fish and Wildlife
Sub-Agency or Division	
Organization Mission	To preserve, protect and perpetuate fish, wildlife and ecosystems while providing sustainable fish and wildlife recreational and commercial opportunities.
Program Name	WDFW has three major programs: Fish Program, Wildlife Program, and Habitat Program. We also have an Enforcement Program that works with the other three programs.
Total Annual Program Budget	
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	BU 07 - Wildlife and Habitat Management
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	It varies from individual feature to the full state offshore area.
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Large features were the most frequent answer among those polled at WDFW although some people do work with small features. The features we are interested in typically involve animal habitats and structures that can impact habitats.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL0B	Special Order
Update Frequency	2-3 years	6-10 years	I don't know, depends on frequency of change in features.	I don't know yet the features of interest are not likely to change frequently (i.e. rocky reefs)
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	The best horizontal accuracy achievable for the vertical accuracy I need	I don't know	I don't know
Acceptable Vertical Error	Up to 20 cm	I don't know	I don't know	I don't know
How far onshore needed			>1 kilometer inland	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			I don't know	I don't know
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Highly desirable

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Not required	Not required	Highly desirable	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Not required	Not required	Highly desirable	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Required	Highly desirable	Highly desirable
Raw point cloud data	Nice to have	Highly desirable	Highly desirable	Highly desirable
Classified point cloud	Nice to have	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Highly desirable	Highly desirable
Full waveform	Nice to have	Highly desirable	Highly desirable	Highly desirable
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	Highly desirable
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Highly desirable	Nice to have	Highly desirable
Underwater videography			Nice to have	Highly desirable
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Not required
Offshore cadastral			Nice to have	Highly desirable
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Highly desirable
Floating observation/navigation systems			Nice to have	Highly desirable
Shorelines – current, historic, change rates	Required	Highly desirable	Highly desirable	
Land use/land cover	Required	Nice to have	Nice to have	Highly desirable
Wetlands	Required	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Highly desirable	Nice to have	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			
Other			Required	
Other description			Responder is not expert in these importance rating- the goal is to have habitat maps.	

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	10-meter DEM 1-meter LIDAR, highest hit	Incomplete state-wide bathymetric contour map based on surveys published in the 1970 plus ad-hoc data from public utility districts (PUDs), where available	The best available data is a seafloor habitat map led by Oregon State University.	The best available data is a seafloor habitat map led by Oregon State University.
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes		Yes	

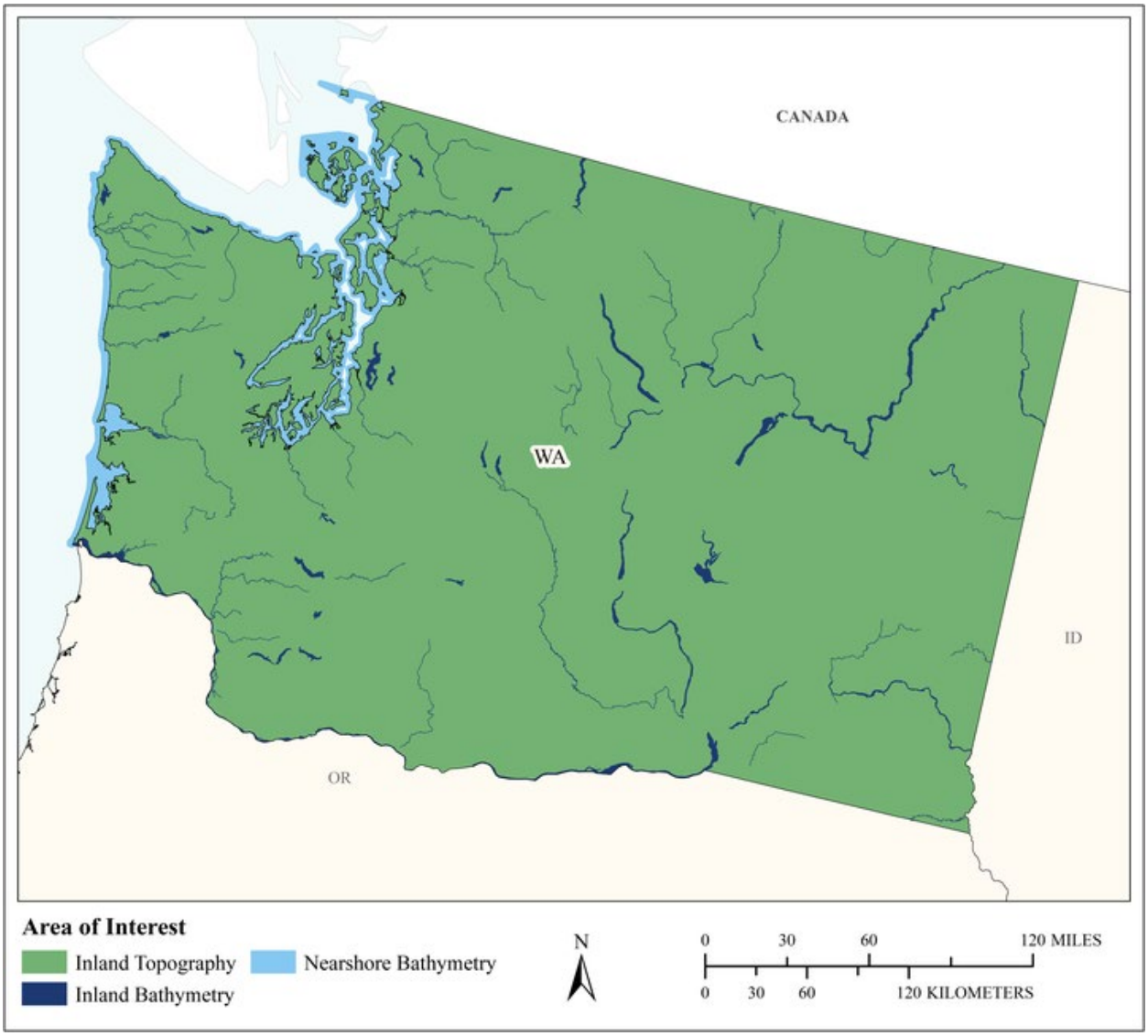
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State repositories used	We have an agency repository called GeoLib. We also rely on the resources of other state agencies, Department of Natural Resources and Department of Ecology.		Agency specific repositories.	
Other	Yes	Yes		Yes
Other description	Puget Sound LIDAR Consortium	I don't know.		Various portals
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	I don't know	I don't know	Moderate
Cost savings/cost reduction	Major	I don't know	I don't know	I don't know
Cost avoidance	Major	I don't know	I don't know	I don't know
Increased revenues	I don't know	I don't know	I don't know	I don't know
Mission-driven performance improvements	Major	I don't know	I don't know	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	I don't know	I don't know	Moderate
Improved response or timeliness	Moderate	I don't know	I don't know	Moderate
Improved customer experience	I don't know	I don't know	I don't know	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	I don't know	I don't know	Moderate
Environmental	Major	I don't know	I don't know	Moderate
Public safety, including life and property	I don't know	I don't know	I don't know	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Increased revenues	Moderate	Unable to provide		I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$69,057		Annual dollars saved/ realized	$135,176		Annual dollars saved/ realized	$240,645			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$149,998		Annual dollars saved/ realized	$61,524		Annual dollars saved/ realized	$17,673			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know			Major			Major		
Environmental	Moderate			Major			Major			Major		
Public safety, including life and property	Moderate			I don't know			I don't know			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes	Yes	Yes	Yes
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes	Yes	Yes	Yes
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes	Yes	Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Tsunami, Landslide, and Other Hazard Risk Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Tsunami risk identification, mapping, preparedness, and mitigation. Landslide risk identification, and mitigation. Hazard mitigation planning. We need better elevation data to improve the quality of our hazard and risk assessments, land use codes, evacuation maps, mitigation action identification, and the effectiveness of this data in convincing local partners of the risk and the importance of personal preparedness and mitigation.
MCA Title	Tsunami, Landslide, and Other Hazard Risk Management
MCA ID	1173
Organization Type	State or U.S. Territorial government
Organization Name	Washington State Emergency Management Division
Sub-Agency or Division	
Organization Mission	The Washington Emergency Management Division leads and coordinates mitigation, preparedness, response and recovery in Washington State to minimize the impact of disasters and emergencies on the people, property, environment and economy.
Program Name	Hazard Mitigation Planning Program, Tsunami Program Geologic Hazards Program, Public Outreach Infrastructure and Private Sector Program
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Tertiary Business Use	BU 16 - Sea Level Rise and Subsidence

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Buildings

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL2B	
Update Frequency	>10 years	>10 years	>10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	I don't know	I don't know	I don't know	
Acceptable Vertical Error	I don't know	I don't know	I don't know	
How far onshore needed			To the fall line	
How far down the beach profile needed	To MHW		To MHW	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required	Not required		Not required	Not required
Entire AOI under same environmental conditions	Nice to have	Nice to have	Not required		Not required	Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Highly desirable	Nice to have		Highly desirable	Not required
DEM for entire AOI needs to be seamless	Nice to have	Highly desirable	Nice to have		Highly desirable	Not required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Nice to have	Highly desirable	
DTM	Highly desirable	Nice to have	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Nice to have	Nice to have	
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Highly desirable	Nice to have	
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Not required	Highly desirable	Not required	
Ground control/ground truthing	Highly desirable	Nice to have	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Not required	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Highly desirable	Not required	Highly desirable	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Not required	
Submerged features			Not required	
Subbottom characteristics			Not required	
Geologic and seismic data	Required	Highly desirable	Required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Highly desirable	
Sea ice conditions			Not required	
Habitat distribution and classification			Not required	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Highly desirable	Highly desirable	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Nice to have	
Cultural resources	Highly desirable	Highly desirable	Nice to have	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We are currently using the original 30M DEM supplemented with locally-produced LIDAR of at least 10M quality.	DEM's from the army corps of engineers and depth grids.	USACE	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes	Yes	
State repositories used	WA Department of Natural Resources	DNR	WA Department of Natural Resources	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None	None	None	
Cost savings/cost reduction	None	None	None	
Cost avoidance	None	None	None	

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	Moderate	Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	
Improved response or timeliness	Minor	None	None	
Improved customer experience	Major	Major	Major	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major	Major	
Environmental	Moderate	None	Major	
Public safety, including life and property	Major	Major	Major	

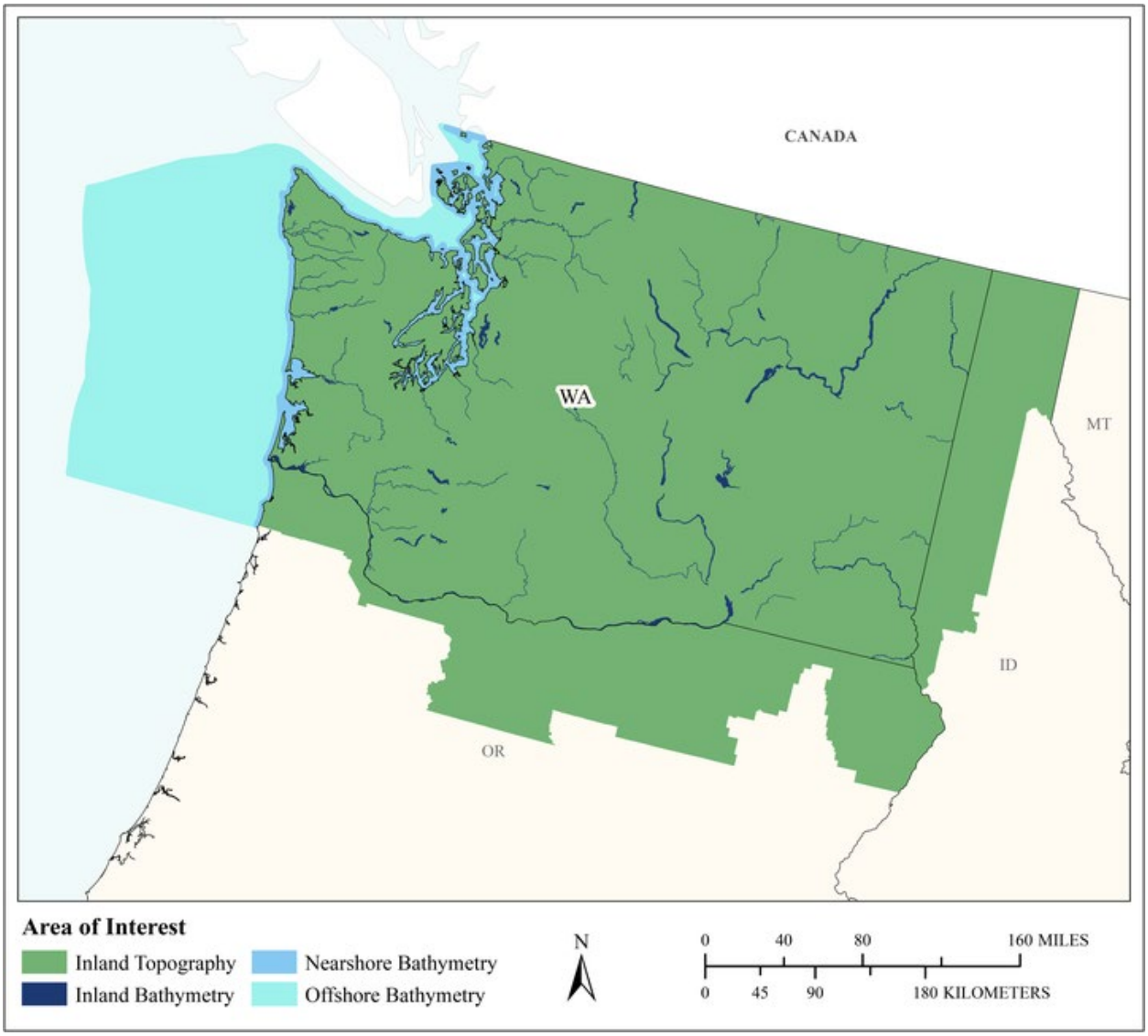
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		Major	Unable to provide		None					
Cost savings/cost reduction	Major	Unable to provide		None			None					
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	None			None			None					
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Other operational benefits	Major	Unable to provide										
Other operational benefits description	Also improves the quality of products used in education and outreach to coastal communities. Improved risk assessments leading to better land use decisions and mitigation measures.											
Future annual operational benefits added during validation		Annual dollars saved/ realized	$7,130,374		Annual dollars saved/ realized	$94,385		Annual dollars saved/ realized	$59,073			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Value added to products or services description	Improved mapping and risk assessment assets.			Improved coastal flooding and tsunami hazard maps.			Improved hazard maps and evacuation maps.					
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness description	Improved risk assessments at the state and local level. Improved tsunami evacuation routes and route mapping. Improved support for local jurisdictions using our products.			Faster port opening, better prioritization. Improved support for response and recovery missions and better information on damage locations. Improved evacuation and risk maps and assessments.			Response prioritization.					
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience description	Improved data leading to significantly improved customer acceptance of products. Data would be added to state web portals.			Much better acceptance of mapping and risk information.			Improved accuracy leading to better acceptance of products.					
Other customer service benefits				Major	Unable to provide							
Other customer service benefits description				Much better acceptance of mapping and risk information.								
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$125,173		Annual dollars saved/ realized	$103,714		Annual dollars saved/ realized	$95,046			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major					
Education or outreach description	Improved data leading to significantly improved customer acceptance of products.			Much better acceptance of mapping and risk information. Much better acceptance of mapping and risk information.								
Environmental	Moderate			None			Major					
Public safety, including life and property	Major			Major			Major					

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Public safety, including life and property description	Better damage and fatality projections leading to improved response/recovery planning.	Better data leading to improved land use decision-making.		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes	Yes	
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes	Yes	Yes	
Viewshed maps				
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement	Yes		Yes	
Rugosity/Surface Roughness		Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Geological Mapping and Geologic Hazard Identification



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Custom description	One or more states, territories, or counties	Custom description	Custom description
Sub Area Requirements	Washington and one county into neighboring states		Washington and one county into Oregon	Out to 100 miles to Cascadian subduction zone, including 1st county in Oregon

MCA Description	Response
Mission Critical Activity	Geological mapping and geologic hazard identification. Tsunami modeling, fault mapping, coastal erosion and flooding. Ecology group collects data, DNR would use data. Shoreline change is tracked annually for local planning using bathymetry and topographic data. The data are needed to map the beach profile and identify areas of accretion/retreat, nearshore substrate change, and sediment movement. BU 26 – Education K12 and Beyond, Basic Research would be an additional Business Use.
MCA Title	Geological Mapping and Geologic Hazard Identification
MCA ID	21543
Organization Type	State or U.S. Territorial government
Organization Name	Washington Department of Natural Resources
Sub-Agency or Division	
Organization Mission	In partnership with citizens and governments, the Washington State DNR provides innovative leadership and expertise to ensure environmental protection, public safety, perpetual funding for schools and communities, and a rich quality of life.
Program Name	The Washington Geological Survey
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 11 - Geologic Resource Mining and Extraction
Tertiary Business Use	BU 03 - Coastal Zone Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Vertical offsets of a few centimeters, such as small fractures or scarps (for example, on landslides).

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Not required
51 - 100 ft	Nice to have

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B	QL2B	Special Order
Update Frequency	6-10 years	>10 years and certain events.	>10 years and certain events.	>10 years and certain events.
Event type(s)		A landslide offshore of a lake that disturbs the lake or river, or a dam breach or break.	A landslide, earthquake, or volcanic eruption.	A landslide, earthquake, or volcanic eruption.
Quality Level and/or update frequency variability across AOI			We may require variable quality levels depending on events: tsunami modeling, hazard events, or fault mapping. Tsunami models require finer data in nearshore areas than offshore.	Tsunami modeling may require variable IHO orders. Tsunami models require finer data in nearshore areas than offshore.
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need
Acceptable Vertical Error	Up to 10 cm	Up to 40 cm	Up to 40 cm	Less than 1 meter
How far onshore needed			>1 kilometer inland	
How far down the beach profile needed	Below MLLW		To MLLW	
Tide correction requirement			NAVD88	NAVD88
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable

Hydrologic Processing Required	Response
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required	Not required	Not required	Highly desirable	Not required
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Nice to have	Nice to have	Nice to have	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Required	Required
DTM	Required	Required	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Not required	Not required	Not required	Not required
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Not required	Not required	Not required
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	Required
Tide Predictions			Highly desirable	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Nice to have
Intensity imagery/sidescan imagery	Required	Required	Required	Required
Ground control/ground truthing	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Required	Highly desirable	Highly desirable
Underwater videography			Nice to have	Nice to have
Bottom texture			Required	Required
Bottom type			Required	Required
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Required	Required	Required	Required
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Required	Required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Highly desirable	Highly desirable
Routes			Highly desirable	Highly desirable
Offshore cadastral			Not required	Not required
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Highly desirable	Highly desirable	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We are using the Washington state repository of lidar data, which consists of data from 2002 to present, with variable quality levels from QL1, QL2, or lower. We primarily use the state repository of lidar data, collected from 2002 to present. The Quality Level is variable, from QL1 to QL2 or less.	Typically we use bathymetric lidar data or sonar data. We have collected bathymetric lidar data on inland rivers. Quality levels are QLB 0 or QLB2 (better than 2 pts/square meter)	Washington state lidar (bathymetric) repository. This data is primarily from 2010 to current. Sonar bathymetric data or national bathymetric data may also be used for tsunami modeling. The quality level is QL2 or less.	Digital Coast or other national repositories, or data reprocessed by other agencies. IHO Order is unknown - generally the data is reprocessed to be included with coastal topographic data for tsunami modeling.
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	Yes
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes	Yes	

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State repositories used	The Washington State lidar repository, Oregon Department of Geology and Mineral Industries (DOGAMI), Washington Department of Natural Resources, Department of Geology and Mineral Industries (Oregon state repository).	Washington state lidar repository or Washington Dept. of Ecology	Washington state repository	
Other	Yes			
Other description	Puget Sound Lidar Consortium			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Major	Major
Cost savings/cost reduction	Moderate	None	None	None
Cost avoidance	Major	None	None	None
Increased revenues	None	None	None	None
Mission-driven performance improvements	Major	Minor	Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	Major
Improved response or timeliness	Major	Major	Major	Major
Improved customer experience	Major	Major	Major	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major	Major	Major
Environmental	Major	Major	Major	Major
Public safety, including life and property	Major	Major	Major	Major
Other Current Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other	Major			
Other description	Increased service reputation			

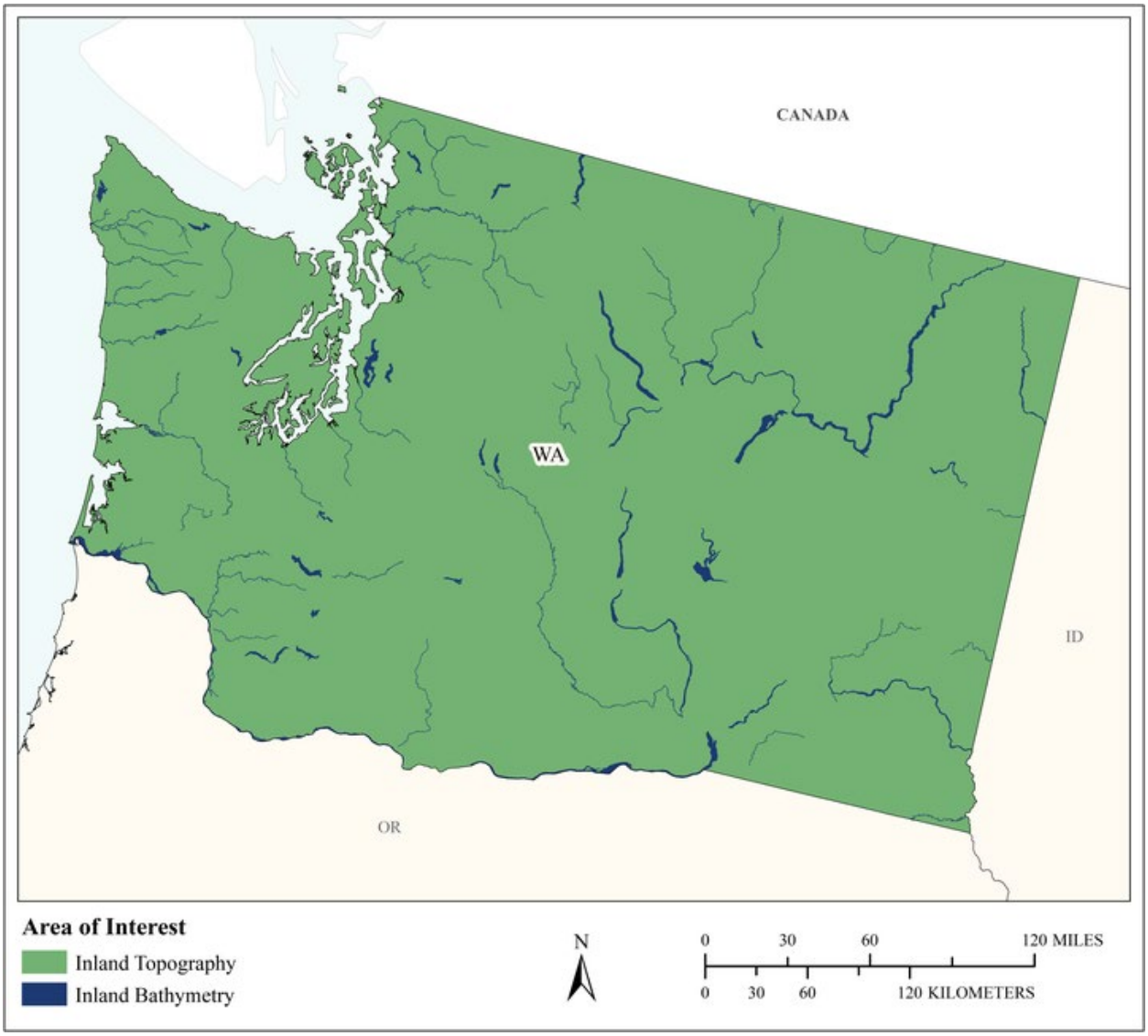
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$259,290	Major	Unable to provide		Major	Annual dollars saved/realized	$1,206	Major	Unable to provide	
Time savings description	Conservative estimate. Time saved for modelling and data dissemination. Conservative estimate. Hours saved planning field work or inspections. Faster or reduced field work for our geologic mapping and landslide teams. We may actually do more data manipulation in preparation of modeling. Estimate of hours saved for mine permitting processes.			We may end up doing more data manipulation to prepare for modeling or mapping, but cannot currently estimate. Currently, we are not doing much with inland bathymetry because we do not have much, but this would be an important improvement in the future.			Expected benefits from reduced landslide mapping errors. Improved nearshore 3D bathymetry may greatly improve tsunami modeling and mapping products. Expected benefits for more streamlined workflow for tsunami modeling. Conservative estimate. Currently, we do inspect landslides in the nearshore environment. Improved nearshore bathymetry would likely reduce field inspections. Expected benefits from reduced tsunami or hazard program planning. We would likely do more data manipulation to prepare for modeling tasks.			More efficient workflow for tsunami modeling and map production. More efficient tsunami modeling and data dissemination. Example: reduced data errors in tsunami modeling. We may likely do more data manipulation for modeling efforts. Expected benefits for landslide and tsunami in-office project planning.		
Cost savings/cost reduction	Major	Annual dollars saved/realized	$500,000	Major	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Cost savings/cost reduction description	If the need was present, there would be higher costs on surveying, aerial imagery, or drilling. This is estimated from drilling costs and materials - 3D topography translates into less drilling needed.			Current methods to collect inland bathymetry are prohibitive, 3D inland bathymetry would change this.								
Cost avoidance	Major	Annual dollars saved/realized	$110,000,000	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost avoidance description	Potential cost avoidance. For example, Aldercrest Banyon landslide cost $110 million for property damage. Errors in landslide detection errors continues to be a huge cost (millions), and with 3D topography this cost is being mitigated. Avoided accidents for our field crews and technicians. We have done more data processing currently, and expect to do more in the future.			We could potentially avoid hazardous situations for our field crews. We would likely spend more time processing data. Landslides into lakes and rivers have huge potential in Washington, more work to catalog past events and the bathymetry would help avoid these costs.			Coastal landslides are a large hazard in the state that we currently inventory and track, and will likely do so in the future. Potential reduced accidents for field crews. We would likely do more data processing (quality control, custom products).			Landslides have the potential to reach offshore areas (deeper than 10m), tsunami modeling. We would likely do more data processing and quality control.		
Increased revenues	None			None			None			None		
Mission-driven performance improvements	Major	Annual percent improvement	95%	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Mission-driven performance improvements description	Benefits have already been realized and we expect this to continue. There is a huge increase in decision making, particularly for landslide detection and mitigation efforts. This will continue. It is state law that our agency collect, disseminate and use 3D topography data.			Currently, most data collection for bathymetry is cost prohibitive, but we would realize large gains in effectiveness if we could expand work.			Increased nearshore 3D bathymetric information would increase our program effectiveness to provide this information to the public. Mapping tsunami, faults, and landslide hazards are a large part of our mission critical activity. Increased bathymetric data in the nearshore environment would improve our ability to provide information regarding these hazards. Improved decision making for tsunami and landslide hazards is expected to be a large benefit from increased nearshore bathymetric data.			Landslide mapping and tsunami mapping in the offshore environment will help carry our mission to deliver information do decision makers in these communities. The data and modeling provided will ultimately lead to improved decision making for coastal communities. Improved tsunami modeling and landslide mapping would greatly increase program effectiveness.		
Future annual operational benefits added during validation					Annual dollars saved/ realized	$94,385		Annual dollars saved/ realized	$57,891		Annual dollars saved/ realized	$3,385,941
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Value added to products or services description	We have developed a lidar portal application and other GIS services.			The increase value in hazard maps for landslides along rivers and lakes would be a large improvement. We probably would develop a new portal/service if there were more data and opportunity.			Expected increase in accuracy to tsunami modeling, inundation and evacuation maps. We would likely add, or at least add on, to current applications to provide the data.			Our agency would likely add or make new products, publications, or online services. Updated/new offshore bathymetric data would increase the accuracy of the tsunami modeling publications and landslide inventories.		
Improved response or timeliness	Major	Annual dollars saved/realized	$890,450	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness description	This estimate is derived from costs for lidar data in a county/region, multiplied by estimated FEMA mitigation costs realized for having 3D toporaphy data. The agency has greatly improved landslide mapping and tsunami risk maps. Having 3D topography has increased response time during an event, particularly landslide events, but difficult to estimate. Estimated from the number of hours saved in reviewing mine permit applications. 3D topography has and will continue to provide improved projections of tsunami inundation areas and potential landslide risks.			There is high potential for landslides or other hazards in lakes and rivers, better 3D bathymetry would help recovery time. There is high potential for landslides or other hazards in lakes and rivers, better 3D bathymetry would help response. 3D bathymetry would help improve predictions of landslide potential near lakes and rivers. Few mine permit locations are along lakes and/or major rivers.			There are few permitting boundaries along the nearshore, benefits are expected to be moderate. Currently, providing tsunami models, inundation maps and evacuation maps is a significant part of our mission critical activity. Any increase or improvement will provide large customer and public benefits. Expected faster recovery time to nearshore tsunami and landslide events. Improved and up-to-date products for tsunami inundation and evacuation maps, as well as nearshore landslide inventories. Expected faster response time to nearshore tsunami and landslide events.			Improved tsunami inundation maps, offshore fault maps, and any offshore landslide mapping. Faster response to a natural hazard event (for example: landslide or tsunami). Faster recovery from a natural hazard event. Better/up-to-date tsunami inundation maps, offshore fault maps, and potentially landslide inventories.		
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience description	Our agency has created an online lidar portal and tools for download. Our customers have so far greatly appreciated the lidar portal and will likely continue to use it in the future.			We would make 3D bathymetry available for download (the few areas we do have data are made available). We expect 3D bathymetry would increase customer confidence in certain areas/locations within the state. We would likely add services and applications that would increase the value for the customer.			The agency may be able to provide new services, or at least build upon current applications and services. Increased data availability and accuracy is expected to increase customer confidence. Data would be provided through either the agency lidar portal or the aquatic data portal. Currently, little of the data is available, and any new data would be made available.			We would add the data to either the lidar portal or potentially to an online aquatic division map service. Our agency would likely develop or add new applications to existing portals.		
Other customer service benefits	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Other customer service benefits description	Similar to a question above, but not only have customers increased their confidence, our agency has become an authoritative leader in certain aspects of our mission. Increased service reputation.						Our agency is becoming an authoritative leader for tsunami, landslide, and fault mapping. Increased data and accuracy is expected to continue this trend, as well as our agency's ability to deliver critical data. Increased service reputation.			Our agency is becoming an authoritative leader for tsunami, landslide, and fault mapping. Increased data and accuracy is expected to continue this trend, as well as our agency's ability to deliver critical data. Increased service reputation.		
Future annual customer service benefits added during validation					Annual dollars saved/ realized	$103,714		Annual dollars saved/ realized	$95,046			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major			Major		
Education or outreach description	We currently use and will continue to use 3D topography to make education products and materials			We expect that 3D inland bathymetry data would be used in education and outreach products			Increased public outreach regarding nearshore hazards			Our agency would provide data, publications and information for tsunamis and offshore hazards		
Environmental	Major			Major			Major			Major		
Environmental description	Increased knowledge of environmental hazards and risks will lead to better decisions on how to mitigate those risks											
Public safety, including life and property	Major			Major			Major			Major		
Public safety, including life and property description	3D topography greatly informs the risk of geologic hazards to the public and property, disseminating that information has and will continue to have huge societal benefits			The public safety issue from landslides along lakes and rivers is big concern. Inclusion of inland 3D bathymetry data could really improve our understanding of the risks as well as provide products to counties and individual customers to help understand those risks.			The increase awareness of coastal and nearshore hazards by the public and decision-makers is expected to be a huge benefit			The public safety aspect is very important for the agency, providing data to help decision makers protect public and property		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes	Yes	Yes	Yes
Curvature maps	Yes	Yes	Yes	Yes
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps	Yes	Yes	Yes	Yes
Viewshed maps	Yes	Yes	Yes	Yes
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes	Yes	Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Geologic Resource Mining and Extraction



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Onshore or offshore mineral extraction. Monitoring sand as a local resource. Seabed resources. Open mine volume computations. Stockpile analysis. Environmental impact assessment and site restoration. Topography is used for regulating and within the industry.
MCA Title	Geologic Resource Mining and Extraction
MCA ID	60514
Organization Type	State or U.S. Territorial government
Organization Name	Washington Department of Natural Resources
Sub-Agency or Division	Washington Geological Survey
Organization Mission	In partnership with citizens and governments, the Washington State DNR provides innovative leadership and expertise to ensure environmental protection, public safety, perpetual funding for schools and communities, and a rich quality of life.
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 11 - Geologic Resource Mining and Extraction
Secondary Business Use	BU 13 - Oil and Gas Resources
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B		
Update Frequency	2-3 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Nice to have			Nice to have	
DEM for entire AOI needs to be seamless	Highly desirable	Nice to have			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Highly desirable		
Raw point cloud data	Nice to have	Highly desirable		
Classified point cloud	Highly desirable	Nice to have		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Highly desirable		
Ground control/ground truthing	Nice to have	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Highly desirable		
Land use/land cover	Nice to have	Not required		
Wetlands	Nice to have	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Nice to have		
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Nice to have	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Moderate	Moderate		
Cost avoidance	Moderate	Moderate		
Increased revenues	None	None		
Mission-driven performance improvements	Moderate	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	None		

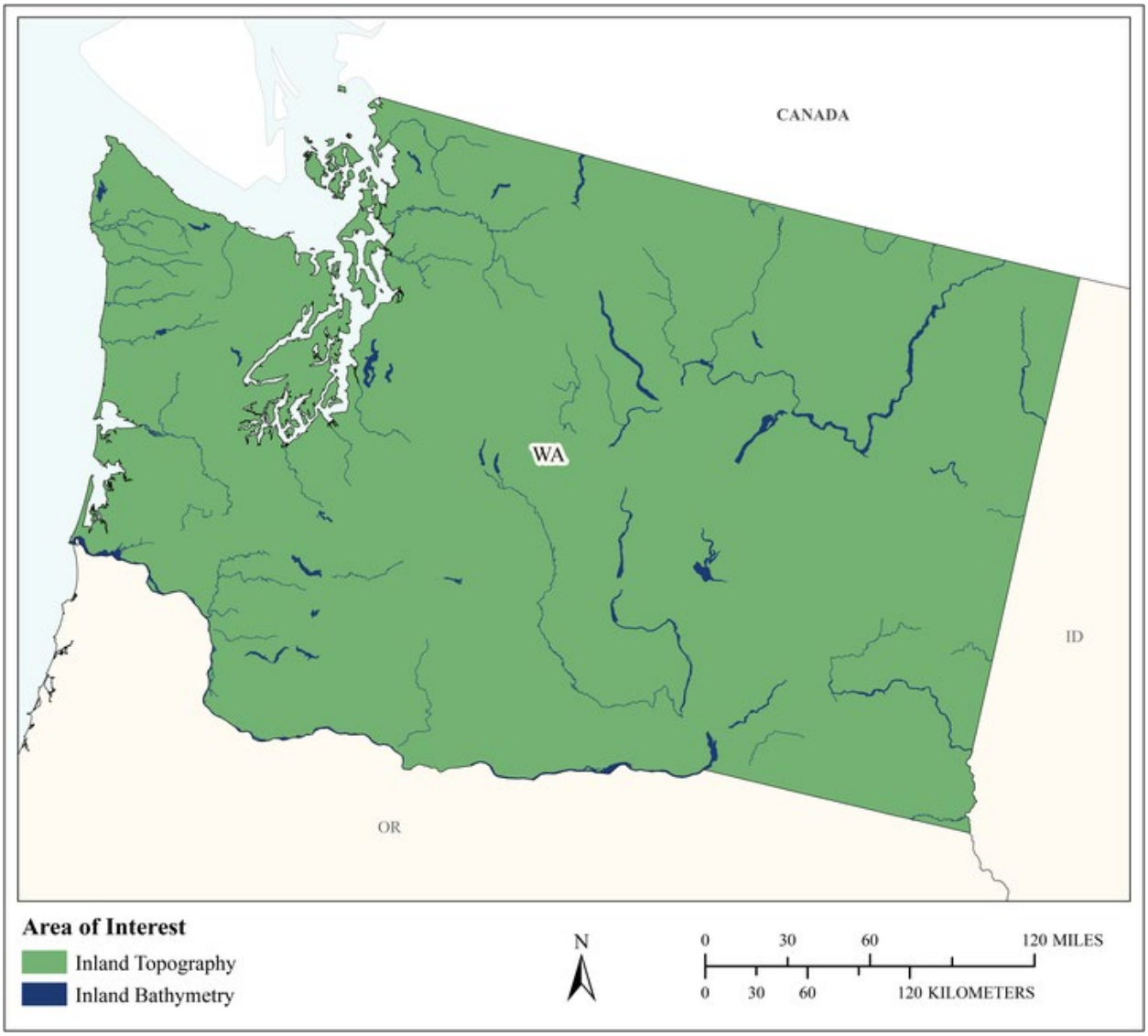
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	None		
Improved customer experience	Moderate	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	None		
Environmental	Major	Minor		
Public safety, including life and property	Moderate	None		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide							
Cost savings/cost reduction	Minor	Unable to provide		Minor	Unable to provide							
Cost avoidance	Minor	Unable to provide		Moderate	Unable to provide							
Increased revenues	None			None								
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$16,502									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide		None								
Improved response or timeliness	Major	Unable to provide		Minor	Unable to provide							
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$10,946		Annual dollars saved/ realized	$1,128						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			None								
Environmental	Major			Minor								
Public safety, including life and property	Major			Minor								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Renewable Energy Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Alternate energy development – solar, tidal, wind, wave, and ocean current. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Low head power potential for hydropower. Geothermal Exploration. Topography is used for planning for geothermal.
MCA Title	Renewable Energy Resources
MCA ID	60515
Organization Type	State or U.S. Territorial government
Organization Name	State of Washington
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	I don't know
Rivers and Streams	
Less than 10 ft	I don't know
10 - 50 ft	I don't know
51 - 100 ft	I don't know
101 - 500 ft	I don't know
501 - 2,500 ft	I don't know
Greater than 2,500 ft	I don't know
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	I don't know
½ - 1 acre	I don't know
1.1 – 2 acres	I don't know

Inland Bathy Feature Size Requirements	Response
2.1 – 5 acres	I don't know
5.1 – 10 acres	I don't know
Greater than 10 acres	I don't know

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	I don't know		
Update Frequency	6-10 years	I don't know		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	I don't know		
Acceptable Vertical Error	Up to 20 cm	I don't know		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					I don't know	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	I don't know			I don't know	
Entire AOI under same environmental conditions	Highly desirable	I don't know			I don't know	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	I don't know			I don't know	
DEM for entire AOI needs to be seamless	Highly desirable	I don't know			I don't know	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	I don't know		
DTM	Required	I don't know		
DEM	Required	I don't know		
Raw point cloud data	Highly desirable	I don't know		
Classified point cloud	Highly desirable	I don't know		
Edited/cube XYZ		I don't know		
Full waveform	Nice to have	I don't know		
Bathymetric Attributed Grid (BAG)		I don't know		
Breaklines required for standard hydro-flattening	Nice to have	I don't know		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	I don't know		
Ground control/ground truthing	Highly desirable	I don't know		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	I don't know		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	I don't know		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	I don't know		
Land use/land cover	Highly desirable	I don't know		
Wetlands	Nice to have	I don't know		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have	I don't know		
Bridges/culverts	Nice to have	I don't know		
Landmark features	Nice to have	I don't know		
Cultural resources	Not required	I don't know		
Coastal and riverine structures	Nice to have	I don't know		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	I don't know		
Cost savings/cost reduction	Moderate	I don't know		
Cost avoidance	Moderate	I don't know		
Increased revenues	None	I don't know		
Mission-driven performance improvements	Minor	I don't know		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	I don't know		

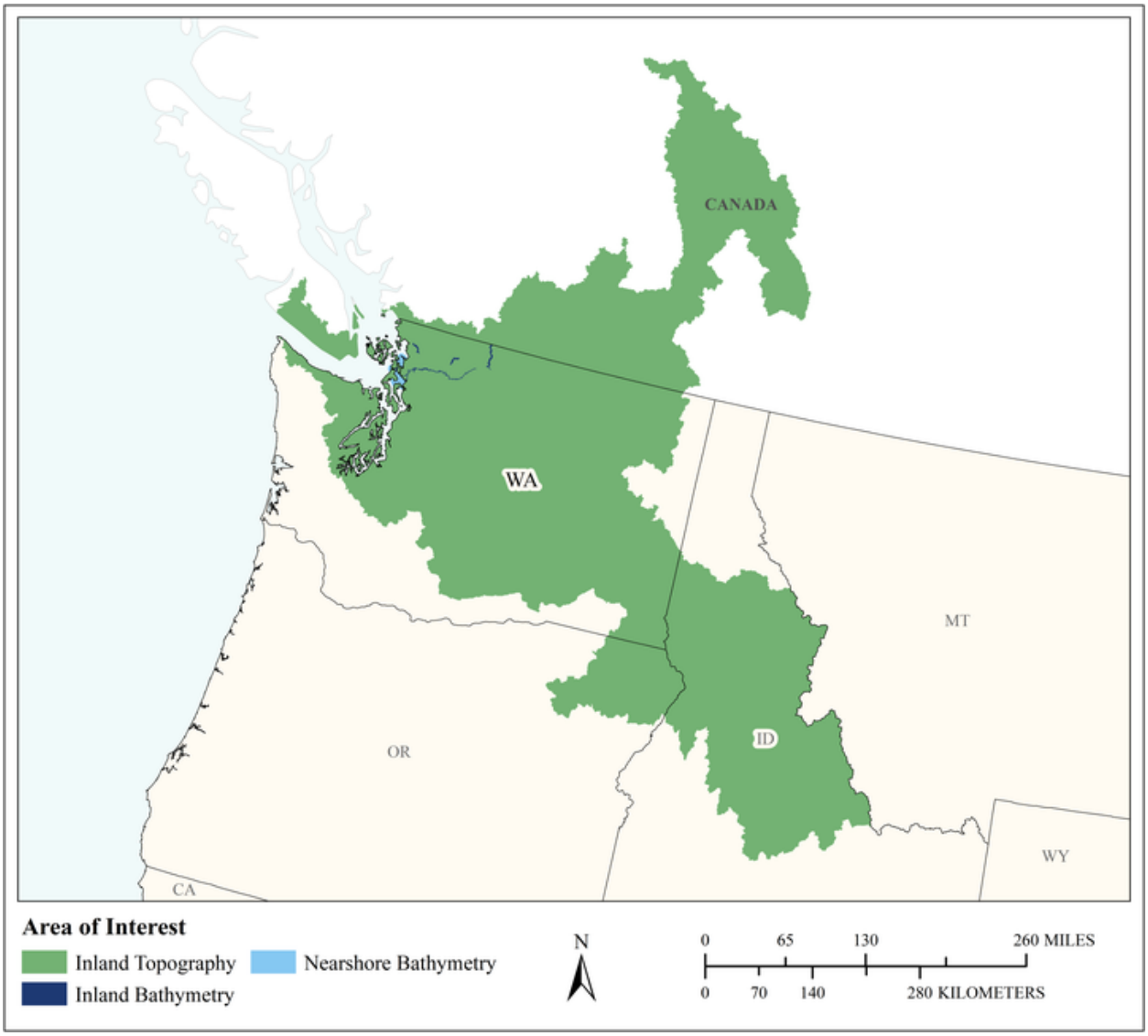
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor	I don't know		
Improved customer experience	Minor	I don't know		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	I don't know		
Environmental	Minor	I don't know		
Public safety, including life and property	Minor	I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		I don't know	Unable to provide							
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide							
Increased revenues	Moderate	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	Moderate	Unable to provide		I don't know	Unable to provide							
Improved customer experience	Minor	Unable to provide		I don't know	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			I don't know								
Environmental	Minor			I don't know								
Public safety, including life and property	None			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Swinomish Indian Tribal Community Land and Water Resources Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)	One or more states, territories, or counties	Custom description	
Sub Area Requirements		Whatcom, Skagit, Snohomish, and Island Counties, WA	Swinomish Channel, and Skagit, Padilla, & Turner's Bays	

MCA Description	Response
Mission Critical Activity	Addressing, Assignment of Tax Parcel Numbers, Geospatial support for Tribal departments including - Water Resource Monitoring, Coastal and Geohazard Mapping, Cultural Resource Mapping, Land Record Management.
MCA Title	Swinomish Indian Tribal Community Land and Water Resources Management
MCA ID	1432
Organization Type	Tribal government
Organization Name	Swinomish Indian Tribal Community
Sub-Agency or Division	
Organization Mission	The governmental and business affairs of the Swinomish Indian Tribal Community are conducted by the Swinomish Senate, the duly elected governing body of the Tribe. The Senate governs the affairs of the Tribe through Senate committees, boards, and commissions established by tribal ordinance, interagency boards, and commissions that the Tribe participates in with other tribes and organizations. Twenty Senate committees and several other, more limited and ad hoc committees oversee the administration of tribal affairs. With limited exceptions, Senate committees make recommendations to the Senate but do not exercise delegated decision making authority. Nine boards and commissions have been authorized to hire their own staff and operate independently for the most part from the Tribe and Swinomish Senate. Each Senator serves as the chair and vice-chair of at least one board or committee. The Senate reappoints the members of tribal boards and Senate committees annually. The General Council, comprised of all voting age members of the Swinomish Tribe, meets on a regular basis to address issues facing Swinomish. At the February General Council meeting the membership votes on the Senate election and sets the goals for the Swinomish Tribe for the next year.
Program Name	Cultural Resources Department, Land Management Department, Department of Environmental Protection.
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	BU 01 - Water Supply and Quality
Tertiary Business Use	BU 14 - Cultural Resources Preservation and Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)

General Geographic Area and Size	
Description of smallest 3D features	Buildings

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL0B	QL2B	
Update Frequency	2-3 years	2-3 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI	Primarily interested in coastal areas for highest resolution data.			
Acceptable Horizontal Error	Less than 20 cm	Up to 1 meter	The best horizontal accuracy achievable for the vertical accuracy I need	
Acceptable Vertical Error	Less than 5 cm	Up to 20 cm	Up to 40 cm	
How far onshore needed			To cover the beach slope	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			NAVD88	
Cross sections and/or transects meet needs		Partial		
Cross section/transect requirement		Swinomish Channel as well as Skagit, Padilla, and Turner's Bays		

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have

Hydrologic Processing Required	Response
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Required		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Nice to have	Highly desirable	Required		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Highly desirable	
DTM	Required	Required	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Highly desirable	Nice to have	
Classified point cloud	Highly desirable	Highly desirable	Nice to have	
Edited/cube XYZ		Highly desirable	Not required	
Full waveform	Nice to have	Highly desirable	Highly desirable	
Bathymetric Attributed Grid (BAG)		Highly desirable	Nice to have	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Highly desirable	Required	
Underwater videography			Nice to have	
Bottom texture			Highly desirable	
Bottom type			Required	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Highly desirable	Highly desirable	Required	
Water column properties - Physical			Required	
Water column properties - Chemical			Highly desirable	
Water column properties - Biological			Highly desirable	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Not required	
Habitat distribution and classification			Required	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Highly desirable	
Lease areas			Highly desirable	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Required	
Land use/land cover	Highly desirable	Highly desirable	Required	
Wetlands	Highly desirable	Highly desirable	Highly desirable	
Estuaries			Required	
Inland surface water features	Highly desirable	Highly desirable	Nice to have	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Washington State Lidar Portal, 2012 Flights and 2016 Flights in Whatcom and Skagit Counties.	Field derived transects created in house.	Best available	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast		Yes		
NCEI			Yes	
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts		Yes	Yes	
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS			Yes	
State Repositories	Yes	Yes		
State repositories used	Washington State Lidar Portal	Washington State Geospatial Portal		
Data that meet my needs are not available				

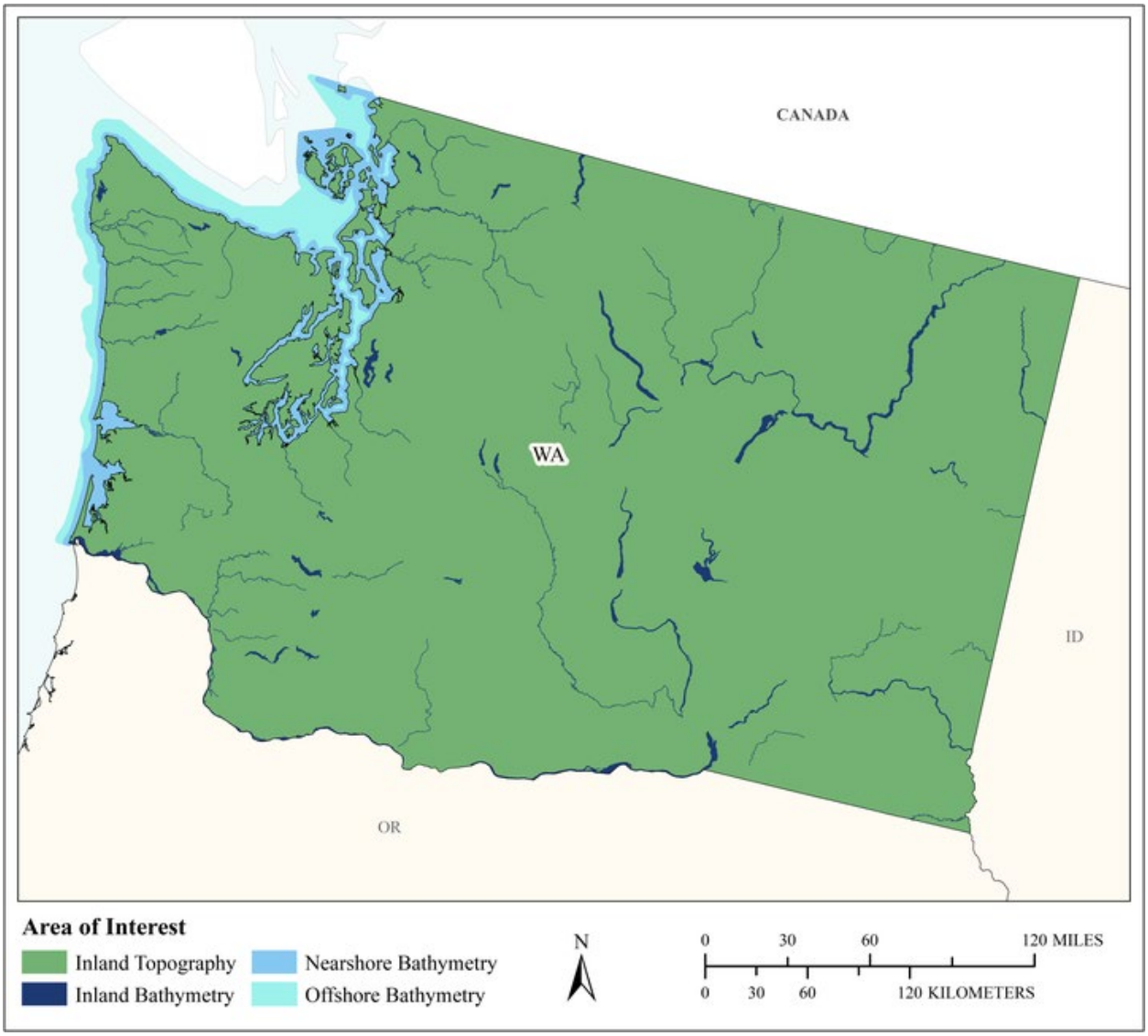
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	
Cost savings/cost reduction	Major	Major	Minor	
Cost avoidance	Moderate	Moderate	Minor	
Increased revenues	Moderate	Minor	I don't know	
Mission-driven performance improvements	Moderate	Major	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Major	I don't know	
Improved response or timeliness	Minor	Major	Minor	
Improved customer experience	Minor	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	Minor	
Environmental	Major	Major	Minor	
Public safety, including life and property	Major	Major	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Moderate	Annual dollars saved/realized	$15,000	Major	Unable to provide				
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide				
Increased revenues	Minor	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		I don't know	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			I don't know			Minor					
Environmental	Major			I don't know			Moderate					
Public safety, including life and property	Major			I don't know			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes	Yes	Yes	
Curvature maps				
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes	Yes	Yes	
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Cultural Resources Preservation and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Discovery and analysis of underwater archaeological and historical cultural sites. Site protection and preservation planning. Discovery and analysis of Native American and other historical cultural sites and subsistence activities.
MCA Title	Cultural Resources Preservation and Management
MCA ID	60516
Organization Type	State or U.S. Territorial government
Organization Name	State of Washington
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	Order 1a
Update Frequency	4-5 years	6-10 years	4-5 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Not required	Nice to have	Nice to have	Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	Required
DTM	Required	Highly desirable	Nice to have	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Not required	Not required	Not required	Not required
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Not required	Nice to have
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Nice to have	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Highly desirable
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Nice to have	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Required
Nautical and/or navigation charts			Highly desirable	Required
Acoustic imagery of the seafloor			Highly desirable	Required
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Nice to have
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Required	Required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have	Highly desirable	Highly desirable	Highly desirable
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Highly desirable	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Highly desirable	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Required	Required
Floating observation/navigation systems			Highly desirable	Required
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Required	
Land use/land cover	Nice to have	Highly desirable	Nice to have	Highly desirable
Wetlands	Nice to have	Highly desirable	Nice to have	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Nice to have	Highly desirable	Nice to have	
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Nice to have	Highly desirable	Highly desirable	
Cultural resources	Required	Highly desirable	Required	
Coastal and riverine structures	Nice to have	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	Moderate
Cost savings/cost reduction	Moderate	Minor	Minor	Minor
Cost avoidance	Minor	Minor	Minor	Minor
Increased revenues	None	Minor	None	None
Mission-driven performance improvements	Moderate	Moderate	Minor	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor	None	Minor

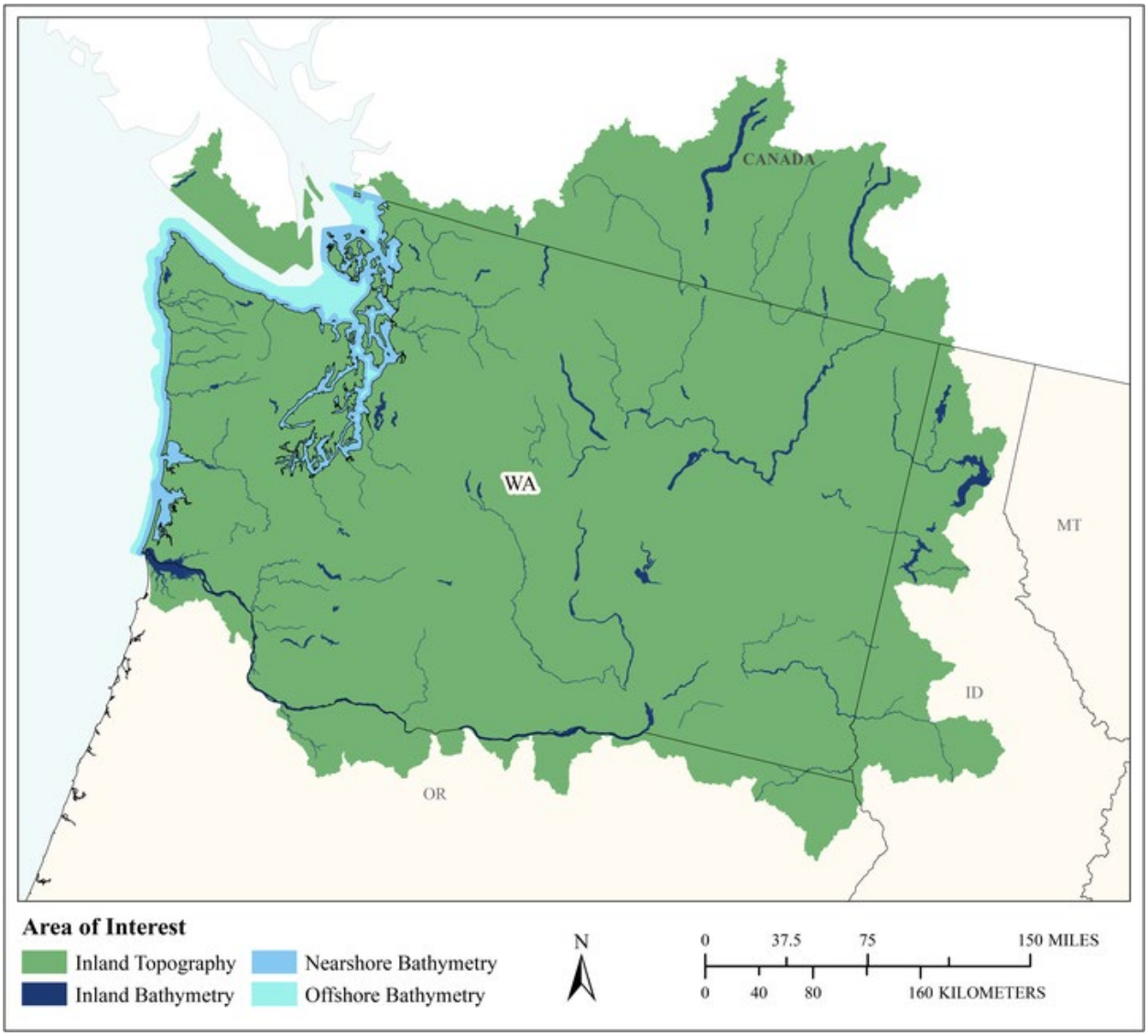
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major	Minor	Moderate
Improved customer experience	Moderate	Moderate	Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	Minor	Minor
Environmental	Minor	Moderate	Minor	Moderate
Public safety, including life and property	Minor	Moderate	None	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Increased revenues	None			None			None			None		
Mission-driven performance improvements	Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$12,382		Annual dollars saved/ realized	$29,694		Annual dollars saved/ realized	$4,384		Annual dollars saved/ realized	$5,503
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$10,826									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Moderate			Minor			Minor		
Environmental	Minor			Minor			Moderate			Moderate		
Public safety, including life and property	Minor			Minor			Minor			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				Yes

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Flood Risk Reduction



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more Hydrologic Units (HUC8s)	One or more Hydrologic Units (HUC8s)	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Flood Risk Reduction
MCA Title	Flood Risk Reduction
MCA ID	22404
Organization Type	State or U.S. Territorial government
Organization Name	Washington State Dept. of Ecology
Sub-Agency or Division	
Organization Mission	Ecology is Washington's environmental protection agency. Our mission is to protect, preserve, and enhance Washington's land, air, and water for current and future generations.
Program Name	RiskMAP - Risk Mapping, Assessment, and Planning
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 02 - Riverine Ecosystem Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Not required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Buildings

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL2B	Special Order
Update Frequency	4-5 years	4-5 years	4-5 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI	Varying degrees of slope throughout the State.			
Acceptable Horizontal Error	Up to 80 cm	Up to 2 meters	Up to 5 meters	Up to 2 meters
Acceptable Vertical Error	Up to 10 cm	Up to 20 cm	Up to 1 meter	Less than 1 meter
How far onshore needed			To the fall line	
How far down the beach profile needed	To MLLW		Below MLLW	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs			Partial	
Cross section/transect requirement			Varying nearshore characterizations	

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Required	Highly desirable	Required
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Required	Required	Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Required	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Required	Highly desirable	Highly desirable
DTM	Required	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	Nice to have
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Highly desirable	Nice to have
Full waveform	Nice to have	Highly desirable	Highly desirable	Nice to have
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	Nice to have
Tide Predictions			Highly desirable	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Highly desirable
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Highly desirable	Required
Underwater videography			Nice to have	Not required
Bottom texture			Highly desirable	Nice to have
Bottom type			Required	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Highly desirable	Highly desirable	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Required	Highly desirable
Tide/wave heights			Required	Required
Sea ice conditions			Nice to have	Nice to have
Habitat distribution and classification			Highly desirable	Required
Boundaries			Required	Nice to have
Routes			Highly desirable	Nice to have
Offshore cadastral			Highly desirable	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Nice to have	Nice to have	Highly desirable	Nice to have
Wetlands	Highly desirable	Highly desirable	Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Required
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Highly desirable			
Other	Highly desirable			
Other description	Building footprints			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL1 & QL2 of varying dates	Best available	Flood hazard mapping (QL1 and QL2), coastal erosion (QL1 or better, and channel migration (QL1 or QL2)	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes		Yes	
State repositories used	WA State Dept. of Natural Resources and the Puget Sound LiDAR Consortium		Puget Sound LiDAR Consortium and WA State Dept. of Natural Resources	
Data that meet my needs are not available				

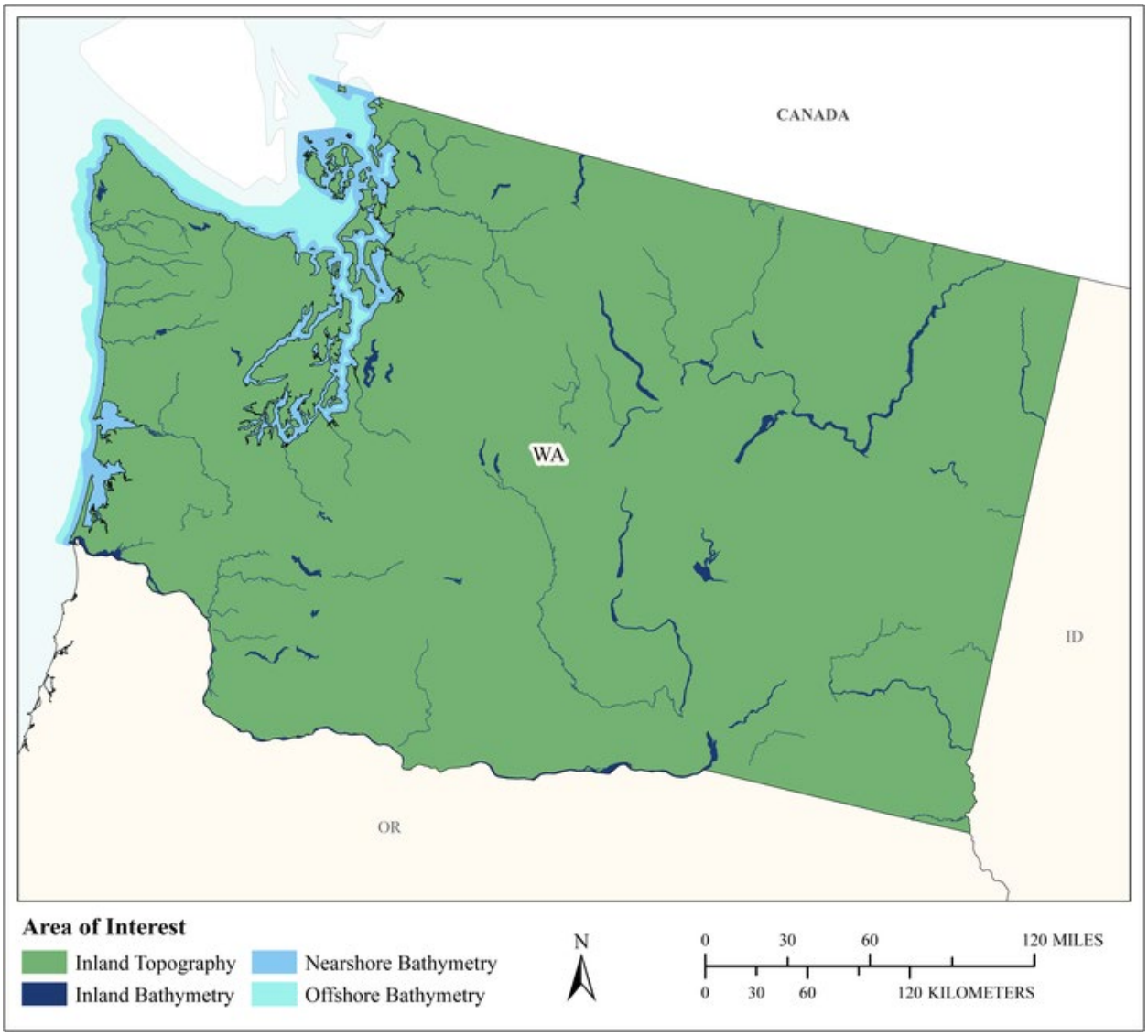
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	I don't know	I don't know	Minor
Cost savings/cost reduction	Major	I don't know	I don't know	Minor
Cost avoidance	Major	I don't know	I don't know	Moderate
Increased revenues	Moderate	I don't know	I don't know	Minor
Mission-driven performance improvements	Major	I don't know	I don't know	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	I don't know	Major	Moderate
Improved response or timeliness	Moderate	I don't know	Moderate	Major
Improved customer experience	Major	I don't know	Moderate	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	Moderate	Minor
Environmental	Major	Moderate	Moderate	Moderate
Public safety, including life and property	Moderate	Moderate	Major	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		Major	Unable to provide	
Increased revenues	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$9,485,497		Annual dollars saved/ realized	$658,928		Annual dollars saved/ realized	$290,026			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,659,665		Annual dollars saved/ realized	$739,807		Annual dollars saved/ realized	$214,950			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			I don't know			I don't know			Major		
Environmental	Moderate			I don't know			I don't know			Major		
Public safety, including life and property	Moderate			I don't know			I don't know			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			Yes
Contours	Yes			Yes
Hillshades	Yes			Yes
Slope maps				
Aspect maps				
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				Yes
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness		Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Sea Level Rise and Subsidence



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Modeling and mapping the effects of sea level rise or subsidence. Population and economic vulnerability assessments. Coastal inundation and infrastructure assessment.
MCA Title	Sea Level Rise and Subsidence
MCA ID	60517
Organization Type	State or U.S. Territorial government
Organization Name	State of Washington
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 16 - Sea Level Rise and Subsidence
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL1B	QL2B	Order 2
Update Frequency	4-5 years	4-5 years	2-3 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	Up to 20 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	Up to 2 meters
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Required	Required	Highly desirable	Highly desirable	Required
Entire AOI under same environmental conditions	Highly desirable	Required	Required	Highly desirable	Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Required	Required	Highly desirable	Required
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have	Highly desirable	Highly desirable
DTM	Required	Required	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Highly desirable	Nice to have	Nice to have
Classified point cloud	Required	Nice to have	Highly desirable	
Edited/cube XYZ		Not required	Not required	Not required
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Not required	Not required	Not required
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	Required
Tide Predictions			Required	Required
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Required
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Highly desirable	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Required
Nautical and/or navigation charts			Highly desirable	Required
Acoustic imagery of the seafloor			Nice to have	Not required
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Not required	Not required
Bottom texture			Not required	Not required
Bottom type			Nice to have	Nice to have
Submerged features			Nice to have	Not required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Not required
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Not required
Water column properties - Biological			Not required	Not required
Currents			Nice to have	Nice to have
Tide/wave heights			Required	Required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Required
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Not required	Not required
Lease areas			Not required	Not required
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Required	Required	Highly desirable	Highly desirable
Wetlands	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Required	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes	Yes	Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Major	Major
Cost savings/cost reduction	Major	Major	Major	Major
Cost avoidance	Major	Major	Major	Major
Increased revenues	None	Minor	Minor	None
Mission-driven performance improvements	Major	Major	Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	Major

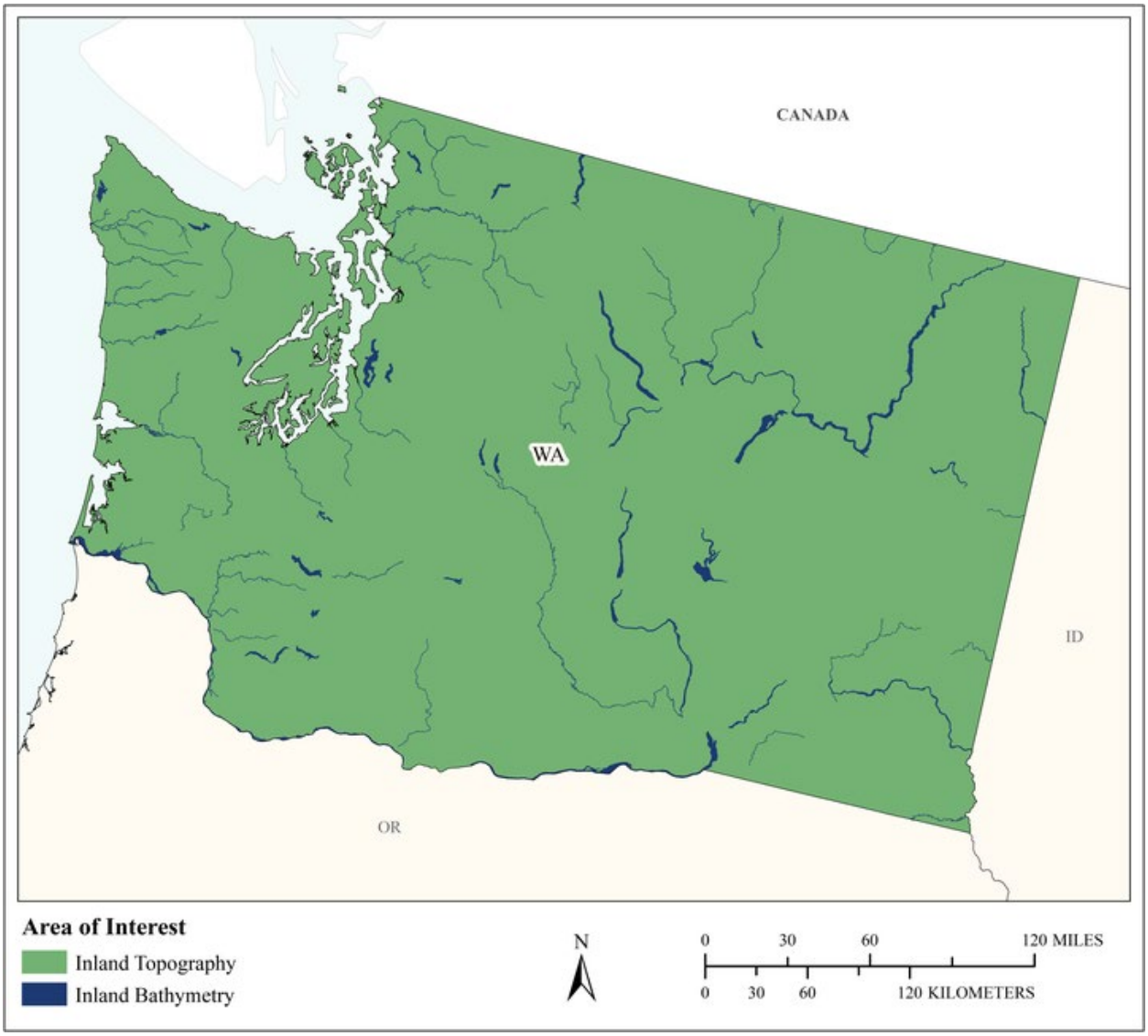
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Minor	Major	Major
Improved customer experience	Moderate	Moderate	Major	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Major	Moderate
Environmental	Moderate	Moderate	Major	Major
Public safety, including life and property	Major	Moderate	Major	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Increased revenues	Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$3,556,739									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Major			Major		
Environmental	Moderate			Major			Major			Major		
Public safety, including life and property	Moderate			Major			Minor			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		Yes
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Forest Health for Wildfire Mitigation and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Forest health for wildfire mitigation and management. The Wildfire Division looks at disease, fuel load, and fire susceptibility on all forest lands in Washington including state lands. For this Mission Critical Activity, it is extremely important to be able to track vegetation changes over time. This is currently most effectively accomplished through 3D elevation data. It is part of the Division's strategic plan, therefore 3D topography data is needed to meet the operational and mission goals.
MCA Title	Forest Health for Wildfire Mitigation and Management
MCA ID	21708
Organization Type	State or U.S. Territorial government
Organization Name	Washington Department of Natural Resources
Sub-Agency or Division	
Organization Mission	In partnership with citizens and governments, the Washington State DNR provides innovative leadership and expertise to ensure environmental protection, public safety, perpetual funding for schools and communities, and a rich quality of life.
Program Name	Washington Department of Natural Resources Wildfire Division
Total Annual Program Budget	
Primary Business Use	BU 17 - Wildfire Management, Planning, and Response
Secondary Business Use	BU 04 - Forest Resources Management
Tertiary Business Use	BU 07 - Wildlife and Habitat Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required
Other	Required
Other description	Roads and road beds

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Individual trees

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Nice to have

Inland Bathy Feature Size Requirements	Response
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B		
Update Frequency	>10 years and certain events.	2-3 years		
Event type(s)	Wildfire.			
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	Up to 2 meters		
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed	Below MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Required			Required	
Entire AOI under same environmental conditions	Highly desirable	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Required			Required	
DEM for entire AOI needs to be seamless	Highly desirable	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	No opinion or strong feeling one way or another	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Not required	Required		
Classified point cloud	Required	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Not required	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Nice to have		
Ground control/ground truthing	Highly desirable	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Not required		
Land use/land cover	Not required	Required		
Wetlands	Not required	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Not required	Required		
Bridges/culverts	Not required	Required		
Landmark features	Not required	Required		
Cultural resources	Not required	Required		
Coastal and riverine structures	Not required	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			
Other	Required			
Other description	Photogrammetrically derived point clouds (phodar)			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Best available lidar and phodar (photogrammetrically derived topography) within Washington. Generally QL1, but any available data. All available dates (generally from 2002 on)			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
State repositories used	Washington state lidar and phodar repository (stored on-site)			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Major		
Increased revenues	None	Major		
Mission-driven performance improvements	Major	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		
Improved response or timeliness	Major	Major		
Improved customer experience	Major	Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major		
Environmental	Major	Major		
Public safety, including life and property	Major	Major		

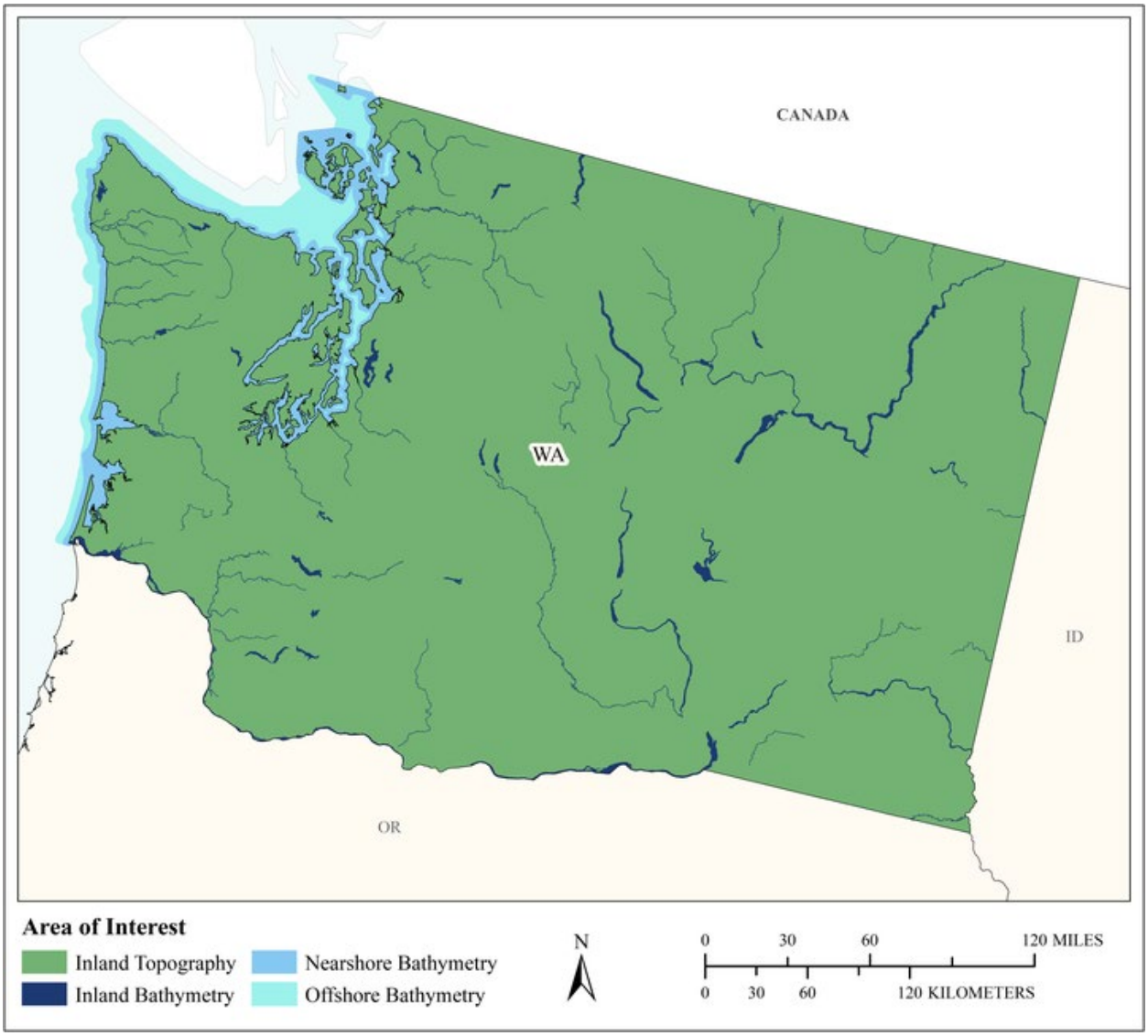
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$18,090	Major	Unable to provide							
Time savings description	More efficient modeling for vegetation data and better ability to scale depending on area of interest. Can refine in-office planning to more relevant locations for monitoring. Having accurate forest structures modeled from 3D topography reduces field visits.											
Cost savings/cost reduction	Major	Annual dollars saved/realized	$1,000,000	Major	Unable to provide							
Cost savings/cost reduction description	For example: annual operational costs for vegetation monitoring saved.											
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Cost avoidance description	For example: better road information, topography information on firelines and wildfire locations.											
Increased revenues	None			Major	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements description	For example: better vegetation monitoring leads to better modeling of forest health and better decisions for mitigation efforts. For example: improved ability to monitor vegetation, change, status, and overall health at a finer scale than previously. For example: more effective plan and design for forest treatment and locations of treatment.											
Other operational benefits	Major	Unable to provide										
Other operational benefits description	Improved derivative datasets. Improved roads and streams data.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Value added to products or services description	For example: new vegetation maps and potential for new applications. For example: improved vegetation monitoring and accuracy of at-risk areas.											
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness description	For example: Wildfire response/road access. If collection occurs after a wildfire, updated 3D topography is very beneficial. For example: updated vegetation monitoring products.											
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Improved customer experience description	For example: major customers are the state legislature and the USFS. 3D topography data increases accuracy and therefore confidence in work and decision making.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Environmental	Major	Major		
Environmental description	For example: vegetation monitoring increases awareness of environmental (forest) health and condition			
Public safety, including life and property	Major	Major		
Public safety, including life and property description	For example: increased awareness of at-risk for wildfire areas, ability to plan and mitigate			

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes		
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement		Yes		
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Homeland Security, Law Enforcement, Disaster Response, and Emergency Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Infrastructure and border protection. Coastal search and rescue. Population dynamics. Emergency fuel supply and movement. Line of sight analysis in urban areas. Disaster response. Flood risk analysis resulting from acts of terrorism.
MCA Title	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
MCA ID	60518
Organization Type	State or U.S. Territorial government
Organization Name	State of Washington
Sub-Agency or Division	Washington Emergency Management Division
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B	QL1B	Order 2
Update Frequency	4-5 years	4-5 years	6-10 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 20 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Up to 2 meters
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable	Highly desirable	Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Required	Required
DTM	Required	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Nice to have	Highly desirable	Highly desirable	Required
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Highly desirable	Highly desirable	Highly desirable
Full waveform	Nice to have	Nice to have	Highly desirable	Highly desirable
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Highly desirable
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Nice to have	Highly desirable
Bottom texture			Nice to have	Highly desirable
Bottom type			Nice to have	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Highly desirable	Highly desirable
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Highly desirable	Required
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Nice to have	Nice to have
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Highly desirable	Highly desirable
Routes			Highly desirable	Highly desirable
Offshore cadastral			Nice to have	Highly desirable
Lease areas			Nice to have	Highly desirable
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Required
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	Major
Cost savings/cost reduction	Major	Major	Major	Major
Cost avoidance	Major	Moderate	Moderate	Major
Increased revenues	None	None	None	Major
Mission-driven performance improvements	Major	Moderate	Moderate	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Minor	Major

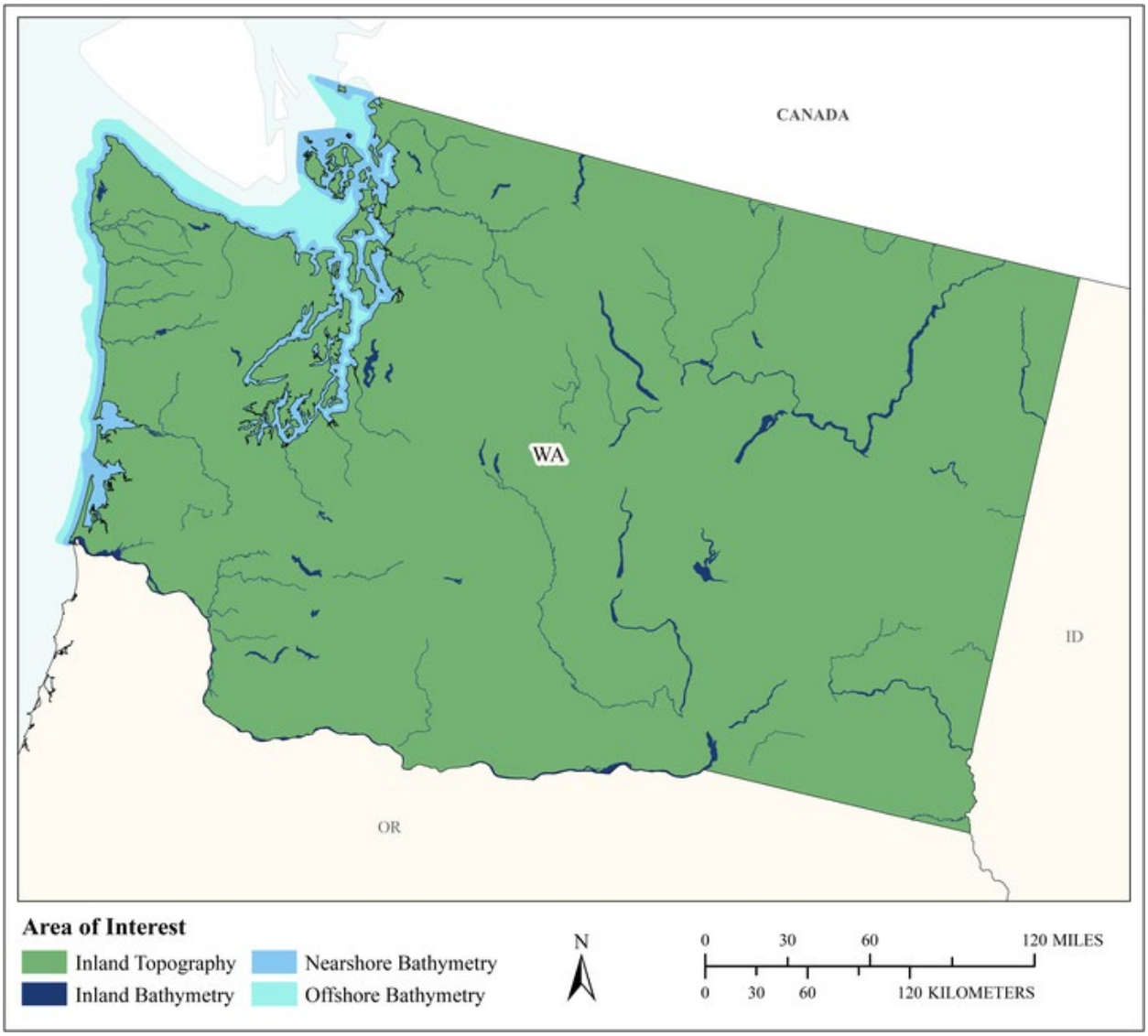
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major	Minor	Major
Improved customer experience	Major	Moderate	Minor	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	Minor	Major
Environmental	Minor	Moderate	Minor	Major
Public safety, including life and property	Major	Major	Moderate	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,992,963		Annual dollars saved/ realized	$561,269		Annual dollars saved/ realized	$14,111			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$35,224		Annual dollars saved/ realized	$35,809		Annual dollars saved/ realized	$405			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate			Major		
Environmental	Moderate			Moderate			Moderate			Major		
Public safety, including life and property	Major			Major			Major			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes		Yes
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Land Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Road and railroad route selection and maintenance. Slope analysis for autonomous cars. GPS navigation visualization.
MCA Title	Land Navigation and Safety
MCA ID	60519
Organization Type	State or U.S. Territorial government
Organization Name	State of Washington
Sub-Agency or Division	Washington State Department of Transportation
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 19 - Land Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL0B	QL0B	I don't know
Update Frequency	2-3 years	2-3 years	2-3 years	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	Up to 2 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable	Highly desirable	Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Required	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Required	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Highly desirable	Highly desirable
DTM	Required	Required	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Classified point cloud	Highly desirable	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Highly desirable	Highly desirable
Full waveform	Nice to have	Nice to have	Highly desirable	Highly desirable
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Required	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Required
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Required	Highly desirable	Required
Underwater videography			Nice to have	Highly desirable
Bottom texture			Highly desirable	Required
Bottom type			Highly desirable	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Highly desirable	Required
Geologic and seismic data	Highly desirable	Highly desirable	Highly desirable	Required
Water column properties - Physical			Highly desirable	Required
Water column properties - Chemical			Highly desirable	Required
Water column properties - Biological			Highly desirable	Required
Currents			Highly desirable	Required
Tide/wave heights			Highly desirable	Required
Sea ice conditions			Nice to have	Highly desirable
Habitat distribution and classification			Highly desirable	Required
Boundaries			Highly desirable	Required
Routes			Highly desirable	Required
Offshore cadastral			Highly desirable	Highly desirable
Lease areas			Highly desirable	Required
Fixed obstructions			Highly desirable	Required
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Nice to have	Required	Highly desirable	
Land use/land cover	Highly desirable	Required	Highly desirable	Required
Wetlands	Required	Required	Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Required
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Highly desirable	Highly desirable	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Minor	Minor
Cost savings/cost reduction	Major	Minor	Minor	Minor
Cost avoidance	Moderate	Minor	Minor	Minor
Increased revenues	None	None	None	None
Mission-driven performance improvements	Major	Minor	Minor	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	None	None

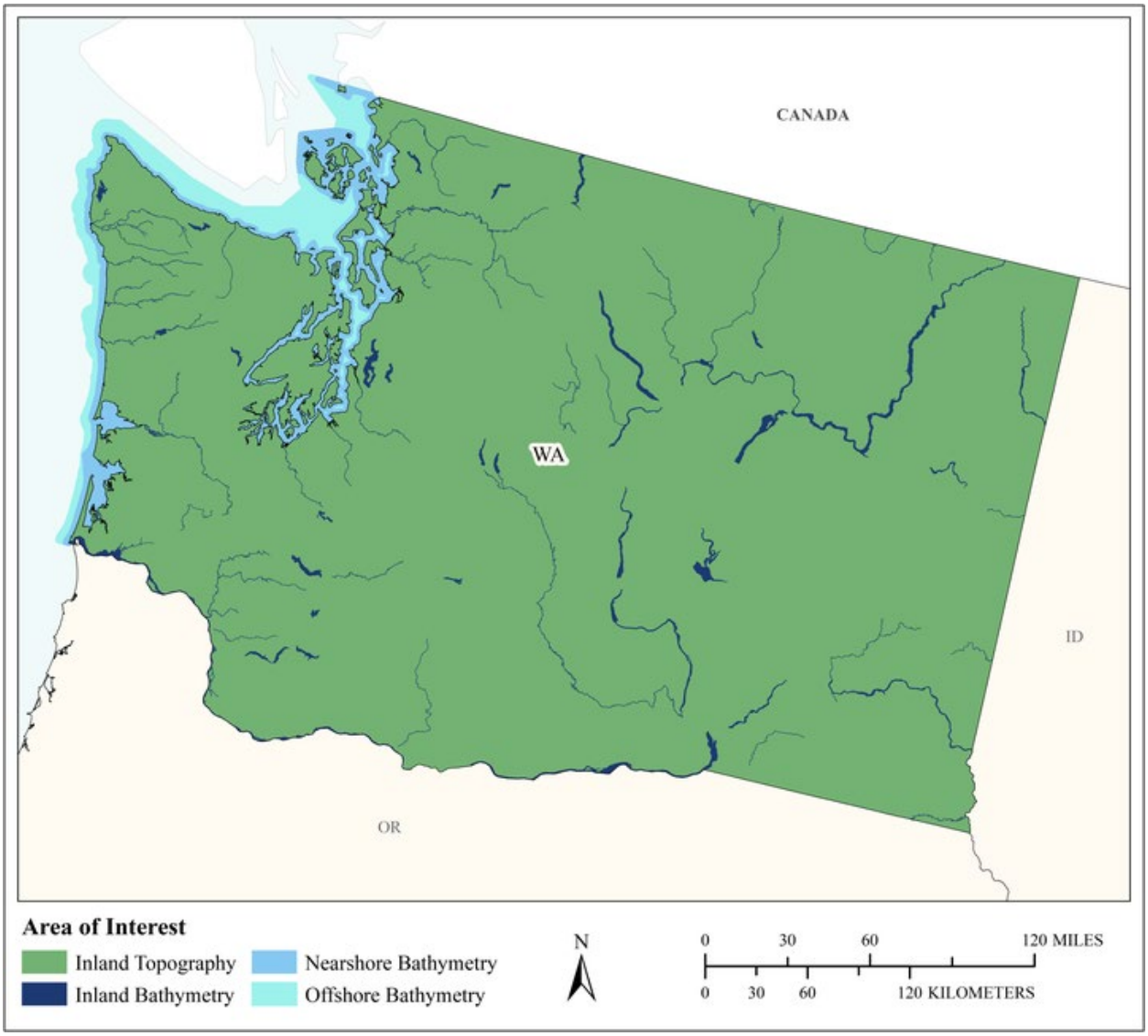
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	None	None
Improved customer experience	Major	Minor	None	None
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	None	None
Environmental	Moderate	Moderate	Moderate	Moderate
Public safety, including life and property	Major	Minor	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		None			None		
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$875,167		Annual dollars saved/ realized	$37,329						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$70,674		Annual dollars saved/ realized	$386						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			None			None		
Environmental	Major			Moderate			Moderate			Moderate		
Public safety, including life and property	Major			Moderate			Moderate			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes		Yes	Yes
Aspect maps	Yes			Yes
Curvature maps	Yes		Yes	Yes
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps	Yes			Yes
Viewshed maps	Yes		Yes	Yes
Hydrologic Flow Direction Grids	Yes			Yes
Hydrologic Flow Accumulation Grids				Yes
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		Yes
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	Yes
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Marine and Riverine Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Nautical charting. Bathymetric measurements of nearshore submerged coastal topography. Identification of hazards to navigation. Sediment management at coastal navigation projects. Precision marine navigation. Movement of goods and fishing vessels.
MCA Title	Marine and Riverine Navigation and Safety
MCA ID	60520
Organization Type	State or U.S. Territorial government
Organization Name	State of Washington
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Nice to have
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B	QL0B	I don't know
Update Frequency	2-3 years	2-3 years	2-3 years	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	Up to 2 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have	Nice to have	I don't know	Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Nice to have	Nice to have	I don't know	Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required	I don't know	Required	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required	I don't know	Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Required	I don't know
DTM	Required	Highly desirable	Required	I don't know
DEM	Required	Required	Required	I don't know
Raw point cloud data	Required	Nice to have	Required	I don't know
Classified point cloud	Required	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Highly desirable	I don't know
Full waveform	Not required	Not required	Not required	I don't know
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	I don't know
Breaklines required for standard hydro-flattening	Highly desirable	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	I don't know
Tide Predictions			Required	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	I don't know
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Highly desirable	I don't know
Ground control/ground truthing	Required	Nice to have	Highly desirable	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	I don't know
Nautical and/or navigation charts			Highly desirable	I don't know
Acoustic imagery of the seafloor			Highly desirable	I don't know
Aerial and/or satellite imagery	Required	Required	Highly desirable	I don't know
Underwater videography			Nice to have	I don't know
Bottom texture			Highly desirable	I don't know
Bottom type			Highly desirable	I don't know
Submerged features			Highly desirable	I don't know
Subbottom characteristics			Nice to have	I don't know
Geologic and seismic data	Not required	Not required	Nice to have	I don't know
Water column properties - Physical			Nice to have	I don't know
Water column properties - Chemical			Nice to have	I don't know
Water column properties - Biological			Nice to have	I don't know
Currents			Highly desirable	I don't know
Tide/wave heights			Highly desirable	I don't know
Sea ice conditions			Nice to have	I don't know
Habitat distribution and classification			Highly desirable	I don't know
Boundaries			Nice to have	I don't know
Routes			Required	I don't know
Offshore cadastral			Nice to have	I don't know
Lease areas			Nice to have	I don't know
Fixed obstructions			Required	I don't know
Floating observation/navigation systems			Required	I don't know
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Nice to have	Nice to have	Nice to have	I don't know
Wetlands	Highly desirable	Required	Highly desirable	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	I don't know
Inland surface water features	Highly desirable	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Required	Nice to have	Nice to have	
Cultural resources	Highly desirable	Highly desirable	Nice to have	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts		Yes	Yes	
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	I don't know
Cost savings/cost reduction	Major	I don't know	Minor	I don't know
Cost avoidance	Moderate	Major	Minor	I don't know
Increased revenues	Moderate	None	Minor	I don't know
Mission-driven performance improvements	Moderate	Minor	Minor	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	None	Minor	I don't know

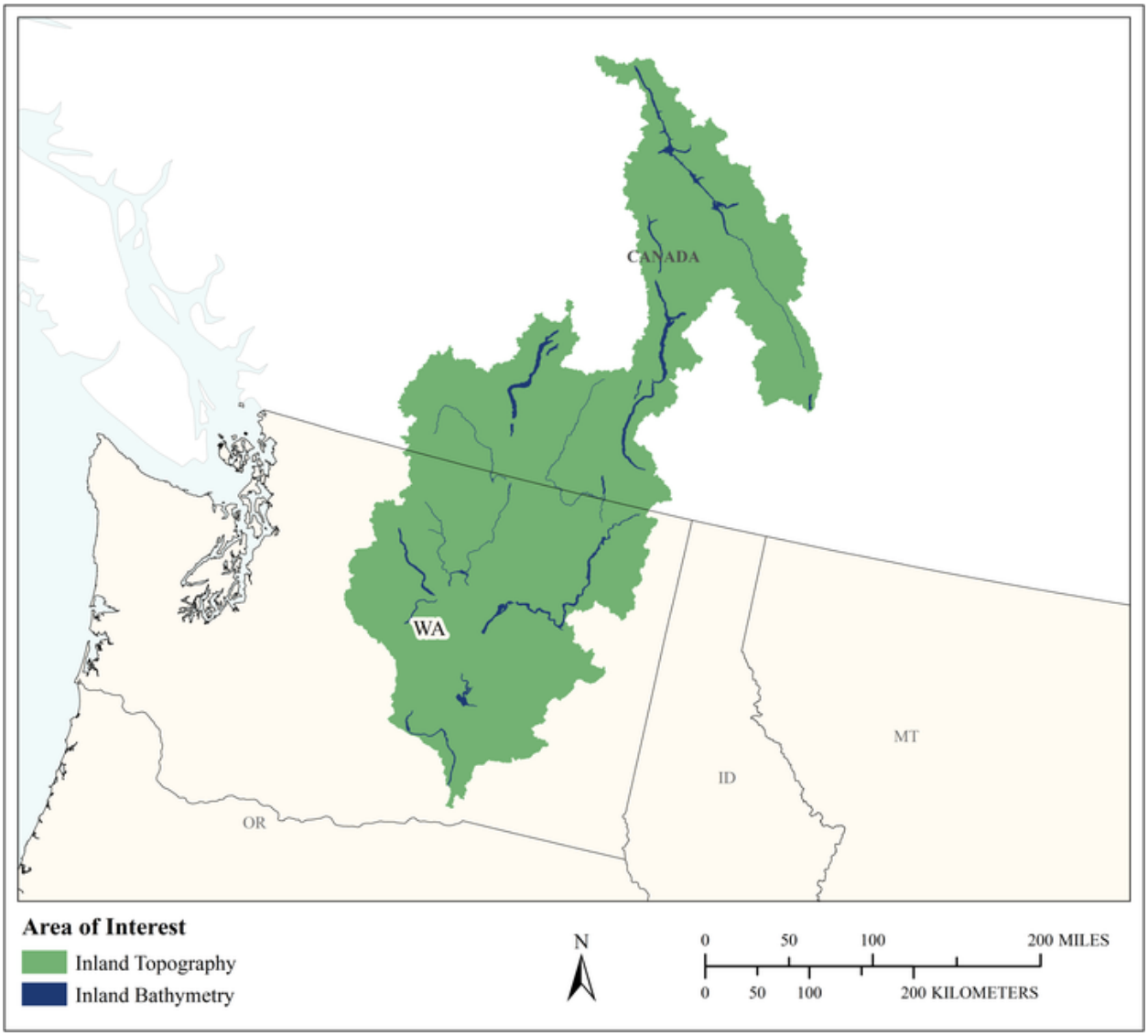
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Minor	None	Minor	I don't know
Improved customer experience	Moderate	None	Minor	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	None	Minor	I don't know
Environmental	Moderate	None	Minor	I don't know
Public safety, including life and property	Major	None	Major	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Increased revenues	None			Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			Moderate			Minor			I don't know		
Environmental	None			Moderate			Major			I don't know		
Public safety, including life and property	Minor			Moderate			Major			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			
Slope maps				
Aspect maps				
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps				Yes
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				Yes

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Road and Bridge Infrastructure, Maintenance, Design and Construction



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)	One or more Hydrologic Units (HUC4s)		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Road and Bridge infrastructure, maintenance, design and construction.
MCA Title	Road and Bridge Infrastructure, Maintenance, Design and Construction
MCA ID	1185
Organization Type	Regional, County, City, or other local government
Organization Name	Kittitas County Public Works
Sub-Agency or Division	
Organization Mission	Kittitas County Public Works has responsibility for the engineering, construction, maintenance and administration of the Kittitas County Road System.
Program Name	Public Works
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 23 - Urban and Regional Planning
Tertiary Business Use	BU 15 - Flood Risk Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Manholes, utility poles, road signs, catch basins

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	Cross sections and/or transects meet needs	Cross sections and/or transects meet needs		
Update Frequency	2-3 years	2-3 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	The best horizontal accuracy achievable for the vertical accuracy I need		
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs	Yes	Yes		
Cross section/transect requirement	Variable accuracy depending on project. Sampling ranges from 25' cross sections to 1700' cross sections. Vertical accuracy is 2.5 cm.	Depends on project, 25' to 1700' cross sections Vertical datum is 2.5 cm or better. For modeling purposes, cross sections at every significant grade break.		

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Not required	Nice to have			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Not required			Nice to have	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Required		
DTM	Highly desirable	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Required	Required		
Classified point cloud	Required	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Highly desirable		
Bathymetric Attributed Grid (BAG)		Nice to have		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Not required		
Ground control/ground truthing	Highly desirable	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Required	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Multiple sources: DNR Lidar consortium, Puget sound lidar consortium, In house data collection	DNR, NOAA Bathymetric Data (green lidar/red lidar) is not highly effective in mountainous regions.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI		Yes		
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	DNR	DNR Puget Sound		
Other	Yes			
Other description	In house Data Collection			
Data that meet my needs are not available				

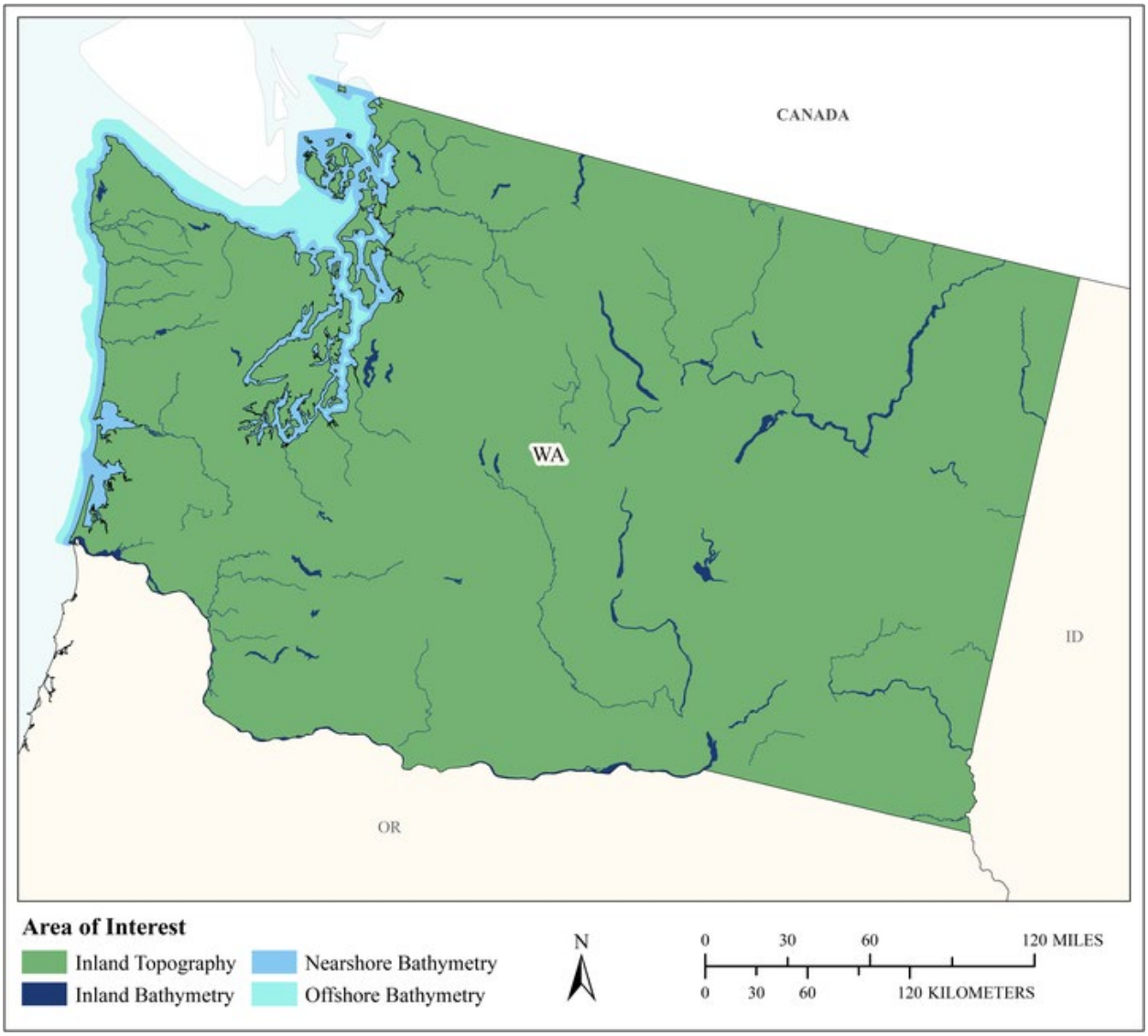
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Major		
Increased revenues	Minor	Minor		
Mission-driven performance improvements	Moderate	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	Moderate		
Improved response or timeliness	Major	Major		
Improved customer experience	Major	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate		
Environmental	None	Minor		
Public safety, including life and property	Moderate	Major		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$50,049	Major	Annual dollars saved/realized	$56,682						
Time savings description	Reduce in house data collection.											
Cost savings/cost reduction	Major	Annual dollars saved/realized	$60,000	Major	Annual dollars saved/realized	$60,000						
Cost avoidance	Major	Annual dollars saved/realized	$10,000	Major	Annual dollars saved/realized	$60,030						
Increased revenues	None			None								
Mission-driven performance improvements	Moderate	Annual percent improvement	9%	Major	Annual percent improvement	8%						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$6,030	Moderate	Annual dollars saved/realized	$6,030						
Improved response or timeliness	Major	Annual dollars saved/realized	$25,628	Major	Annual dollars saved/realized	$3,015						
Improved customer experience	Moderate	Annual dollars saved/realized	$2,412	Major	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Education or outreach description	Graphic and inclusion with public information portals											
Environmental	Minor			Minor								
Environmental description	Uncertain at this point											
Public safety, including life and property	Major			I don't know								
Public safety, including life and property description	Greatly beneficial in both risk reduction and response/planning times											
Other												
Other benefits				Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Infrastructure and Construction Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Marine construction. Bridge design and construction. Engineering and construction of dams, levees, dikes, reservoirs, and coastal structures. Shipyard and port construction. Water, sewer, or power line planning and vegetation analysis. Pump, drain, and well placement. Stormwater modeling. Cut and fill analysis for earth-moving. Building site analysis. Road infrastructure. Infrastructure hardening or mitigation for climate change effects, e.g. sea level change.
MCA Title	Infrastructure and Construction Management
MCA ID	60521
Organization Type	State or U.S. Territorial government
Organization Name	State of Washington
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B	QL1B	Cross sections and/or transects meet needs
Update Frequency	4-5 years	4-5 years	4-5 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	Up to 2 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				Yes
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Highly desirable	Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Highly desirable	Highly desirable
DTM	Required	Required	Required	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Nice to have	Nice to have	Highly desirable
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Nice to have
Ground control/ground truthing	Required	Highly desirable	Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Highly desirable
Nautical and/or navigation charts			Nice to have	Nice to have
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required	Required	Highly desirable	Nice to have
Underwater videography			Not required	Nice to have
Bottom texture			Not required	Nice to have
Bottom type			Nice to have	Nice to have
Submerged features			Highly desirable	Nice to have
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Not required	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Nice to have	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Nice to have	Nice to have
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Highly desirable	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Highly desirable	Nice to have
Floating observation/navigation systems			Highly desirable	Nice to have
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Required	Highly desirable	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	Moderate
Cost savings/cost reduction	Major	Major	Minor	Moderate
Cost avoidance	Major	Moderate	Minor	Moderate
Increased revenues	Minor	None	None	Moderate
Mission-driven performance improvements	Moderate	Moderate	Minor	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate	Minor	Moderate

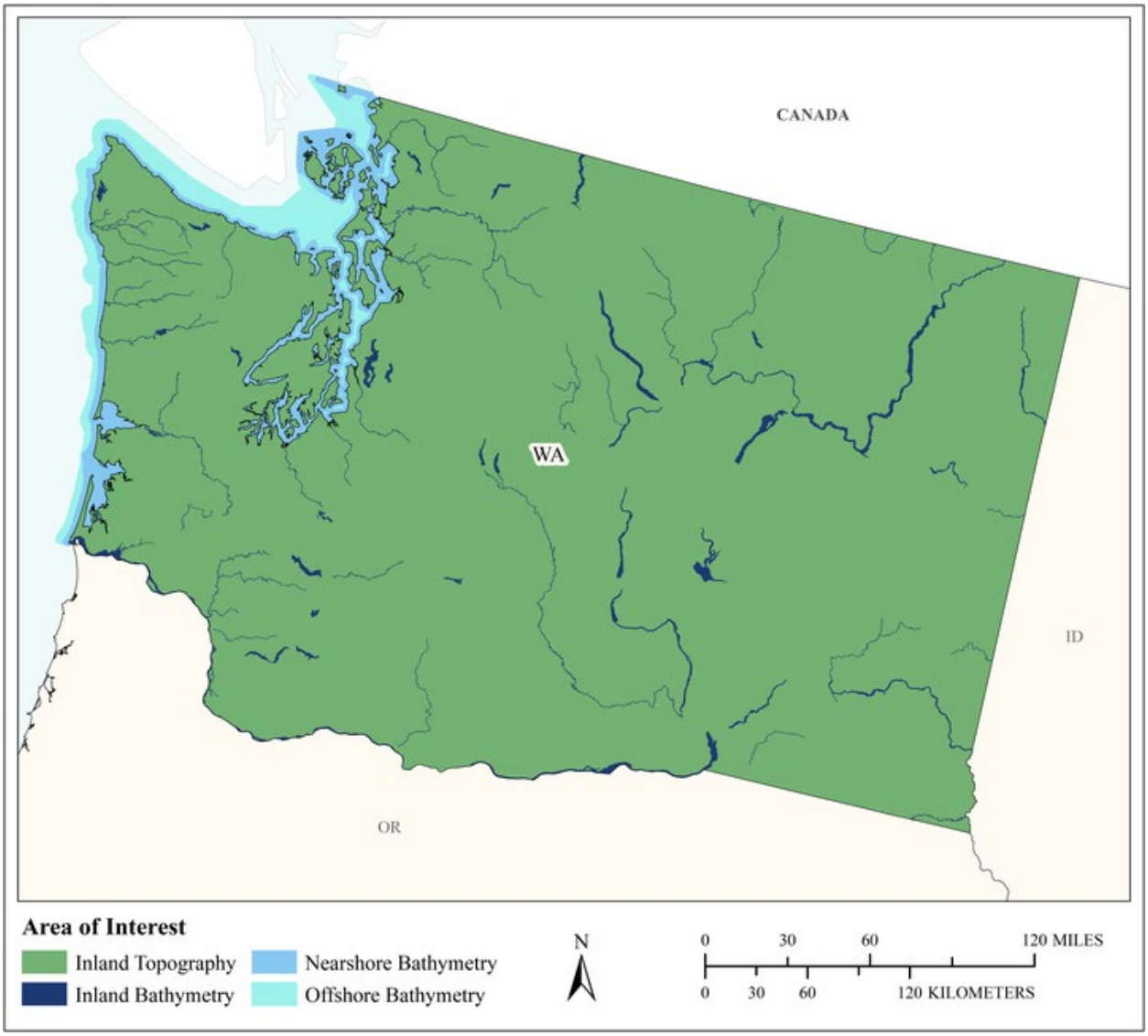
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major	Minor	Moderate
Improved customer experience	Moderate	Minor	Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	Minor	Moderate
Environmental	Moderate	Minor	Minor	Moderate
Public safety, including life and property	Moderate	Moderate	Minor	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	None			None			Minor	Unable to provide		None		
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$3,036,025		Annual dollars saved/ realized	$1,022,885		Annual dollars saved/ realized	$32,010			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$8,934,410		Annual dollars saved/ realized	$106,214		Annual dollars saved/ realized	$4,401			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			Minor			Minor		
Environmental	Moderate			Moderate			Moderate			Major		
Public safety, including life and property	Major			Moderate			Major			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Urban and Regional Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Land development and zoning. Municipal mapping of building footprints and elevations. Port resilience planning. Parks and transportation planning. Virtual city creation. Urban ecology planning.
MCA Title	Urban and Regional Planning
MCA ID	60522
Organization Type	State or U.S. Territorial government
Organization Name	State of Washington
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL2B	Cross sections and/or transects meet needs
Update Frequency	4-5 years	6-10 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				Yes
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Required	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Required	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Required	Required
DTM	Required	Required	Required	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Required	Nice to have	Highly desirable	Highly desirable
Classified point cloud	Required	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Highly desirable
Full waveform	Nice to have	Nice to have	Nice to have	Required
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Highly desirable
Tide Predictions			Nice to have	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Highly desirable
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Highly desirable
Ground control/ground truthing	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	Required
Nautical and/or navigation charts			Highly desirable	Required
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Highly desirable
Underwater videography			Not required	Nice to have
Bottom texture			Nice to have	Highly desirable
Bottom type			Nice to have	Highly desirable
Submerged features			Nice to have	Highly desirable
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Not required	Highly desirable
Water column properties - Chemical			Not required	Highly desirable
Water column properties - Biological			Not required	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Nice to have	Required
Routes			Nice to have	Highly desirable
Offshore cadastral			Nice to have	Highly desirable
Lease areas			Nice to have	Highly desirable
Fixed obstructions			Nice to have	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Required	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Nice to have	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Minor	Major
Cost savings/cost reduction	Major	Minor	Minor	Major
Cost avoidance	Major	Minor	Minor	Major
Increased revenues	Minor	Minor	None	Moderate
Mission-driven performance improvements	Major	Minor	Minor	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Minor	Major

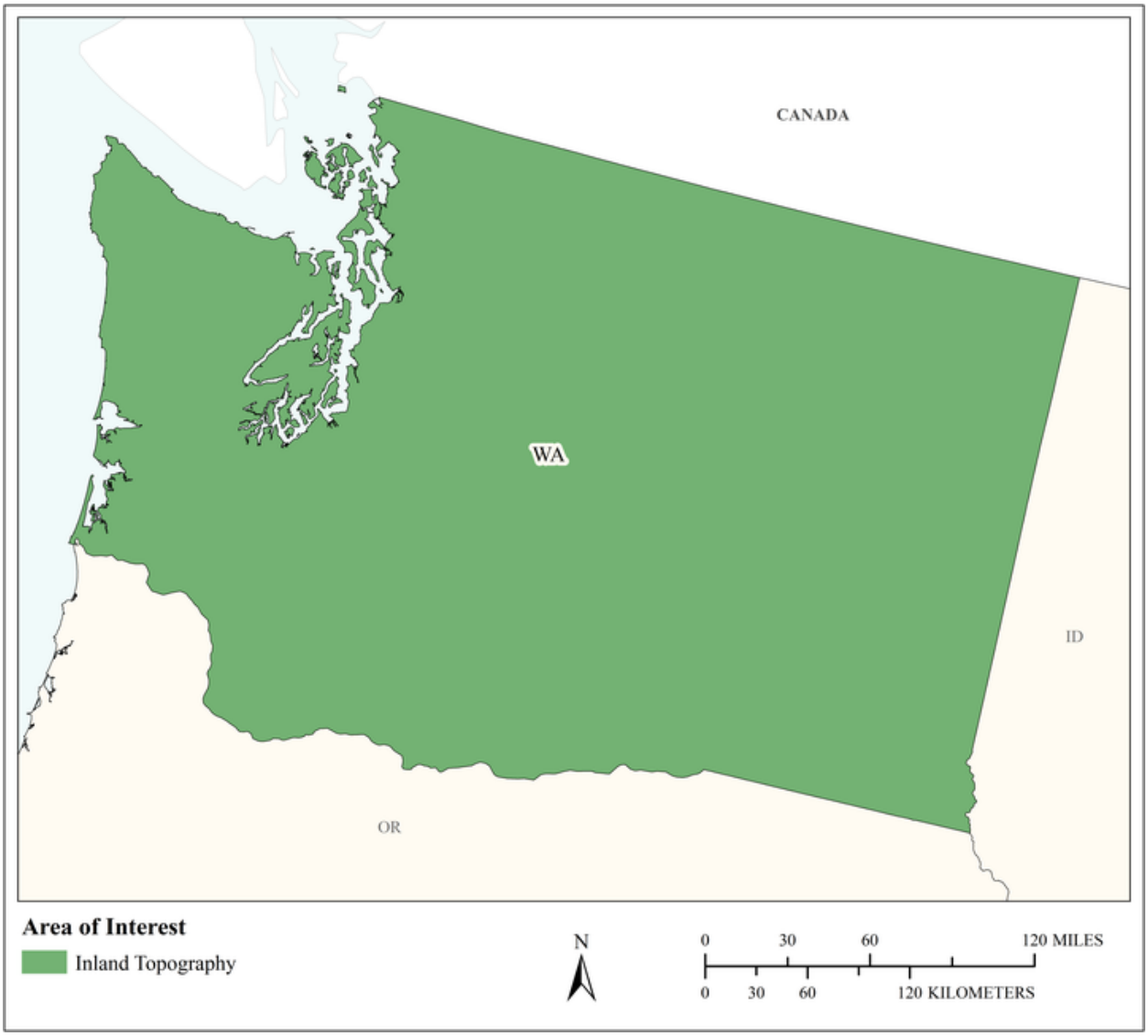
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	Minor	Major
Improved customer experience	Major	Moderate	Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	Major
Environmental	Major	Minor	Minor	Major
Public safety, including life and property	Major	Minor	Minor	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide		Major	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Major	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$18,177,146		Annual dollars saved/ realized	$740,323		Annual dollars saved/ realized	$280,360			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$2,098,559		Annual dollars saved/ realized	$936,573		Annual dollars saved/ realized	$295,769			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate			Major		
Environmental	Major			Moderate			Moderate			Major		
Public safety, including life and property	Major			Major			Moderate			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes		Yes	
Aspect maps	Yes			Yes
Curvature maps				Yes
Cross sections		Yes	Yes	Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Health and Human Services



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Health emergency response. Habitat modeling and disease prevention. Defining boundaries for health advisories for swimming and fishing. Marine-based bioproducts and pharmaceuticals. Public health and safety. Prevention of waterborne diseases. Elevation data are used to accurately locate structures and services.
MCA Title	Health and Human Services
MCA ID	60523
Organization Type	State or U.S. Territorial government
Organization Name	State of Washington
Sub-Agency or Division	Washington Health Care Authority
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 24 - Health and Human Services
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Not required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required			
DTM	Required			
DEM	Highly desirable			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Nice to have			
Wetlands	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Not required			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			

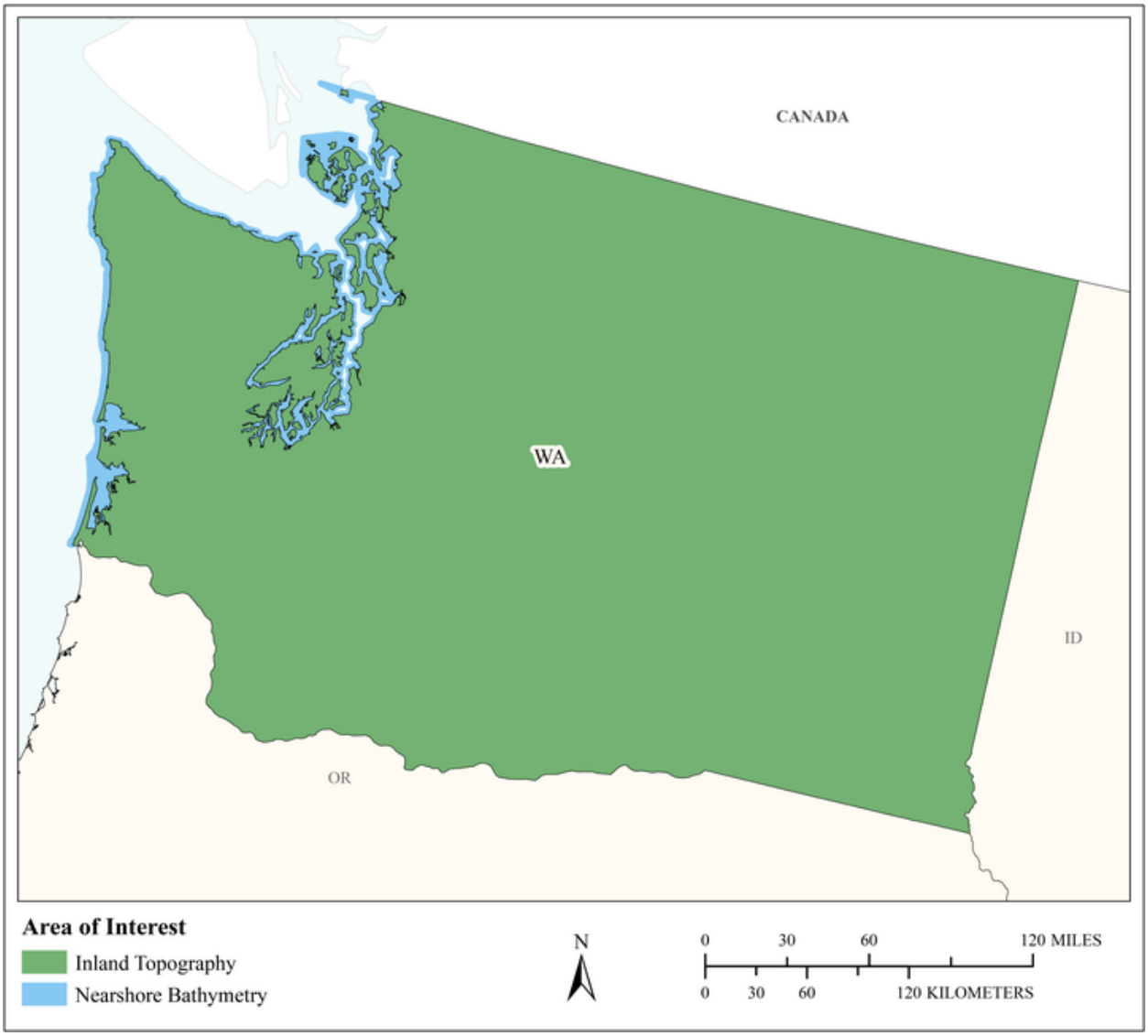
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Minor			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Moderate			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide										
Improved response or timeliness	Minor	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Moderate											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Situational Analysis for Real Property



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	One or more states, territories, or counties		Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Our mission critical activity is to develop and host a web mapping application that provides all users with complete site and situation analysis for property in Washington state. This enables users to clearly see and potentially mitigate physical hazards for any subject structure.
MCA Title	Situational Analysis for Real Property
MCA ID	22353
Organization Type	State or U.S. Territorial government
Organization Name	Washington Surveying and Rating Board (WSRB)
Sub-Agency or Division	
Organization Mission	WSRB maps all physical hazards, fire hydrants, fire district boundaries, roads and structure information for the state of Washington. WSRB grades all fire districts in the state and compiles information on construction inspection quality. We provide a common operating web app and map services primarily for property casualty insurers under the oversight on the state Insurance Commissioner.
Program Name	Property Edge web app
Total Annual Program Budget	
Primary Business Use	BU 25 - Real Estate, Banking, Mortgage, and Insurance
Secondary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Tertiary Business Use	BU 15 - Flood Risk Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Not required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Individual building

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD		QL2B	
Update Frequency	2-3 years		2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm		Less than 50 cm	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Vertical Error	Up to 10 cm		Up to 30 cm	
How far onshore needed			To the fall line	
How far down the beach profile needed	To MLLW		Below MLLW	
Tide correction requirement			No requirement for tide correction	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have		Nice to have			Highly desirable
Entire AOI under same environmental conditions	Highly desirable		Highly desirable			Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable		Nice to have			Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable		Highly desirable			Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level		Up to triple the required TVU at the 95% confidence level			Up to triple the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable		Highly desirable	
DTM	Required		Highly desirable	
DEM	Required		Required	
Raw point cloud data	Nice to have		Nice to have	
Classified point cloud	Highly desirable		Nice to have	
Edited/cube XYZ			Nice to have	
Full waveform	Nice to have		Nice to have	
Bathymetric Attributed Grid (BAG)			Highly desirable	
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable		Highly desirable	
Ground control/ground truthing	Required		Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Highly desirable		Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Highly desirable	
Bottom type			Nice to have	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Highly desirable		Required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Highly desirable	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Nice to have	
Boundaries			Highly desirable	
Routes			Nice to have	
Offshore cadastral			Highly desirable	
Lease areas			Highly desirable	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Highly desirable		Required	
Land use/land cover	Highly desirable		Highly desirable	
Wetlands	Highly desirable		Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Highly desirable		Nice to have	
Bridges/culverts	Highly desirable			
Landmark features	Nice to have		Nice to have	
Cultural resources	Nice to have		Nice to have	
Coastal and riverine structures	Highly desirable		Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	10m DEM		State of Washington DNR data set	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast			Yes	
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Major	
Cost savings/cost reduction	Major		Major	
Cost avoidance	Major		Moderate	
Increased revenues	None		None	
Mission-driven performance improvements	None		Moderate	

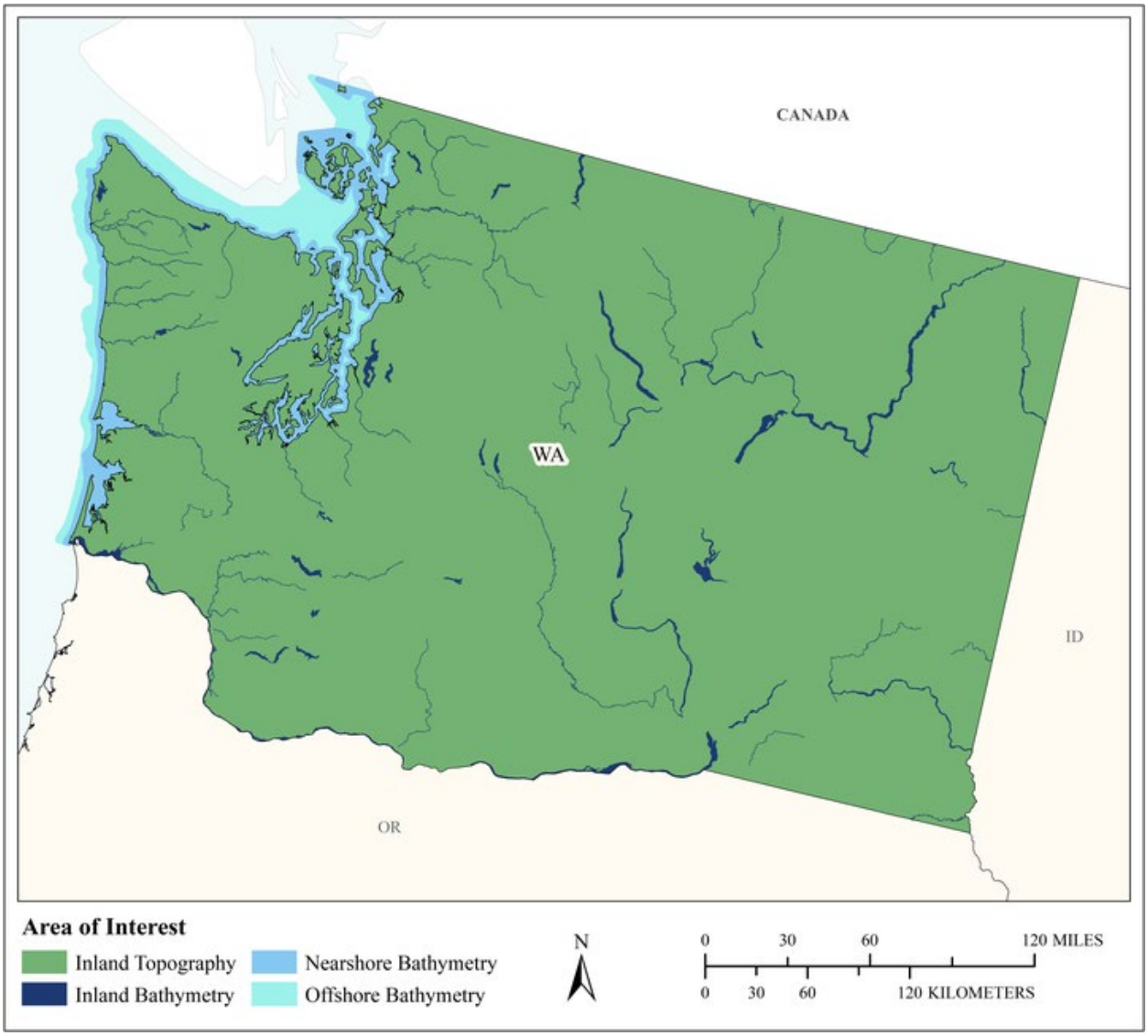
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		Major	
Improved response or timeliness	Minor		Minor	
Improved customer experience	Major		Major	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major		Major	
Environmental	Minor		Minor	
Public safety, including life and property	Major		Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					Major	Unable to provide				
Cost savings/cost reduction	Moderate	Unable to provide					Major	Unable to provide				
Cost avoidance	Major	Unable to provide					Major	Unable to provide				
Increased revenues	Major	Unable to provide					Moderate	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide					Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,347,319									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide					Major	Unable to provide				
Improved customer experience	Major	Unable to provide					Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major						Major					
Environmental	Minor						Moderate					
Public safety, including life and property	Major						Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	
Contours	Yes		Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes		Yes	
Hydrologic Flow Accumulation Grids	Yes		Yes	
Hydrologic networks (e.g. streams, lakes)	Yes		Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes		Yes	
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Maritime and Land Boundary Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Delimitation of legal and other coastal boundaries, inland boundaries, and ordinary high water lines (OHWL). Elevation data are used to define state-owned aquatic lands.
MCA Title	Maritime and Land Boundary Management
MCA ID	60524
Organization Type	State or U.S. Territorial government
Organization Name	State of Washington
Sub-Agency or Division	Washington Department of Natural Resources, Aquatics Division
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 30 - Maritime and Land Boundary Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B	QL0B	I don't know
Update Frequency	6-10 years	6-10 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Highly desirable	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Nice to have	Nice to have	Highly desirable	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable	Highly desirable	Required	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable	Highly desirable	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	Required
DTM	Required	Required	Required	Required
DEM	Highly desirable	Required	Required	Required
Raw point cloud data	Nice to have	Highly desirable	Required	Required
Classified point cloud	Highly desirable	Highly desirable	Required	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Not required	Nice to have
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Not required
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Nice to have	Required	Not required	Not required
Ground control/ground truthing	Highly desirable	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Required	Highly desirable	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Nice to have
Water column properties - Biological			Not required	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Highly desirable	Nice to have
Routes			Nice to have	Highly desirable
Offshore cadastral			Highly desirable	Nice to have
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Required	Required
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Nice to have
Wetlands	Required	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Highly desirable	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Minor	None	I don't know
Cost savings/cost reduction	Moderate	None	Minor	Moderate
Cost avoidance	Moderate	None	Minor	Moderate
Increased revenues	Minor	None	None	I don't know
Mission-driven performance improvements	Major	None	Moderate	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None	None	I don't know

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	None	Minor	Moderate
Improved customer experience	Major	None	Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	Moderate
Environmental	Major	Minor	Minor	Moderate
Public safety, including life and property	Moderate	None	Minor	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	Minor	Unable to provide		None			None			I don't know	Unable to provide	
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$76,020		Annual dollars saved/ realized	$57,050		Annual dollars saved/ realized	$351,868			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$291,466									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Moderate			Moderate		
Environmental	Minor			Major			Major			Major		
Public safety, including life and property	None			Moderate			Moderate			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps		Yes		
Cross sections		Yes		
Height-Above-Ground maps		Yes		
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

West Virginia

Current status of elevation data for West Virginia

As highlighted in the National Enhanced Elevation Assessment (NEEA), West Virginia was the first state to incorporate a complete 1/9th Arc Second Digital Elevation Model (DEM) to the National Elevation Dataset (NED). However, after 15 years and with advances in technology there are opportunities to enhance the elevation data to better serve the needs of a variety of public and private entities in the state. Over the years there have been several elevation data acquisition projects in the state using lidar. These included projects by state agencies, the U.S. Army Corps of Engineers, the Federal Emergency Management Administration (FEMA), the National Park Service, and other entities. These efforts covered over fifty percent of the state's surface at varying resolutions and quality. In addition to government efforts, a large portion of the state has been collected by private entities for internal business purposes related to the natural gas industry.

The need for consistent elevation data nationwide was recognized by the federal government which created the 3DEP administered by the USGS. In 2012, FEMA and the USGS captured Lidar for the Eastern Panhandle of West Virginia. In 2016, FEMA expanded its acquisition of lidar data for eastern West Virginia through its partnership with the USGS 3DEP program. That same year the state suffered devastating floods which prompted FEMA to add three counties and parts of five more that were affected to their 2016 lidar project. In 2017 and 2018, FEMA obligated funding for QL2 Lidar for the remainder of the state, with the final north-central region of the state collected in spring 2020. Lidar data for a majority of the state is being processed with expected delivery in 2020-2021.

Users can download the new Quality Level 2 (QL2) lidar point files and lidar-derived 1-meter DEMs from *The National Map* site hosted by USGS. In addition, the WV GIS Technical Center hosts an elevation data distribution system (www.mapwv.gov/Lidar) that allows users to download the 1-foot contours and county bundles of elevation data.

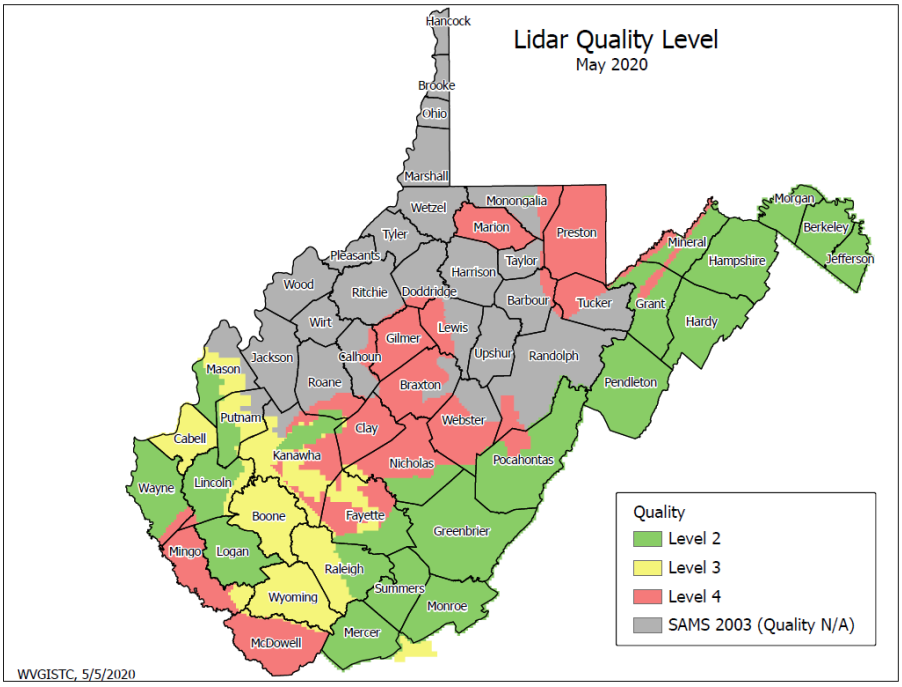


Figure 1. FEMA-Funded QL2 Lidar in West Virginia. Source: FEMA Region III.

Importance of elevation data to West Virginia

State, regional, and local governments and private entities utilize elevation data, for example the Property Tax Division uses 3D modeling in its Reserve Coal Valuation Model which assesses values of coal still on the ground. 3D modeling is also used by the Department of Environmental Protection (DEP) to support its regulatory and research functions. Elevation data are used for floodplain evaluation by floodplain managers both by state and county agencies. The Division of Homeland Security and Emergency Management and the National Guard use elevation data in disaster management, prevention, and post-incident responding. The Geological and Economic Survey use elevation data in quantifying the state's underground resources which include coal, oil, and gas and hazards such as landslides and sinkholes. The use of lidar data has also become a standardized practice for use in geological mapping by the WV Geological and Economic Survey and other geologists. State, regional, and local government use elevation data for land use mapping and planning. The Department of Transportation (DOT) and DEP utilize the data for volumetric studies of road cuts and mining operations. Transportation planning done by DOT, Regional Planning Councils, and cities also needs accurate elevation data. Engineering firms and governmental agencies utilize elevation data for a variety of projects. The Division of Forestry and the Division of Natural Resources use the data in the management of natural and sustainable resources. Of course, the above list does not include many more applications by different entities, including the private sector.

High-level summary of elevation data requirements

As mentioned above, FEMA is completing acquisition of QL2 lidar for the whole state. Though acquisition of QL1 would provide more detailed elevation information at the building level and forested areas would be beneficial for the state, currently there are no state funds available for statewide or large areas acquisition. QL2 lidar supports 1-foot contours and provides enough resolution for most applications and file sizes make it easy to distribute. Respondents in general indicated a need for QL1 inland topography and QL1B inland bathymetry updated every 4-5 years.

High-level summary of benefits that would come from higher resolution elevation data

The need for better elevation data around the "Mountain State" is quite clear. A higher resolution DEM will support detailed classification of landforms. Many of the benefits would be in activities related to the assessment and management of water resources, such as watershed delineation, floodplain mapping, stormwater management, water quantity and quality modeling within watersheds, land cover/ land use mapping, natural resource management, etc. Benefits cited above would enhance work performed in areas of emergency management, transportation, forestry, agriculture, etc. A high-resolution DEM would also help in producing better ecological and habitat assessments used to prioritize land conservation and restoration efforts, and enable accurate mapping of geologic hazards, such as potential landslides.

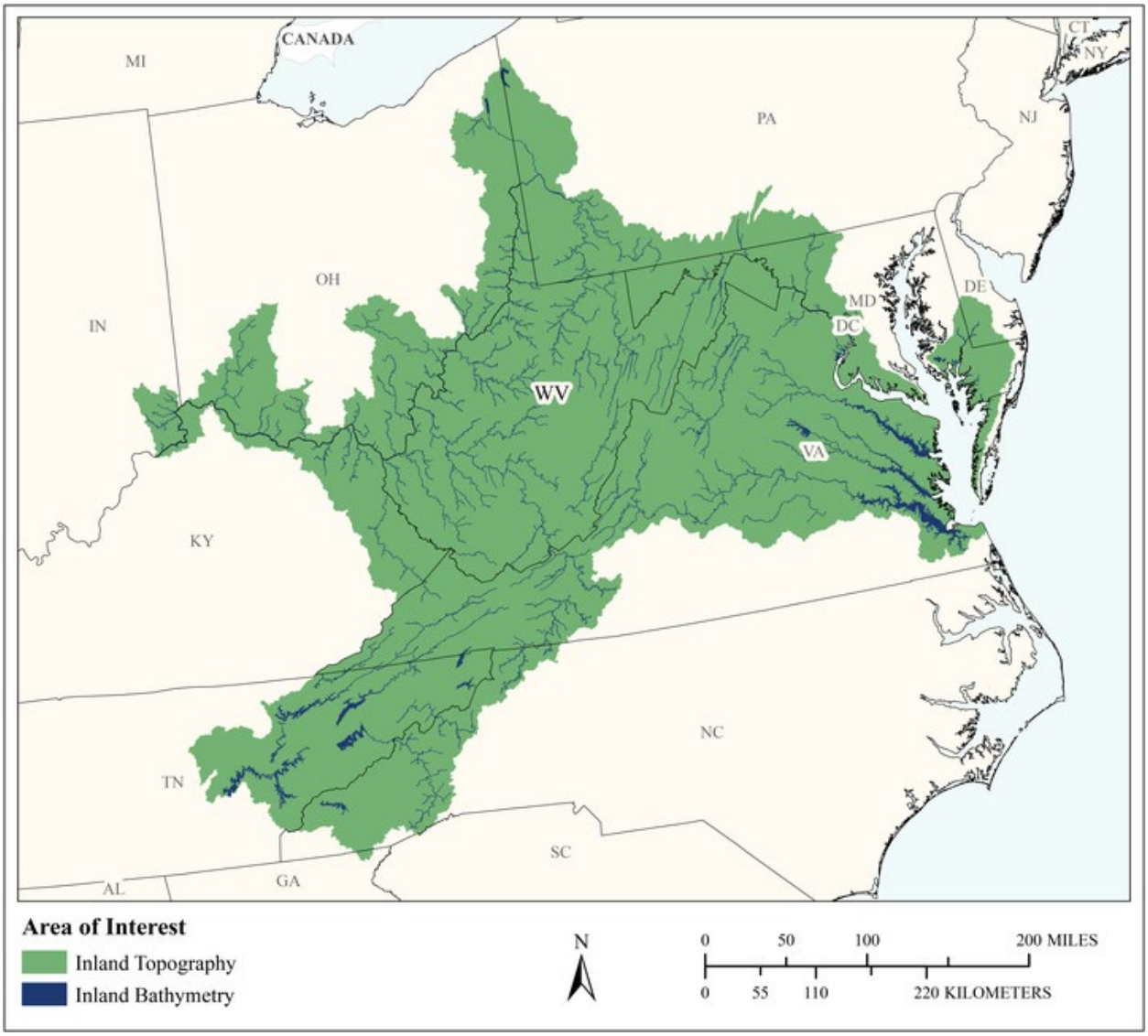
The need for a national elevation program with continued funding support and a regular update cycle will be important to monitor changes to the landscape of West Virginia that impact the environment and economy of its citizens.

The State of West Virginia has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	West Virginia Office of GIS Coordination	1396	GIS Coordination and Data Dissemination	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
BU 01 – Water Supply and Quality	WVDEP	22333	Environmental Protection for West Virginia	Inland Topo	QL2	4-5 years	$133,895	$13,024	Minor	Moderate	Moderate
BU 04 – Forest Resource Management	WV Division of Forestry	22081	Forest Resources Management	Inland Topo	QL1	6-10 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 07 – Wildlife and Habitat Management	West Virginia Division of Natural Resources	1118	Conservation Planning for State Wildlife and Habitat Areas	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Moderate	Major	Minor
				Inland Bathy	QL2B	6-10 years	Unable to quantify	Unable to quantify	Major	Moderate	I don't know
BU 10 – Geologic Assessment	WVGES-WV Geological & Economic Survey	1256	Geological Mapping and Analysis	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 13 – Oil and Gas Resources	The Thrasher Group	22403	Civil Engineering and Field Services	Inland Topo	QL1 HD	Annually	Unable to quantify	Unable to quantify	None	None	None
BU 15 – Flood Risk Management	WV GIS Technical Center	1289	Flood Risk Management and Geologic Assessment	Inland Topo	QL2	Event driven	Unable to quantify	Unable to quantify	Major	Minor	Major
BU 22 – Infrastructure Management	Mott MacDonald	11472	Water, Sewer and Transportation Infrastructure Placement and Routing	Inland Topo	QL0	4-5 years	Unable to quantify	Unable to quantify	None	Moderate	Moderate
				Inland Bathy	QL0B	Event driven	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 22 – Infrastructure Management	WV Division of Highways	22338	Transportation Planning, Design, and Construction	Inland Topo	QL1 HD	4-5 years	Unable to quantify	Unable to quantify	None	Minor	Moderate
				Inland Bathy	Cross sections and/or transects meet needs	6-10 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 23 – Urban and Regional Planning	City of Oak Hill	1293	3D Analysis for City Planning	Inland Topo	QL2	4-5 years	$25,854	Unable to quantify	Major	Major	I don't know
				Inland Bathy	Cross sections and/or transects meet needs	6-10 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

MCA Title: GIS Coordination and Data Dissemination



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)	One or more Hydrologic Units (HUC4s)		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Seeking to optimize the benefits of GIS technology for the state into the future. Elevation data are needed for floodplain modeling and mapping, state planning, and data dissemination for other state users.
MCA Title	GIS Coordination and Data Dissemination
MCA ID	1396
Organization Type	State or U.S. Territorial government
Organization Name	West Virginia Office of GIS Coordination
Sub-Agency or Division	
Organization Mission	The mission of the WV Office of GIS Coordination is to work with state agencies, West Virginia's GIS community, and regional and federal partners to provide and promote cooperative leadership, support, and innovative solutions for utilizing geospatial technology in serving the public good.
Program Name	As State GIS Coordinator I delve into most of the mission critical businesses listed above
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 13 - Oil and Gas Resources
Tertiary Business Use	BU 15 - Flood Risk Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Sign, curb, road line, mailbox, rock, etc.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Highly desirable
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Highly desirable
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 30 cm	Up to 1 meter		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed	To MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Required	Highly desirable		
Classified point cloud	Required	Required		
Edited/cube XYZ		Highly desirable		
Full waveform	Required	Highly desirable		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required	Highly desirable		
Ground control/ground truthing	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required	Highly desirable		
Land use/land cover	Required	Highly desirable		
Wetlands	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Highly desirable		
Bridges/culverts	Required	Highly desirable		
Landmark features	Required	Highly desirable		
Cultural resources	Required	Highly desirable		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Primarily QL3 or lower quality lidar data. FEMA is purchasing QL2 lidar for the entire state of West Virginia.	DNR collected some sonar, also drone based imagery to identify fish		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI	Yes			
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	WV GIS Technical Center and in-house repository	GIS Clearinghouse		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Major	Moderate		
Cost avoidance	Major	Moderate		

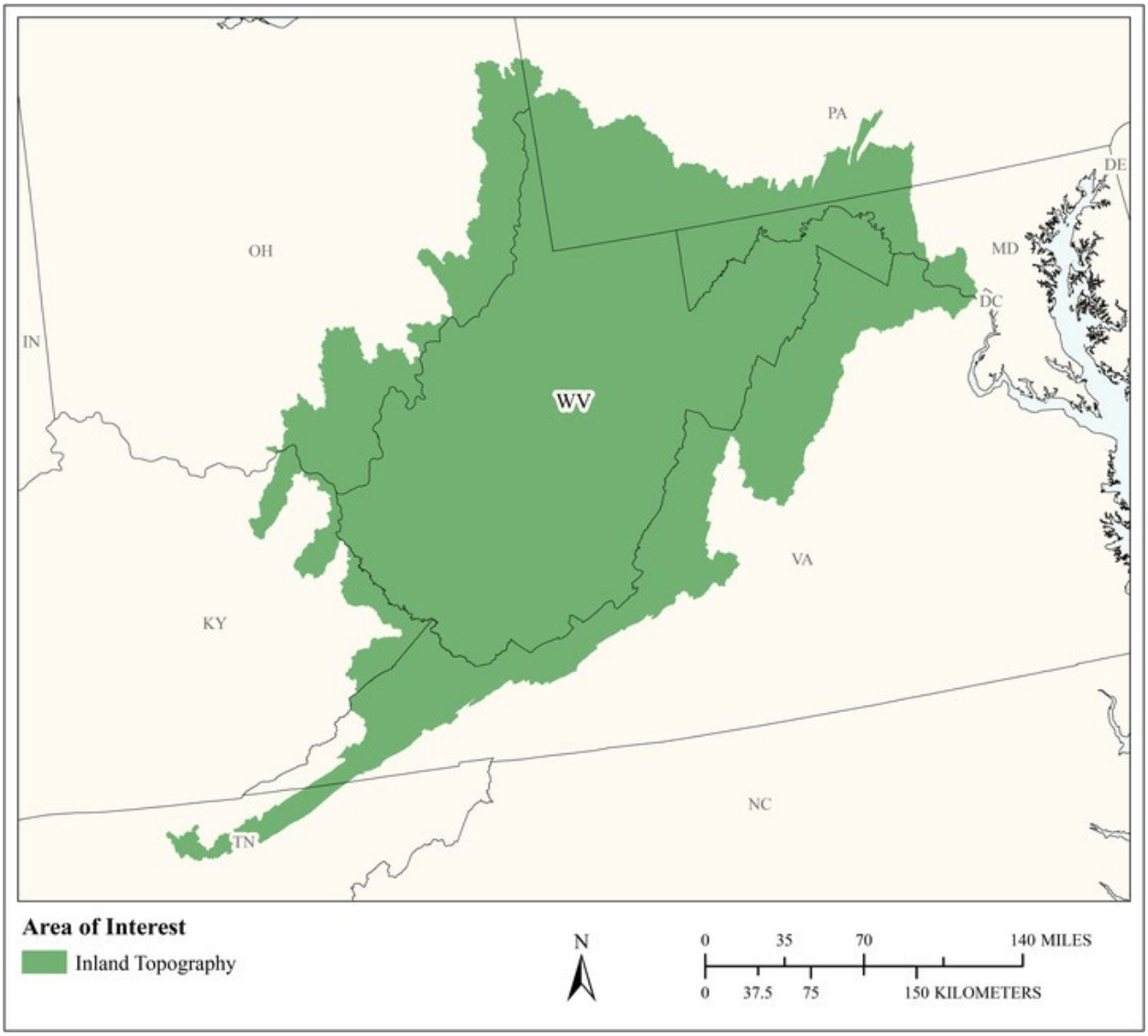
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Increased revenues	Moderate	Moderate		
Mission-driven performance improvements	Major	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate		
Improved response or timeliness	Major	Moderate		
Improved customer experience	Moderate	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate		
Environmental	Major	Moderate		
Public safety, including life and property	Major	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Moderate	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Moderate	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate								
Environmental	Major			Major								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps	Yes	Yes		
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes	Yes		
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Environmental Protection for West Virginia



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more Hydrologic Units (HUC8s)			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	1. Oversee water quality and quantity issues for the state. All Clean Water Act monitoring and enforcement. 2. Regulate and monitor all mining and quarry activity in the state. 3. Regulate and monitor all oil and gas activity in the state. 4. Regulate and monitor all air quality issues for the state. 5. Regulate and monitor all Super Fund and other remediation activity for the state. The use of lidar hillshade data and DEM derived data into mobile platforms is the future of this work. The mixing of these data in Artificial Reality and Virtual Reality platforms is also very exciting. Jumping between tagged photospheres and lidar is more powerful than most people realize.
MCA Title	Environmental Protection for West Virginia
MCA ID	22333
Organization Type	State or U.S. Territorial government
Organization Name	WVDEP
Sub-Agency or Division	
Organization Mission	The lead environmental regulatory agency for the state of West Virginia.
Program Name	1. Manage remote sensing and GIS database gathering for all of the above mentioned programs. 2. Model and spatially define all mining related disturbances in the state. Both above and below ground. 3. Define surface and groundwater hydrology issues for the state. Run large scale modeling in both systems. 4. Define karst and mine pool groundwater flow systems for the state.
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 11 - Geologic Resource Mining and Extraction
Tertiary Business Use	BU 13 - Oil and Gas Resources

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Small cave and deep mine subsidence features about 1-3 meters in size.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			
Other	Highly desirable			
Other description	Specialized Karst Analysis			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	1. Mining related disturbance analysis and related change analysis at half meter accuracy level. 2. Karst feature analysis for limestone regions. 3. Developing accurate DEM data to drive hydrologic modeling. 4. Wetland ID and analysis. 5. Flow and flood analysis and modeling.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	ESRI Datasets, USGS datasets			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Minor			
Cost avoidance	Moderate			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

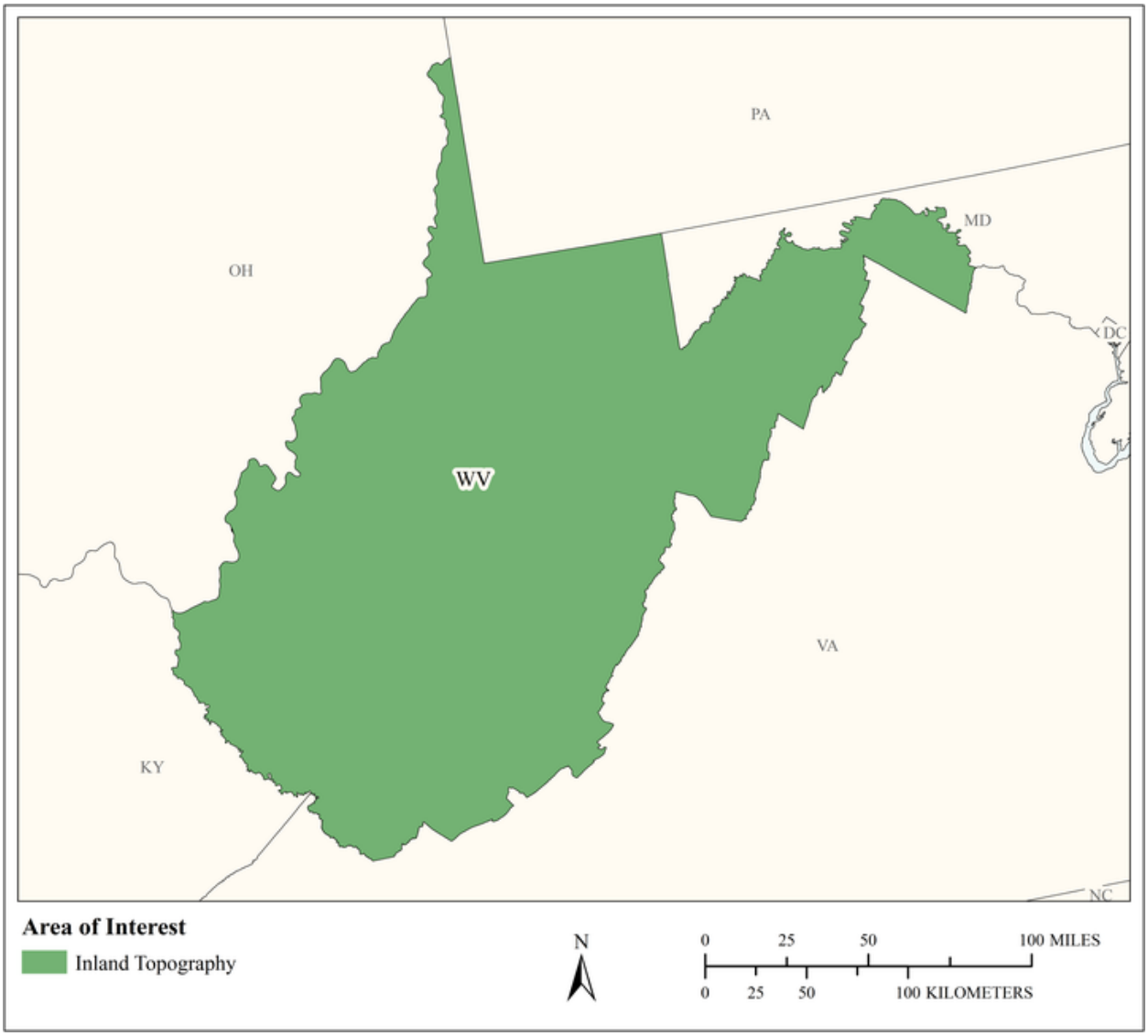
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$15,196									
Time savings description	Same as above. Not common. Locate karst and mining subsidence features without site visits. Allows sharing of mobile GIS data with many people. Mobile LIDAR deployment key on many levels. Mobile GIS LIDAR maps very helpful.											
Cost savings/cost reduction	Moderate	Annual dollars saved/realized	$97,200									
Cost savings/cost reduction description	Minor. Data allows wiser resource deployment.											
Cost avoidance	Major	Annual dollars saved/realized	$21,500									
Cost avoidance description	Flood and pipeline work specifically. Spills and subsidence. Save man hours point reclassification. Hours on QC.											
Increased revenues	Moderate	Unable to provide										
Increased revenues description	GEOPDF LIDAR.											
Mission-driven performance improvements	Moderate	Annual percent improvement	30%									
Mission-driven performance improvements description	Modeling accuracy improvement. Specific Karst and Mining Analysis improvement.											
Other operational benefits	Moderate	Unable to provide										
Other operational benefits description	GeoPDF production. Producing Hillshade GeoPDF product for mobile use.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Annual dollars saved/realized	$5,789									
Value added to products or services description	GPS interaction with mobile GIS product. Mapping of Mining and Karst features.											
Improved response or timeliness	Major	Annual dollars saved/realized	$6,151									
Improved response or timeliness description	Not common. Watershed analysis is greatly enabled. Pipeline reaction analysis greatly improved. Improved EIS, CHIA and TMDL watershed analysis. Dams and impoundments. For specific customers data is very useful.											
Improved customer experience	Moderate	Annual dollars saved/realized	$1,085									
Improved customer experience description	For specific customer base only, but very important at that level. DEM data specifically.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Education or outreach description	Everyone likes nice mapping											

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Environmental	Moderate			
Environmental description	Karst and mining related analysis and identification			
Public safety, including life and property	Moderate			
Public safety, including life and property description	Karst and mining related analysis and identification			

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Forest Resources Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	All of the following are the WVDOF's mission critical activities: Determination of standing inventory of forest resources. Prescribed burn planning. Analysis of carbon stocks for trade. Harvest systems planning. Conservation of critical habitats. Stream channel analysis and mapping for riparian buffers. Determination of forest fuel and fire susceptibility. Fire behavior modeling to support wildfire suppression activities. Wildland/urban interface building identification. Post-fire analysis to determine landslide-prone areas. Urban ecology planning. Tourism. Trail and vista site planning.
MCA Title	Forest Resources Management
MCA ID	22081
Organization Type	State or U.S. Territorial government
Organization Name	WV Division of Forestry
Sub-Agency or Division	
Organization Mission	The West Virginia Division of Forestry's (WVDOF) mission is to protect, nurture, and promote the wise utilization and sustainability of the state's forest resources.
Program Name	We have several programs: Fire Protection, Landowner Assistance, Logging Sediment Control Act, Urban Forestry, Forest Legacy and State Lands
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	BU 17 - Wildfire Management, Planning, and Response
Tertiary Business Use	BU 27 - Recreation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Individual tree

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Not required			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Current freely available downloadable LIDAR data from the WV GIS Technical Center http://wvgis.wvu.edu collected from 2002-2016 in various regions of the state.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
State repositories used	WV GIS Technical Center http://wvgis.wvu.edu			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

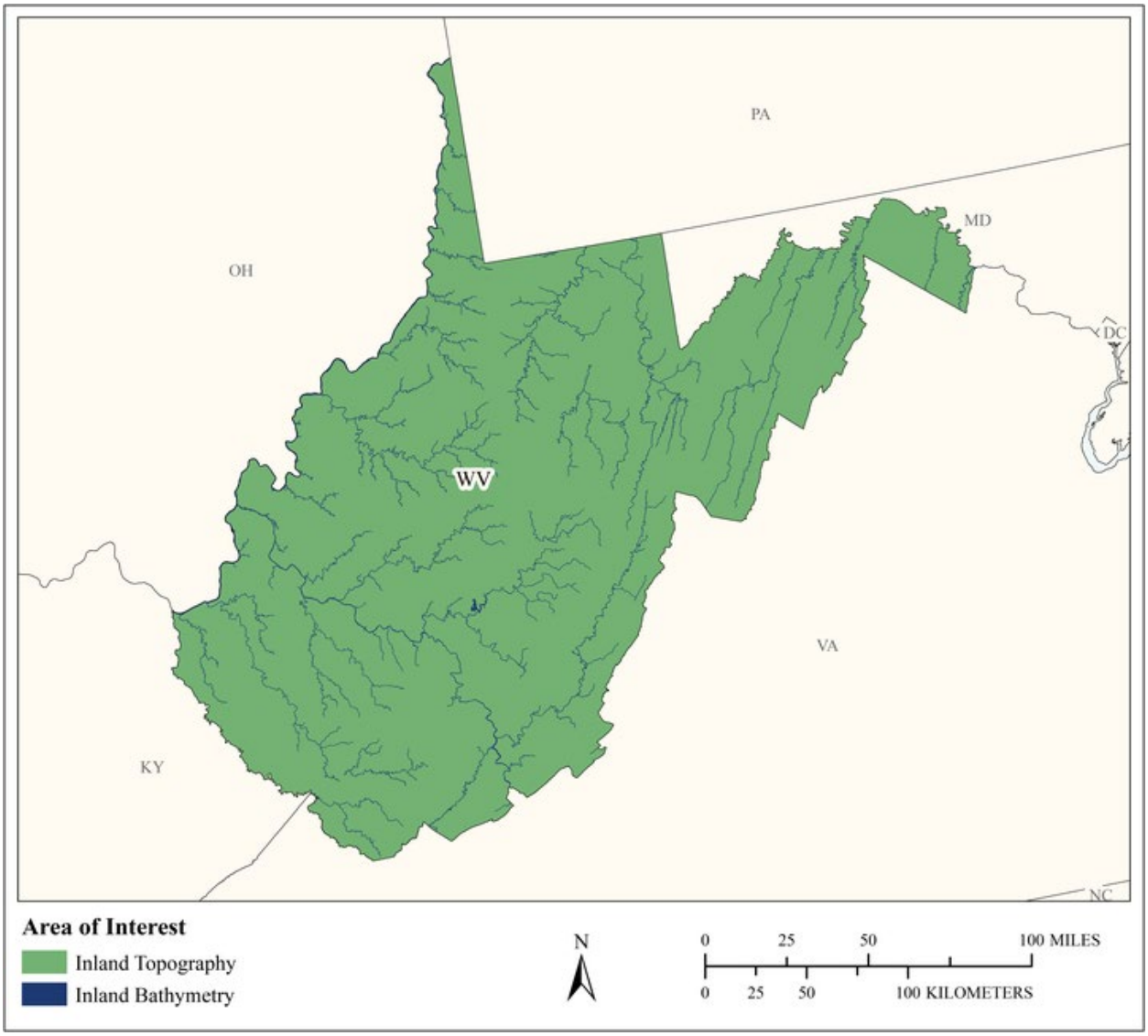
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Time savings description	WVDOF has many staff and programs that could benefit from this data but hard to calculate what hourly savings would be, but it would save a lot of time all around for projects.											
Cost savings/cost reduction	Major	Unable to provide										
Cost savings/cost reduction description	WVDOF has many staff and programs that could benefit from this data but hard to calculate what hourly savings would be, but it would save a lot of time all around for projects.											
Cost avoidance	Major	Unable to provide										
Cost avoidance description	WVDOF has many staff and programs that could benefit from this data but hard to calculate what hourly savings would be, but it would save a lot of time all around for projects.											
Increased revenues	Major	Unable to provide										
Increased revenues description	WVDOF has many staff and programs that could benefit from this data but hard to calculate what hourly savings would be, but it would save a lot of time all around for projects.											
Mission-driven performance improvements	Major	Unable to provide										
Mission-driven performance improvements description	WVDOF has many staff and programs that could benefit from this data but hard to calculate what hourly savings would be, but it would save a lot of time all around for projects.											
Other operational benefits	Major	Unable to provide										
Other operational benefits description	WVDOF has many staff and programs that could benefit from this data but hard to calculate what hourly savings would be, but it would save a lot of time all around for required long range planning documents. Improved long range planning.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Value added to products or services description	WVDOF has many staff and programs that could benefit from this data but hard to calculate what hourly savings would be, but it would save a lot of time all around for projects.											
Improved response or timeliness	Major	Unable to provide										

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Improved response or timeliness description	WVDOF has many staff and programs that could benefit from this data but hard to calculate what hourly savings would be, but it would save a lot of time all around for projects.											
Improved customer experience	Major	Unable to provide										
Improved customer experience description	WVDOF has many staff and programs that could benefit from this data but hard to calculate what hourly savings would be, but it would save a lot of time all around for projects.											
Other customer service benefits	Major	Unable to provide										
Other customer service benefits description	Improved information means a more efficient agency. Improved planning and management.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Education or outreach description	Improved information means a more informed pubic											
Environmental	Major											
Environmental description	Improved information means a more informed planning process											
Public safety, including life and property	Major											
Public safety, including life and property description	Improved information means a more safer pubic hopefully through good planning											
Other	Planning and management											
Other benefits	Major											
Other description	More public confidence in agency's mission											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Conservation Planning for State Wildlife and Habitat Areas



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation planning for state wildlife management areas, rivers, streams, and impoundments (lakes). Conservation of critical habitats. Management of game and fish species, diverse migratory bird and rare species habitats, protected fish species, and trust resources.
MCA Title	Conservation Planning for State Wildlife and Habitat Areas
MCA ID	1118
Organization Type	State or U.S. Territorial government
Organization Name	West Virginia Division of Natural Resources
Sub-Agency or Division	
Organization Mission	It is the statutory mission of the West Virginia Division of Natural Resources to provide and administer a long-range comprehensive program for the exploration, conservation, development, protection, enjoyment and use of the natural resources of the State of West Virginia.
Program Name	Wildlife Resources Section: Game Management Unit; Fish Management Unit; Wildlife Diversity Unit; Operations Unit (Environmental Coordination Program and GIS and Technology Support Program)
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	BU 02 - Riverine Ecosystem Management
Tertiary Business Use	BU 09 - Fisheries Management and Aquaculture

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Natural features, such as shrubs, trees, underwater vegetation, etc.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Nice to have
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B		
Update Frequency	6-10 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Not required			Not required	
Entire AOI under same environmental conditions	Nice to have	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Nice to have	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Up to triple the required TVU at the 95% confidence level			Up to triple the required TVU at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Highly desirable	Highly desirable		
DEM	Required	Highly desirable		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Highly desirable	Highly desirable		
Edited/cube XYZ		Highly desirable		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Highly desirable	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		
Estuaries				
Inland surface water features	Highly desirable	Highly desirable		
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Not required	Not required		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	LIDAR data from the WV GIS Technical Center http://wvgis.wvu.edu collected from 2002-2016 in various regions of the state.	WV Division of Natural Resources is collecting and processing inland bathymetric data. Here are layouts of our completed lakes: http://www.wvdnr.gov/Lake_Maps/ And we are hosting these data on our interactive fishing map: https://www.mapwv.gov/huntfish/map/?v=fish Some of these data were collected by the WV Department of Environmental Protection, Watershed Branch, and we processed the data for our use. We have also processed depth data for our large rivers from the US Army Corps of Engineers for internal use and do not plan to host these data on our fishing map due to changes in river channels, etc. These data were downloaded from: http://navigation.usace.army.mil/Survey/Hydro		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				

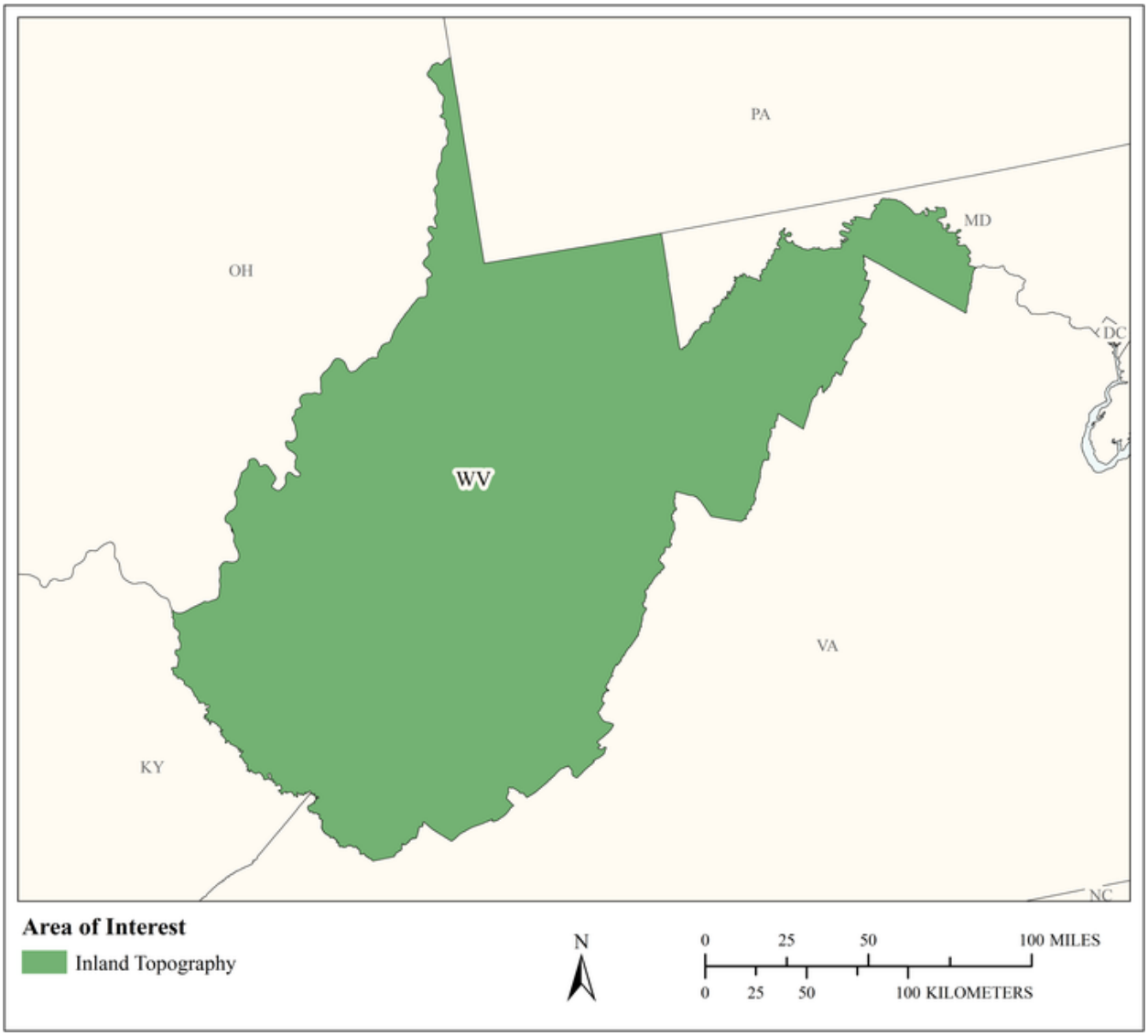
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	WV GIS Technical Center WV Department of Environmental Protection	See comments from 34a		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Moderate	Major		
Cost avoidance	Major	Major		
Increased revenues	Minor	Minor		
Mission-driven performance improvements	Major	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate		
Improved response or timeliness	Minor	Minor		
Improved customer experience	Major	Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate		
Environmental	Major	Moderate		
Public safety, including life and property	Minor	I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Minor	Unable to provide		Major	Unable to provide							
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide							
Increased revenues	Moderate	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Moderate	Unable to provide		Moderate	Unable to provide							
Improved customer experience	Moderate	Unable to provide		Major	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major								
Environmental	Major			Moderate								
Public safety, including life and property	Minor			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geological Mapping and Analysis



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Analyze geological and natural resources of our state including bedrock geologic mapping, surficial geologic mapping, coal, oil, and gas, building stone, ground water, surface water, earth-science education, and anything else related to geology in West Virginia
MCA Title	Geological Mapping and Analysis
MCA ID	1256
Organization Type	State or U.S. Territorial government
Organization Name	WVGES-WV Geological & Economic Survey
Sub-Agency or Division	
Organization Mission	The mission of the West Virginia Geological and Economic Survey (WVGES) is to conduct long-term analysis of the geological resources of the state, especially coal, oil, and gas, and to provide expertise and information to the citizens of West Virginia regarding geological resources and the environment through direct contact, publications, and web-based applications.
Program Name	General Geosciences, Oil and Gas, Coal
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 11 - Geologic Resource Mining and Extraction
Tertiary Business Use	BU 13 - Oil and Gas Resources

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Rock outcrops that range from survey level to small-feature level

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Required			
Wetlands	Highly desirable			
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Required			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	From None to QL2: West Virginia does not have complete lidar coverage, and the QL of most of what we do have is unknown.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	WV GIS Tech Center at http://wvgis.wvu.edu			

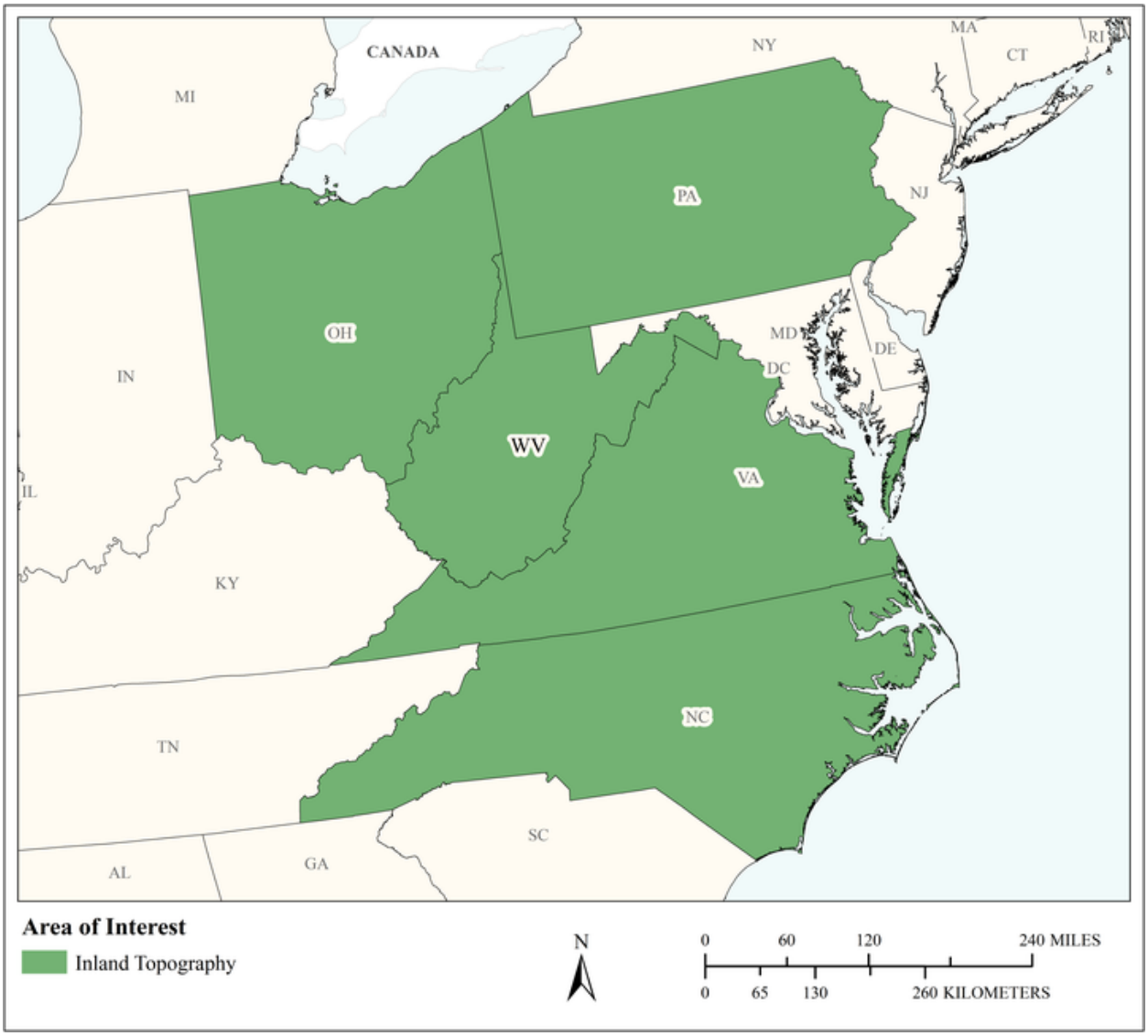
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Moderate			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	**Inland Topo**			**Inland Bathy**			**Nearshore Bathy**			**Offshore Bathy**		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Time savings description	Having high-quality lidar is a game changer.											
Cost savings/cost reduction	Major	Unable to provide										
Cost savings/cost reduction description	Having high-quality lidar is a game changer.											
Cost avoidance	Major	Unable to provide										
Cost avoidance description	Having high-quality lidar is a game changer.											
Increased revenues	Major	Unable to provide										
Increased revenues description	Having high-quality lidar is a game changer.											
Mission-driven performance improvements	Major	Unable to provide										
Mission-driven performance improvements description	Having high-quality lidar is a game changer.											
Other operational benefits	Major	Unable to provide										
Other operational benefits description	Everyting geology related. Having high-quality lidar is a game changer.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Value added to products or services description	Having high-quality lidar is a game changer.											
Improved response or timeliness	Major	Unable to provide										
Improved response or timeliness description	Having high-quality lidar is a game changer.											
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Civil Engineering and Field Services



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Energy development services to include civil engineering design, surveying services, permitting and environmental assessment. Our project types include oil and gas, wind power, coal, telecommunications, construction, transportation, public utilities and private surveys. BU 13 - Oil and Gas Resources
MCA Title	Civil Engineering and Field Services
MCA ID	22403
Organization Type	Private or Commercial
Organization Name	The Thrasher Group
Sub-Agency or Division	
Organization Mission	Geospatial Consultant
Program Name	Aerial Mapping Department
Total Annual Program Budget	
Primary Business Use	BU 13 - Oil and Gas Resources
Secondary Business Use	BU 22 - Infrastructure and Construction Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Survey-level features

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial			
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Highly desirable			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL2/QL1 self-collected			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	In-house			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor			
Cost savings/cost reduction	Minor			
Cost avoidance	Minor			
Increased revenues	None			
Mission-driven performance improvements	Minor			

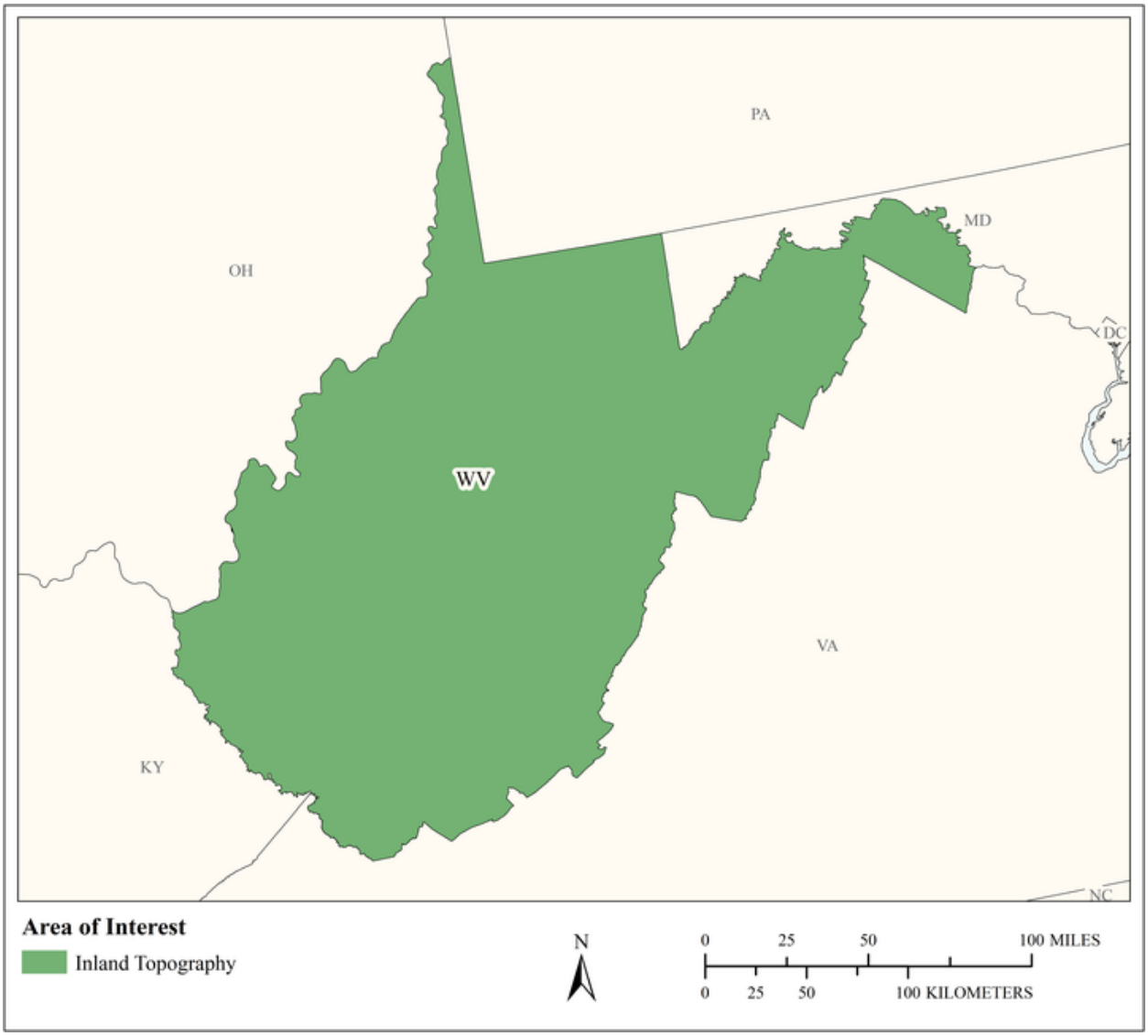
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor			
Improved response or timeliness	None			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	None			
Public safety, including life and property	None			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	None											
Cost savings/cost reduction	None											
Cost avoidance	Minor	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	None											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Minor	Unable to provide										
Improved customer experience	None											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None											
Environmental	None											
Public safety, including life and property	None											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Flood Risk Management and Geologic Assessment



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	MISSION CRITICAL ACTIVITY: Multi-hazard risk assessments BU 15: ** Flood Risk Management ** Flood risk mapping activities using best available topographic data to generate floodplain boundaries and flood depth grids, Hazus Level 2 flood risk analysis and loss estimates, 3D flood visualizations using depth grids and building footprints, floodplain manager NFIP functions, ground elevation determinations. Elevation data critical for WV Flood Tool (www.mapwv.gov/flood) web application. BU 10: ** Geologic Landslide Assessment and Hazard Mitigation ** Landslide hazard mapping and assessment. BU 18: ** Dam/Levee Flood Inundation Maps and Warning Systems ** Best available elevation data is critical for orthorectification of imagery. FEMA flood mapping is a primary driver for elevation data for the state. Slope models are needed for predictive landslide modeling and to identify previously undetected landslides. Addresses, elevation, and imagery are the three critical datasets for the state. Elevation data are also needed for 3D flood models, rooftop identification, and to support floodplain managers, flood determinations, advisory BFEs, etc.
MCA Title	Flood Risk Management and Geologic Assessment
MCA ID	1289
Organization Type	Academic or Not-for-Profit
Organization Name	WV GIS Technical Center
Sub-Agency or Division	
Organization Mission	To provide focus, direction and leadership to users of geographic information systems (GIS), digital mapping and remote sensing within the State of West Virginia
Program Name	FEMA cooperative technical partnerships and Hazard Mitigation Grant Program (post disaster funding for hazard mitigation mapping)
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Tertiary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)

General Geographic Area and Size	
Description of smallest 3D features	FEMA mapping standards. Bare earth and 1' contours are needed.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	Event driven only – Data need to coincide with a specific event.			
Event type(s)	FEMA restudy or other flood mapping requirement such as a flooding event.			
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features				
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			
Other	Highly desirable			
Other description	Buildings			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Primarily QL3 or lower quality lidar data. FEMA is purchasing QL2 lidar for the entire state of West Virginia.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	www.mapwv.gov/lidar			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None			
Cost savings/cost reduction	None			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Cost avoidance	None			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	None			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Minor			
Public safety, including life and property	Major			

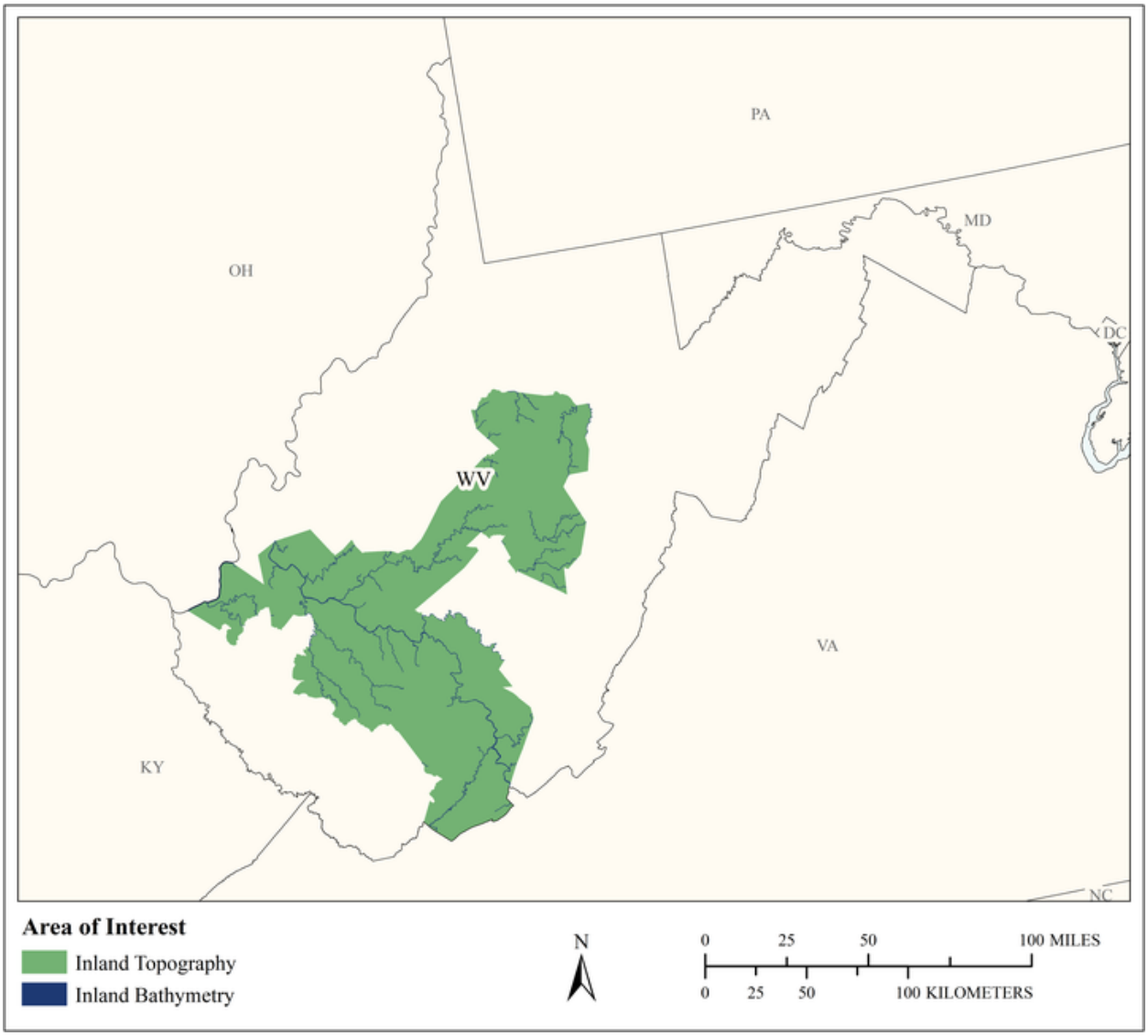
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Time savings description	Hours saved through more efficient, accurate models for H&H and multi-hazard assessments. The lidar derived 1-m DEM is 10x more accurate than the current 10m statewide DEM.											
Cost savings/cost reduction	Major	Unable to provide										
Cost savings/cost reduction description	FEMA is purchasing QL2 lidar for all of West Virginia for flood mapping activities. Products include hydro-flattened bare earth 1m DEMs and 1 ft. contours.											
Cost avoidance	Major	Unable to provide										
Cost avoidance description	More accurate hazard risk map and assessments. FEMA purchased QL2 lidar that comes with high quality products like hydro-flattened 1m DEMs and 1-ft contours.											
Increased revenues	Major	Unable to provide										
Increased revenues description	New and improved elevation/hillshade web map services. New flood map layers including floodplains, flood heights, and depth grids. New landslide susceptibility maps. New multi-hazard risk assessment reports and maps.											
Mission-driven performance improvements	Major	Unable to provide										
Mission-driven performance improvements description	More credible hazard risk products generated for local/state hazard mitigation plans and for general public. Improved decision making due to better elevation data and risk models.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Value added to products or services description	New hazard products and services to make West Virginia communities more resilient to natural hazards. Improved accuracy of hazard products for communities and citizens of West Virginia.											
Improved response or timeliness	Major	Unable to provide										
Improved response or timeliness description	Improved customer services for flood and landslide risk information via web applications like www.mapwv.gov/flood and www.mapwv.gov/landslide. Improved evacuation plans for dam/levee failures. Faster reviews for LOMAs and other FEMA map changes. Faster information for advisory flood height determinations after flood event. More current flood and landslide hazard maps. Improved spatial inventory of at-risk structures exposed to floods, dam/levee failures, and landslides.											

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Improved customer experience	Moderate	Unable to provide										
Improved customer experience description	Elevation data is critical for accurate flood mapping and for base flood elevation determinations. Enhanced elevation query and hillshade web services for communities and public.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Education or outreach description	Better informed public about multi-hazards in West Virginia											
Environmental	Minor											
Environmental description	Open space preservation, green infrastructure, etc.											
Public safety, including life and property	Major											
Public safety, including life and property description	Safer and more resilient communities											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Water, Sewer and Transportation Infrastructure Placement and Routing



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements	Boone, Braxton, Cabell, Clay, Fayette, Kanawha, Lewis, Mercer, Putnam, Raleigh, Summers, Upsher, and Webster Counties, WV	Boone, Braxton, Cabell, Clay, Fayette, Kanawha, Lewis, Mercer, Putnam, Raleigh, Summers, Upsher, and Webster Counties, WV		

MCA Description	Response
Mission Critical Activity	Terrain modeling and analysis for water, sewer and transportation infrastructure placement and routing.
MCA Title	Water, Sewer and Transportation Infrastructure Placement and Routing
MCA ID	11472
Organization Type	Private or Commercial
Organization Name	Mott MacDonald
Sub-Agency or Division	
Organization Mission	Provide professional civil engineering services.
Program Name	Distribution System Improvement and Technical Services Program
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 23 - Urban and Regional Planning
Tertiary Business Use	BU 30 - Maritime and Land Boundary Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required
Other	Highly desirable
Other description	Surface type (pervious/impervious)

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Storage tanks, building structures, roads.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Nice to have
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Not required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL0B		
Update Frequency	4-5 years	Event driven only – Data need to coincide with a specific event.		
Event type(s)		Event driven only		
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	Less than 50 cm		
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required			Not required	
Entire AOI under same environmental conditions	Required	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Required	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Not required		
DTM	Required	Highly desirable		
DEM	Not required	Not required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Highly desirable	Highly desirable		
Edited/cube XYZ		Nice to have		
Full waveform	Highly desirable	Highly desirable		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Required	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Not required		
Land use/land cover	Nice to have	Nice to have		
Wetlands	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Highly desirable		
Bridges/culverts	Required	Highly desirable		
Landmark features	Required	Highly desirable		
Cultural resources	Required	Highly desirable		
Coastal and riverine structures	Required	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Topographic data derived from aerial or terrestrial Lidar and conventional surveys. Usually 0.1' or better accuracy.	USGS Topo maps and field survey data.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	West Virginia Geographic Information System Technology Center	West Virginia Geospatial Information Technology Center		
Other	Yes			
Other description	Project surveys			
Data that meet my needs are not available				

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Minor		
Cost savings/cost reduction	Moderate	Minor		
Cost avoidance	Moderate	Minor		
Increased revenues	Moderate	None		
Mission-driven performance improvements	Moderate	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor		
Improved response or timeliness	Moderate	Minor		
Improved customer experience	Moderate	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	None		
Environmental	None	Minor		
Public safety, including life and property	Moderate	Minor		

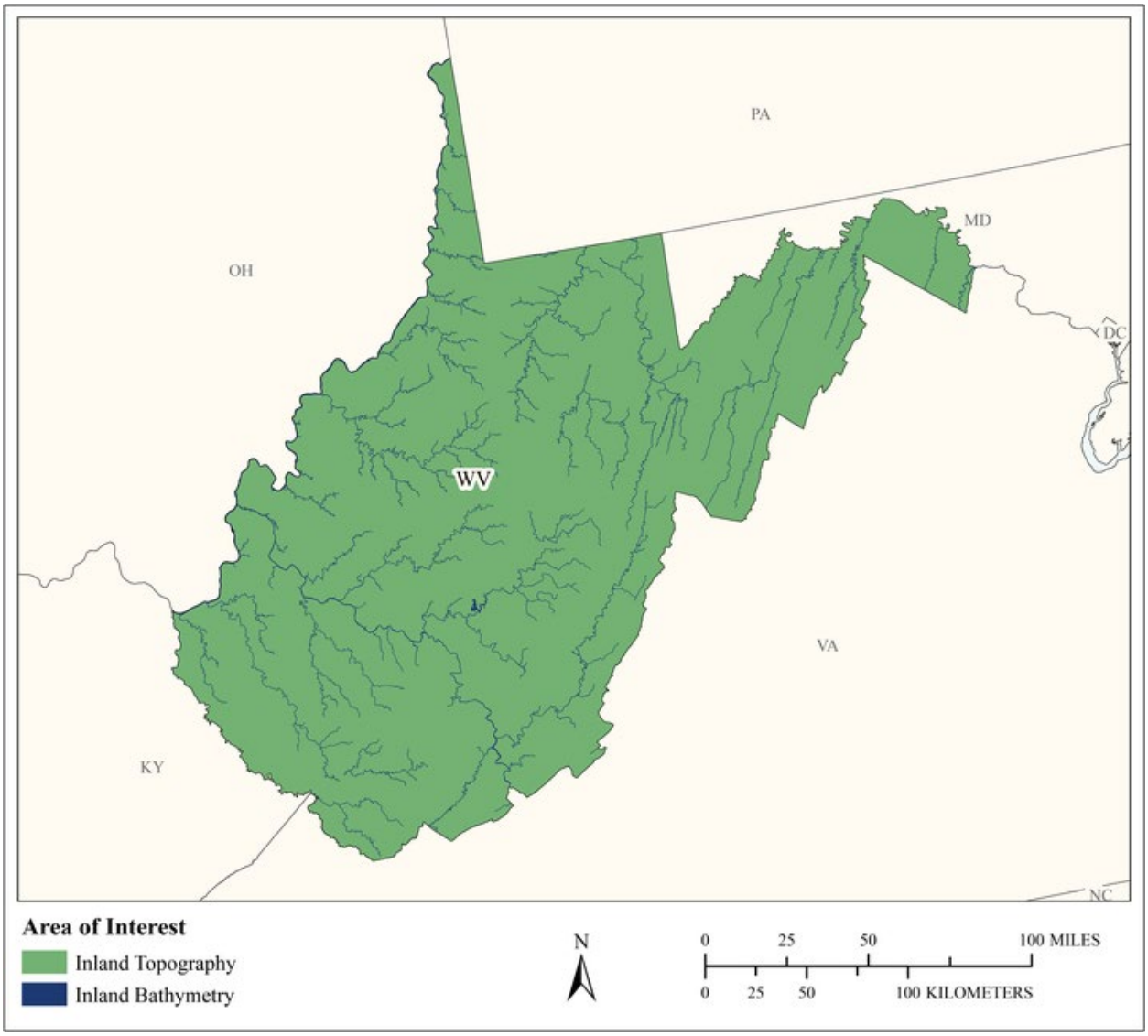
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide							
Time savings description	Frequency varies greatly depending on specific project needs.			Hours vary greatly depending on specific project needs. Frequency varies greatly depending on specific project needs.								
Cost savings/cost reduction	Major	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction description	Cost varies greatly depending on specific project needs. Materials required varies greatly depending on specific project needs.			Project driven costs will fluctuate with market demands.								
Cost avoidance	Minor	Unable to provide		I don't know	Unable to provide							
Cost avoidance description	Not much time is currently spent on this. Rarely or never currently occurs.			Hours vary greatly depending on specific project needs. Impossible to estimate.								
Increased revenues	None			I don't know	Unable to provide							
Increased revenues description				Not applicable to my business.								
Mission-driven performance improvements	Major	Annual percent improvement	15%	I don't know	Unable to provide							
Mission-driven performance improvements description	Pure estimate.			Impossible to estimate.								
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		I don't know	Unable to provide							
Value added to products or services description				Impossible to estimate.								
Improved response or timeliness	Major	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness description	Frequency varies greatly depending on event occurrence. Frequency varies greatly depending on specific project needs.			Impossible to estimate. Not applicable to my business.								
Improved customer experience	Major	Unable to provide		I don't know	Unable to provide							
Improved customer experience description				Impossible to estimate.								
Other customer service benefits	Minor	Unable to provide		I don't know	Unable to provide							
Other customer service benefits description	Unknown.			Impossible to estimate. Unknown.								
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			I don't know								
Education or outreach description	We do not conduct educational outreach.			Impossible to predict.								
Environmental	Moderate			I don't know								
Environmental description	Better ability to minimize adverse impacts of infrastructure projects on the environment.			Impossible to predict								

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Public safety, including life and property	Moderate	I don't know		
Public safety, including life and property description	Any reduction in field work equates to a reduction in potential safety risk.	Impossible to predict		
Other		Unknown		
Other benefits		I don't know		
Other description		Impossible to predict		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps	Yes	Yes		
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Transportation Planning, Design, and Construction



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Transportation Planning, Design, and Construction BU 22 Infrastructure and Construction Management
MCA Title	Transportation Planning, Design, and Construction
MCA ID	22338
Organization Type	State or U.S. Territorial government
Organization Name	WV Division of Highways
Sub-Agency or Division	
Organization Mission	The West Virginia Department of Transportation's mission is to responsibly provide a safe, efficient and reliable transportation system that supports economic opportunity and quality of life.
Program Name	WV Division of Highways
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Tertiary Business Use	BU 19 - Land Navigation and Safety

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Survey level features

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Not required
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	Cross sections and/or transects meet needs		
Update Frequency	4-5 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	The best horizontal accuracy achievable for the vertical accuracy I need		
Acceptable Vertical Error	Up to 10 cm	Up to 50 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs		Yes		
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Not required
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Not required			Nice to have	
Entire AOI under same environmental conditions	Nice to have	Not required			Not required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Nice to have			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Not required	Not required		
Classified point cloud	Nice to have	Nice to have		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have	Not required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required	Not required		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Nice to have	Highly desirable		
Estuaries				
Inland surface water features	Required	Highly desirable		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Nice to have	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	West Virginia lidar and self-collected lidar/field survey data	Self-collected		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor	I don't know		
Cost savings/cost reduction	Minor	I don't know		

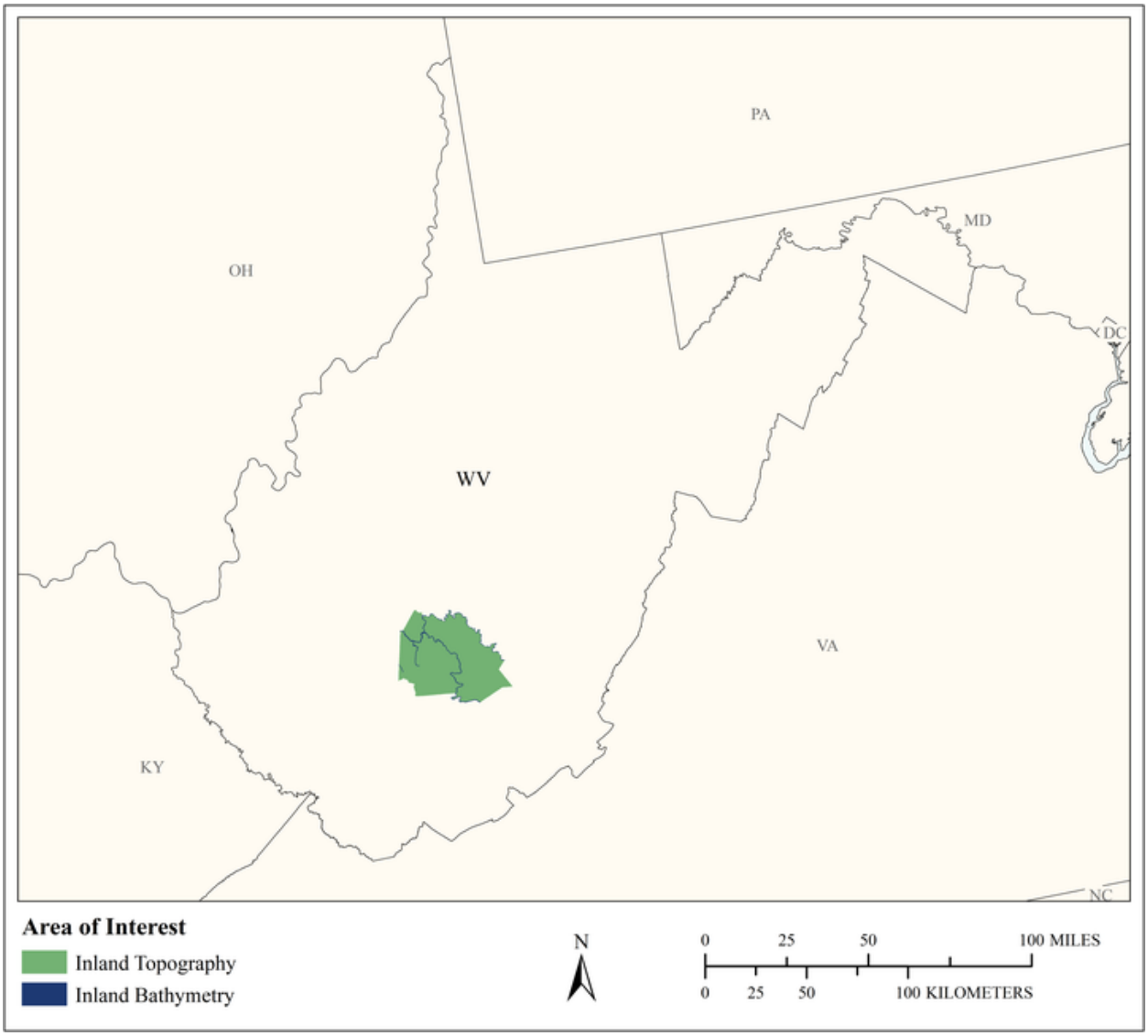
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost avoidance	Moderate	I don't know		
Increased revenues	None	I don't know		
Mission-driven performance improvements	None	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor		
Improved response or timeliness	Major	None		
Improved customer experience	Moderate	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor		
Environmental	Minor	Minor		
Public safety, including life and property	Moderate	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		I don't know	Unable to provide							
Cost avoidance	Minor	Unable to provide		I don't know	Unable to provide							
Increased revenues	None			I don't know	Unable to provide							
Mission-driven performance improvements	Moderate	Unable to provide		I don't know	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	Moderate	Unable to provide		I don't know	Unable to provide							
Improved customer experience	Moderate	Unable to provide		I don't know	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			I don't know								
Environmental	Minor			I don't know								
Public safety, including life and property	Moderate			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: 3D Analysis for City Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements	Fayette County, WV	Fayette County, WV		

MCA Description	Response
Mission Critical Activity	There is a high need for building footprint and height data for our city to produce 3D analysis for light capture (solar energy) and to better analyze the terrain, cliffs, and boulders of Needleseye Park, which requires high-quality LiDAR data.
MCA Title	3D Analysis for City Planning
MCA ID	1293
Organization Type	Regional, County, City, or other local government
Organization Name	City of Oak Hill
Sub-Agency or Division	
Organization Mission	The mission of the City of Oak Hill is to serve its citizens.
Program Name	Oak Hill Planning & Zoning Commission.
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 27 - Recreation
Tertiary Business Use	BU 12 - Renewable Energy Resources

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	There are different sizes of boulders in Needleseye Park. The smaller boulders and cliff faces would be the smallest 3D features I'd be interested in.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required

Inland Bathy Feature Size Requirements	Response
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	Cross sections and/or transects meet needs		
Update Frequency	4-5 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter		
Acceptable Vertical Error	Up to 20 cm	Up to 50 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs		Yes		
Cross section/transect requirement		I would be satisfied with the requirements of up to 50 cm TVU for the data. I do not know the sampling density requirements for the cross sections.		

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Not required	Not required			Not required	
DEM for entire AOI needs to be seamless	Not required	Not required			Not required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Required		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Required	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Not required		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Nice to have	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Highly desirable		
Ground control/ground truthing	Nice to have	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Nice to have		
Land use/land cover	Highly desirable	Required		
Wetlands	Nice to have	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have	Highly desirable		
Bridges/culverts	Highly desirable	Required		
Landmark features	Highly desirable	Required		
Cultural resources	Highly desirable	Required		
Coastal and riverine structures	Nice to have	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	I'm currently using LiDAR data provided by the West Virginia Department of Environmental Protection collected around 2010, but I do not know the quality level of the data outside of it is not as high-quality as QL2.	I have not been using inland bathymetry data.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	WVDEP TAGIS; WV GIS Technical Center.			
Data that meet my needs are not available				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	None		
Cost savings/cost reduction	Major	None		
Cost avoidance	Major	None		
Increased revenues	I don't know	None		
Mission-driven performance improvements	Major	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None		
Improved response or timeliness	Major	None		
Improved customer experience	I don't know	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	None		
Environmental	Major	None		
Public safety, including life and property	I don't know	None		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$10,854	I don't know	Unable to provide							
Time savings description	Current LiDAR data I've used is not classified and requires a lot of manual classification, which can add up to hundreds of hours better used elsewhere. I've taken on average a full work week's worth of time to import multiple datasets and fix their projections to accomplish a similar task.											
Cost savings/cost reduction	Major	Annual dollars saved/realized	$15,000	I don't know	Unable to provide							
Cost savings/cost reduction description	Number based on an estimate to fly QL2 data acquisition for entire city provided by a local contractor.											
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide							
Cost avoidance description	I do not have a price estimate to process LiDAR data by itself.											
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Major	Annual percent improvement	100%	I don't know	Unable to provide							
Mission-driven performance improvements description	New, classified QL2 data would absolutely improve our modeling by 100% itself, and decision making would be improved by at least that, given current data does not meet secondary and tertiary mission requirements. Considering we can only meet part of our primary mission with existing data, new data will allow us to take on our entire mission and additional missions. Compared to our current bare earth modeling and analysis, we could then be able to analyze structures, vegetation, drainage, and infrastructure with the data. 100% may be an understatement.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		I don't know	Unable to provide							
Value added to products or services description	We do not generate our own flood hazard data and rely on state/federal agencies to provide that, but the accuracy would definitely have some savings to our city. We do not sell products related to LiDAR data, and there is no way to calculate the hours to be saved since the project cannot be undertaken currently.											
Improved response or timeliness	I don't know	Unable to provide		I don't know	Unable to provide							
Improved customer experience	Major	Unable to provide		I don't know	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			I don't know								
Education or outreach description	It would provide powerful products to educate the citizens about a multitude of issues.											

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Environmental	Major	I don't know		
Environmental description	We would have a better grasp on how to address potential flooding and drainage issues.			
Public safety, including life and property	I don't know	I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps	Yes			
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

Wisconsin

Importance of elevation data to Wisconsin

The state of Wisconsin covers 54,000 square miles of land area and an additional 11,000 square miles of water including Wisconsin's share of Lake Michigan and Superior. These Great Lakes coasts have more than 1000 linear miles of shoreline. According to the Wisconsin DNR, there are over 15,000 inland water bodies of all shapes and sizes. Wisconsin is truly a landscape defined by the action and presence of water, which makes statewide elevation and derivative products from lidar a critical asset to measure coastal bluff erosion from high lake levels, map streams and inland lakes, inventory dams and ditches, model soil and water conservation practices in agricultural watersheds and identify structures at risk in floodplains. Local, state, and tribal agencies are big consumers of lidar elevation data, including environmental permitting, flood and wildfire risk management, transportation planning and natural resource management. Government agencies in Wisconsin and their clientele need these products to plan new residential, commercial and industrial construction, remediate mines and other contaminated sites, detect and avoid historical, natural and archaeological resources, and many other activities that use to require more expensive topographic ground surveys. Previous benefit/cost studies have shown that the benefits of publicly available elevation products from lidar are conservatively five times the cost of acquiring the lidar data.

Current status of elevation data for Wisconsin

With funding assistance from 3DEP and other federal agencies, Wisconsin lidar partners have acquired first-time statewide coverage as of summer 2019, . In addition to capturing statewide coverage, other Wisconsin lidar priorities include updating older, lower resolution lidar data sets, increasing public access to lidar data, increasing usability of lidar products, increasing lidar user knowledge, and planning for the future. Updating the older, low-resolution data sets to Quality Level 2 (QL2) data is set for completion by 2023. In order to achieve these goals, Wisconsin has upgraded the WisconsinView Remote Sensing Data Archive, developed web streaming services, and provides training workshops and peer-to-peer collaboration through communities of practice. Increasingly, users are requesting lidar elevation derivative products, especially digital elevation models (DEMs) with hydro-enforcing of water features that make hydrological modeling possible.

High-level summary of elevation data requirements

Elevation data are needed for inland topography, inland bathymetry, nearshore bathymetry, and offshore bathymetry. Requirements vary depending by MCA. Most government agency stakeholders require at least QL2 for inland topography, except for DNR forestry, cultural resource managers and county planning increasing the need to QL1. Inland bathymetry is needed by most stakeholders with needs ranging from QL0B to QL3B. Applications include floodplain and water quality modeling, transportation, and conservation engineering design. Five stakeholders require nearshore bathymetry requiring QL1B and QL3B. Three stakeholders indicate a need for offshore bathymetry with cross sections and transects meeting their needs. Nearshore and offshore bathymetry in Lakes Michigan and Superior are needed for coastal navigation and safety, harbor maintenance and cultural resource identification.

High-level summary of benefits that would come from higher resolution elevation data

For improved and updated terrestrial elevation data, Wisconsin local, state, and tribal agency stakeholders estimate a total operational benefit of around $32 million per year and a customer service benefit of about $12 million per year. For new inland, nearshore, and offshore bathymetry, total operational and customer service benefits are estimated at about $3.5 million per year. Lack of widespread availability of

bathymetric data contributes to this lower benefit number with most potential users having little practical experience to form an opinion or do an analysis.

The State of Wisconsin has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

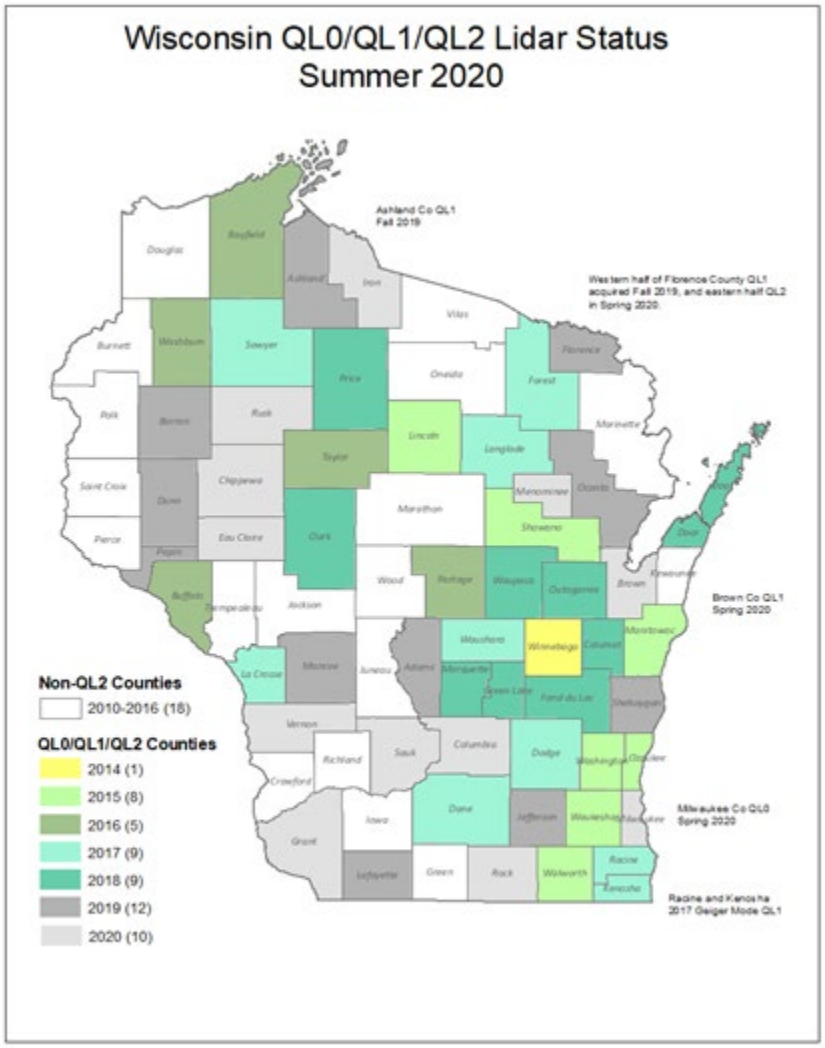


Figure 1. Wisconsin Lidar Status as of Summer 2020.

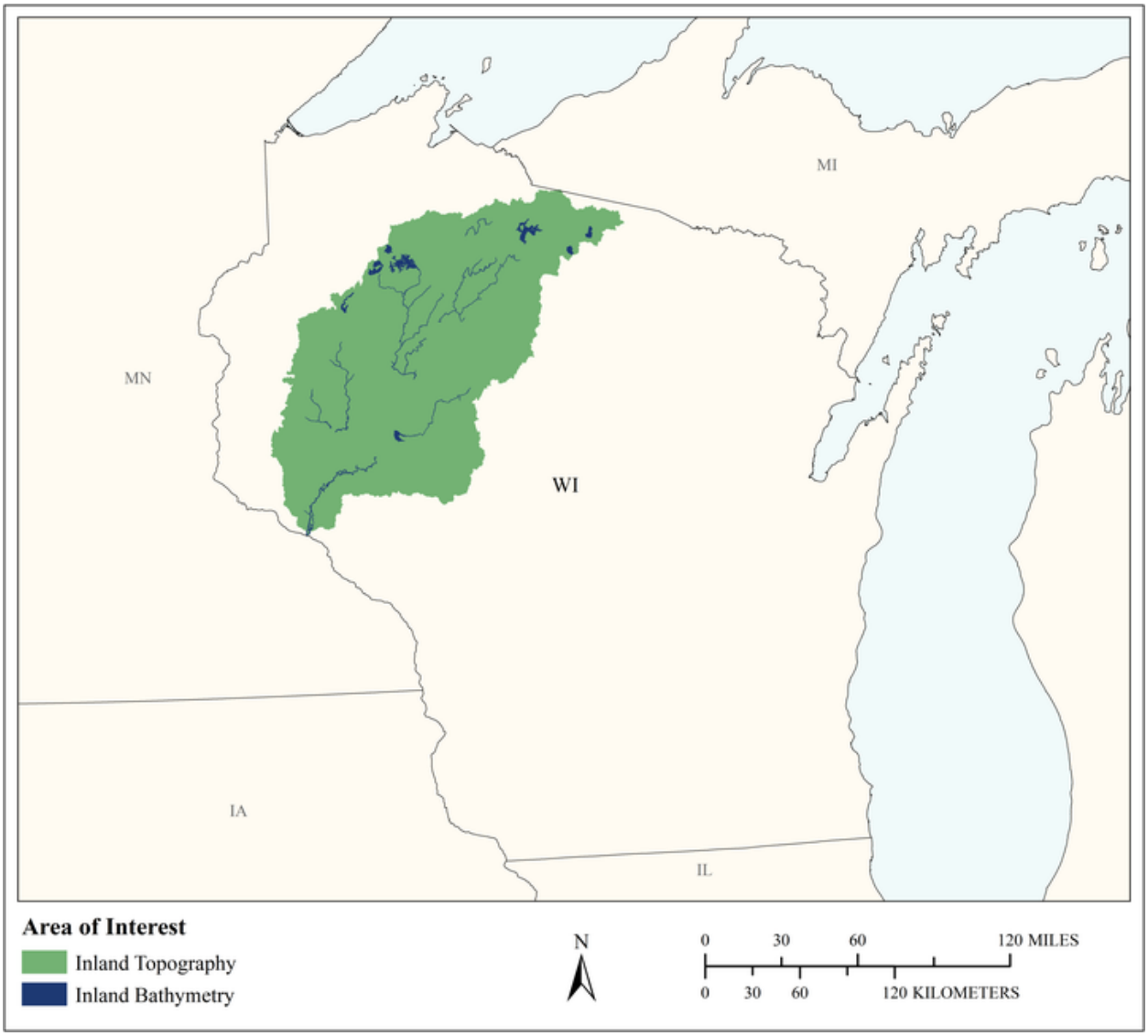
Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	Dunn County, Wisconsin	1372	Watershed Modeling, Stream Bank and Land Erosion Prediction	Inland Topo	QL2	6-10 years	$12,854	$1,809	Moderate	Major	Minor
				Inland Bathy	QL3B	>10 years	$1,054	$150	Minor	Minor	Minor
BU 03 – Coastal Zone Management	Wisconsin Department of Administration	1327	Geospatial Coordination	Inland Topo	QL2	6-10 years	$2,890,439	$505,309	I don't know	I don't know	I don't know
				Inland Bathy	QL1B	6-10 years	$380,904	$223,304	I don't know	I don't know	I don't know
				Nearshore Bathy	QL0B	6-10 years	$184,149	$311,510	I don't know	I don't know	I don't know
				Offshore Bathy	Cross sections and/or transects meet needs	>10 years	$641,666	$128,109	I don't know	I don't know	I don't know
BU 04 – Forest Resource Management	State of Wisconsin	60525	Forest Resources Management	Inland Topo	QL1	2-3 years	$221,664	$321,329	Major	Major	Major
BU 06 – Natural Resource Management	Bad River Band of the Lake Superior Tribe of Chippewa Indians	22449	Natural Resource Management	Inland Topo	QL1 HD	2-3 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate
				Inland Bathy	I don't know	6-10 years	Unable to quantify	Unable to quantify	I don't know	Major	I don't know
				Nearshore Bathy	I don't know	6-10 years	Unable to quantify	Unable to quantify	Major	Major	Moderate
				Offshore Bathy	I don't know	6-10 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
BU 06 – Natural Resource Management	State of Wisconsin	60526	Natural Resources Conservation	Inland Topo	QL1 HD	4-5 years	$2,198,981	$8,075,329	Major	Major	Major
BU 08 – Agriculture	Outagamie County, WI	1445	Outagamie County Conservation Planning and Design	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 09 – Fisheries Management and Aquaculture	Wisconsin Department of Natural Resources - Fisheries Management	21497	Fisheries Management	Inland Bathy	Cross sections and/or transects meet needs	>10 years	Unable to quantify	Unable to quantify	Major	Major	Minor

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 12 – Renewable Energy Resources	State of Wisconsin	60527	Renewable Energy Resources	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	None
BU 14 – Cultural Resource Management	State of Wisconsin	60528	Cultural Resources Preservation and Management	Inland Topo	QL1	4-5 years	$10,276	$8,984	Minor	Minor	Minor
BU 15 – Flood Risk Management	City of Oshkosh, WI	1106	City of Oshkosh Storm Water Management	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
BU 15 – Flood Risk Management	State of Wisconsin	60529	Flood Risk Management	Inland Topo	QL2	4-5 years	$7,871,671	$1,377,296	Major	Moderate	Major
BU 17 – Wildfire Management	State of Wisconsin	60530	Wildfire Management, Planning, and Response	Inland Topo	QL1	4-5 years	$301,222	Unable to quantify	Major	Major	Major
BU 18 – Homeland Security	State of Wisconsin	60531	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management	Inland Topo	QL2	4-5 years	$1,653,888	$29,231	Major	Moderate	Major
BU 19 – Land Navigation	Wisconsin Department of Transportation	1214	Multimodal Transportation Design	Inland Topo	QL0 HD	Event driven	$8,683	Unable to quantify	None	Moderate	Moderate
				Inland Bathy	QL1B	Annually	Unable to quantify	Unable to quantify	None	Moderate	None
				Nearshore Bathy	QL1B	Event driven	Unable to quantify	Unable to quantify	None	Moderate	Moderate
				Offshore Bathy	Cross sections meet needs	Event driven	Unable to quantify	Unable to quantify	None	Moderate	Moderate
BU 22 – Infrastructure Management	Wisconsin Department of Natural Resources	1250	Environmental Impact and Flood Resiliency of Road Stream Crossings	Inland Topo	QL0 HD	4-5 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
BU 22 – Infrastructure Management	Wisconsin Department of Natural Resources	1254	Dam Safety	Inland Topo	QL0 HD	>10 years	$8,683	Unable to quantify	Minor	None	Moderate
				Inland Bathy	I don't know	>10 years	$241	Unable to quantify	None	None	Minor
				Nearshore Bathy	I don't know	6-10 years	Unable to quantify	Unable to quantify	None	None	None

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 22 – Infrastructure Management	WI DNR Bureau of Facilities and Lands	1421	Conservation Engineering	Inland Topo	QL0 HD	2-3 years	$2,809	$5,427	None	Minor	Minor
				Inland Bathy	Cross sections and/or transects meet needs	4-5 years	$17,206	$12,361	I don't know	Moderate	Moderate
				Nearshore Bathy	Cross sections and/or transects meet needs	4-5 years	$17,206	$2,412	I don't know	Moderate	Moderate
BU 23 – Urban and Regional Planning	County Governments	1083	County Planning and Development Activities	Inland Topo	QL1	4-5 years	$15,084,557	$1,741,519	Major	Major	Major
				Inland Bathy	QL3B	6-10 years	$614,367	$777,228	Major	Minor	Major
BU 25 – Real Estate, Banking, and Insurance	State of Wisconsin	60532	Real Estate, Banking, Mortgage, and Insurance	Inland Topo	QL1 HD	4-5 years	$1,947,955	Unable to quantify	Minor	Minor	Major
BU 28 – Telecom-munications	State of Wisconsin	60533	Telecommunications	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

MCA Title: Watershed Modeling, Stream Bank and Land Erosion Prediction



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)	One or more Hydrologic Units (HUC4s)		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Watershed modeling, stream bank and land erosion prediction
MCA Title	Watershed Modeling, Stream Bank and Land Erosion Prediction
MCA ID	1372
Organization Type	Regional, County, City, or other local government
Organization Name	Dunn County, Wisconsin
Sub-Agency or Division	
Organization Mission	Dunn County's Mission: To provide quality public services in a cost effective manner through innovation, leadership, and the cooperation of dedicated people. Mission of the Land and Water Conservation Division: To sustainably use, enhance, and preserve the natural resources of Dunn County.
Program Name	Land and Water Resource Management Plan
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 02 - Riverine Ecosystem Management
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	6" contour or smaller. For watershed modeling I am interested in small changes in the landscape topography, but not individual features. For example, the elevation change between the surface of a paved bike trail and the ground adjacent to it.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Not required
5.1 – 10 acres	Nice to have
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL3B		
Update Frequency	6-10 years	>10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Not required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Nice to have			Not required	
Entire AOI under same environmental conditions	Required	Nice to have			Not required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have			Not required	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Not required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Up to double the required TVU at the 95% confidence level			Up to double the required TVU at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Not required		
DTM	Nice to have	Nice to have		
DEM	Required	Required		
Raw point cloud data	Nice to have	Highly desirable		
Classified point cloud	Highly desirable	Nice to have		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Required		
Land use/land cover	Highly desirable	Nice to have		
Wetlands	Highly desirable	Highly desirable		
Estuaries				
Inland surface water features	Highly desirable	Highly desirable		
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Nice to have	Not required		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	DATA SET NAME 2007 Dunn County Lidar DATA ACCESS Dunn County GIS, 715- 231-6500 METADATA ACCESS Not Provided COLLECTION DATE April 2007 QUALITY LEVEL 3 MEETS 3DEP No REASON DATA DOES/DOES NOT MEET 3DEP Data not in public domain PROJECT STATUS Complete RESTRICTIONS Purchase DATA TYPE Lidar-Topo VERTICAL ACCURACY 18.5 cm RMSE HORIZONTAL ACCURACY Not Provided POINT SPACING 2 m VERTICAL DATUM NAVD_1988 HORIZONTAL DATUM NAD_1983_HARN_Transverse_Mercator PRODUCTS AVAILABLE 2 ft contours	Currently using 13-year old bathymetric data collected using a Lowerance GPS depth finder (fish finder).		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				

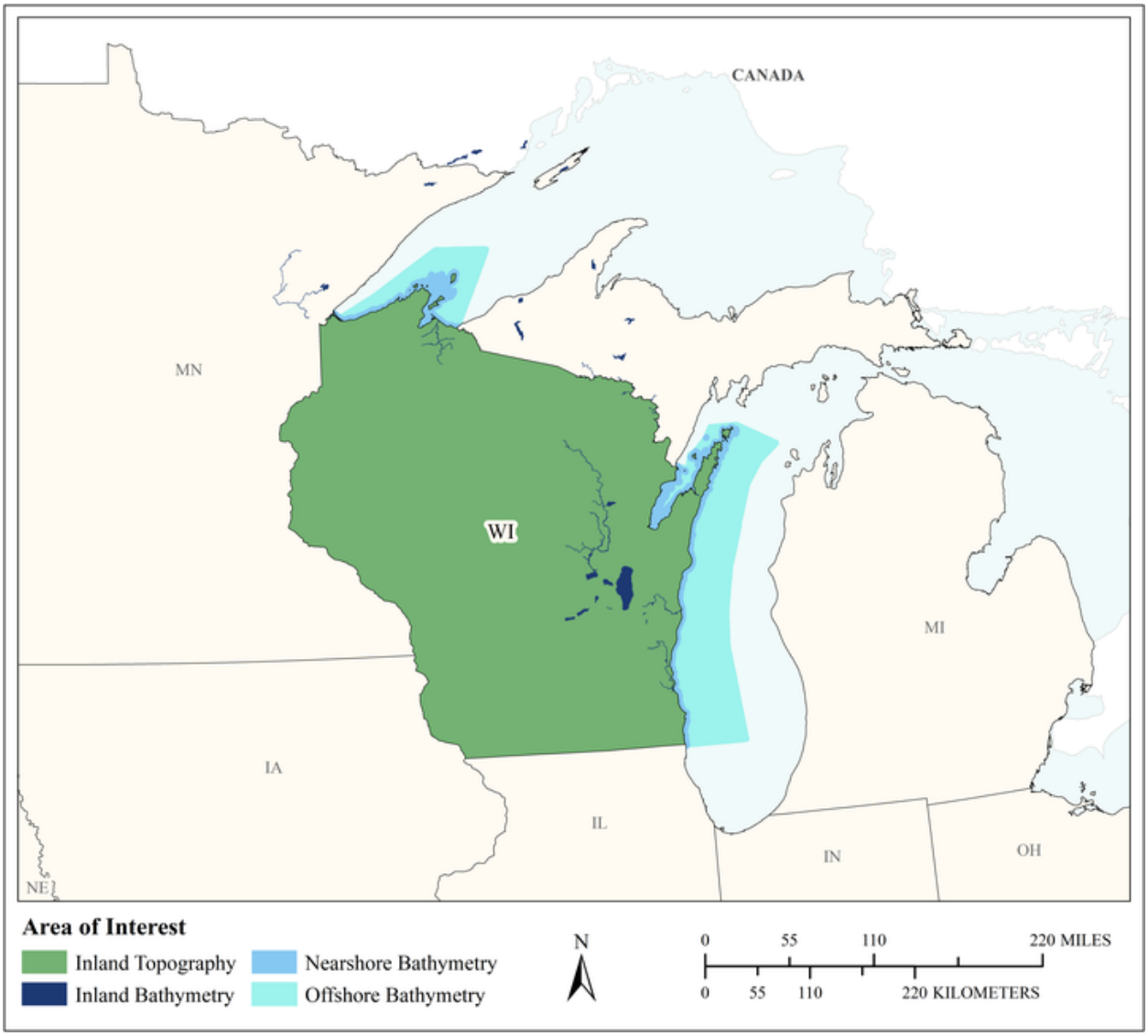
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes	Yes		
Other description	Stored privately on Dunn County network	Locally collected and stored.		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	None		
Cost savings/cost reduction	Moderate	None		
Cost avoidance	Moderate	None		
Increased revenues	Moderate	None		
Mission-driven performance improvements	Major	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor		
Improved response or timeliness	Moderate	None		
Improved customer experience	Moderate	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor		
Environmental	Major	Minor		
Public safety, including life and property	Major	None		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$10,854	Minor	Annual dollars saved/realized	$904						
Time savings description	Time saved ground truthing flow impediments. Time saved mosaicking multiple datasets. Far less time spent on quality control of modeling.			Ability to produce new bathy maps and do analysis (currently no ability to do so). Reduced by 2 field visits at 5 hours each to determine sediment in-filling to reservoir mouth.								
Cost savings/cost reduction	None			Minor	Unable to provide							
Cost avoidance	Moderate	Unable to provide		Minor	Unable to provide							
Cost avoidance description				Could provide important boating hazard information not currently available.								
Increased revenues	Minor	Annual dollars saved/realized	$2,000	Minor	Annual dollars saved/realized	$150						
Increased revenues description	Sale of updated LiDAR data clips to outside agencies.			Ability to provide maps for low-cost purchase to citizens.								
Mission-driven performance improvements	Moderate	Annual percent improvement	15%	Moderate	Annual percent improvement	15%						
Mission-driven performance improvements description	Improved modeling accuracy will allow us to efficiently target our conservation dollars.			Improved ability to assess sedimentation to reservoir lakes and stream bank erosion rates.								
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Annual dollars saved/realized	$150						
Value added to products or services description	Ability to produce high quality maps of citizen's projects and properties.			Unknown how much accuracy will increase with new data - no accuracy estimates on old data. Ability to provide digital bathymetry to customers.								
Improved response or timeliness	Moderate	Annual dollars saved/realized	$1,809	Moderate	Unable to provide							
Improved response or timeliness description	More accurate shoreline and stream bank maps. Ability to evaluate runoff from permitted properties.			Ability to provide public facing web maps of local bathymetry. Ability to better assess impacts of sedimentation and erosion.								
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide							
Improved customer experience description	Better quality online customer-facing GIS web maps.			Bathy maps available to public online.								
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Minor								
Education or outreach description	Ability to produce maps showing potential BMPs, erosion potential, etc.											
Environmental	Major			Minor								
Environmental description	Watershed modeling, hydrologic analysis											
Public safety, including life and property	Minor			Minor								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Geospatial Coordination



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more Hydrologic Units (HUC4s)	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Geospatial coordination. As part of the Dept. of Administration, our program supports a wide range of geospatial activities in a wide range of local and state agencies in Wisconsin, mostly through grants to local governments.
MCA Title	Geospatial Coordination
MCA ID	1327
Organization Type	State or U.S. Territorial government
Organization Name	Wisconsin Department of Administration
Sub-Agency or Division	
Organization Mission	DOA delivers effective and efficient services at the best value to government agencies and the public.
Program Name	Wisconsin Land Information Program
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Small features such as culverts, curbs, sidewalks, gullies - anything that affects hydrology. Also underwater archaeological sites, wrecks, nearshore reserves.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Not required
51 - 100 ft	Nice to have
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL0B	Cross sections and/or transects meet needs
Update Frequency	6-10 years	6-10 years	6-10 years	>10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	I don't know	I don't know	Up to 5 meters
Acceptable Vertical Error	Up to 10 cm	I don't know	I don't know	Up to 2 meters
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed	To MLLW		Below MLLW	
Tide correction requirement			I don't know	I don't know
Cross sections and/or transects meet needs				Yes
Cross section/transect requirement				Unknown

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Not required
Entire AOI under same environmental conditions	Nice to have	Nice to have	Highly desirable	Nice to have	Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Nice to have	Required
DTM	Highly desirable	Nice to have	Nice to have	Nice to have
DEM	Required	Required	Required	Required
Raw point cloud data	Nice to have	Nice to have	Nice to have	Nice to have
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Nice to have	Nice to have	Highly desirable
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	Nice to have
Nautical and/or navigation charts			Nice to have	Nice to have
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Highly desirable	Not required	Nice to have	Nice to have
Underwater videography			Highly desirable	Nice to have
Bottom texture			Highly desirable	Nice to have
Bottom type			Highly desirable	Nice to have
Submerged features			Highly desirable	Nice to have
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have	Not required	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Nice to have	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Nice to have	Nice to have
Habitat distribution and classification			Highly desirable	Nice to have
Boundaries			Highly desirable	Nice to have
Routes			Highly desirable	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Highly desirable	Nice to have
Floating observation/navigation systems			Highly desirable	Nice to have
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Nice to have	Highly desirable	Nice to have
Wetlands	Highly desirable	Highly desirable	Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Nice to have
Inland surface water features	Highly desirable	Highly desirable	Highly desirable	
Bridges/culverts	Highly desirable	Required		
Landmark features	Nice to have	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Currently trying to complete QL2 level lidar for the state. 50% done. 48% QL3 and 2% QL1.	Unknown	Using earlier JALBTCX.	Unknown
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast			Yes	Yes
NCEI			Yes	Yes
Open Topography				
NOAA nautical charts		Yes		Yes
USACE navigation charts		Yes	Yes	Yes
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	WisconsinView ftp://ftp.ssec.wisc.edu/pub/wisconsinview/lidar/ Trying to gather and distribute all available lidar data for state in this one place.			

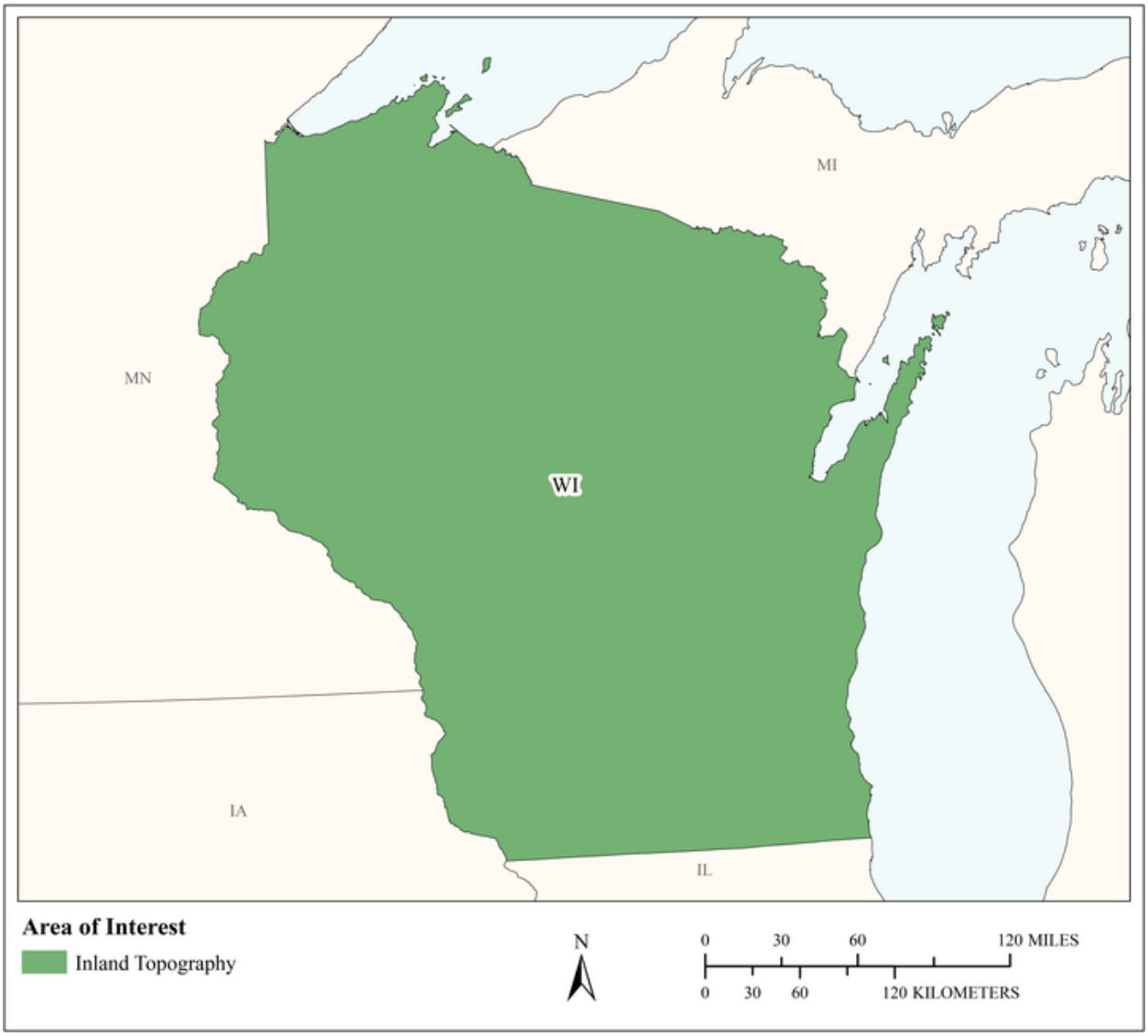
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other	Yes			
Other description	County GIS download pages			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know	I don't know	I don't know	I don't know
Cost savings/cost reduction	I don't know	I don't know	I don't know	I don't know
Cost avoidance	I don't know	I don't know	I don't know	I don't know
Increased revenues	I don't know	I don't know	I don't know	I don't know
Mission-driven performance improvements	I don't know	I don't know	I don't know	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know	I don't know	I don't know	I don't know
Improved response or timeliness	I don't know	I don't know	I don't know	I don't know
Improved customer experience	I don't know	I don't know	I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	I don't know	I don't know	I don't know
Environmental	I don't know	I don't know	I don't know	I don't know
Public safety, including life and property	I don't know	I don't know	I don't know	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,890,439		Annual dollars saved/ realized	$380,904		Annual dollars saved/ realized	$184,149		Annual dollars saved/ realized	$641,666
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$505,309		Annual dollars saved/ realized	$223,304		Annual dollars saved/ realized	$311,510		Annual dollars saved/ realized	$128,109
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know			I don't know			I don't know		
Environmental	I don't know			I don't know			I don't know			I don't know		
Public safety, including life and property	I don't know			I don't know			I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Forest Resources Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Forest health assessment. Determination of standing inventory of forest resources. Prescribed burn planning. Analysis of carbon stocks for trade. Harvest systems planning.
MCA Title	Forest Resources Management
MCA ID	60525
Organization Type	State or U.S. Territorial government
Organization Name	State of Wisconsin
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Highly desirable			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

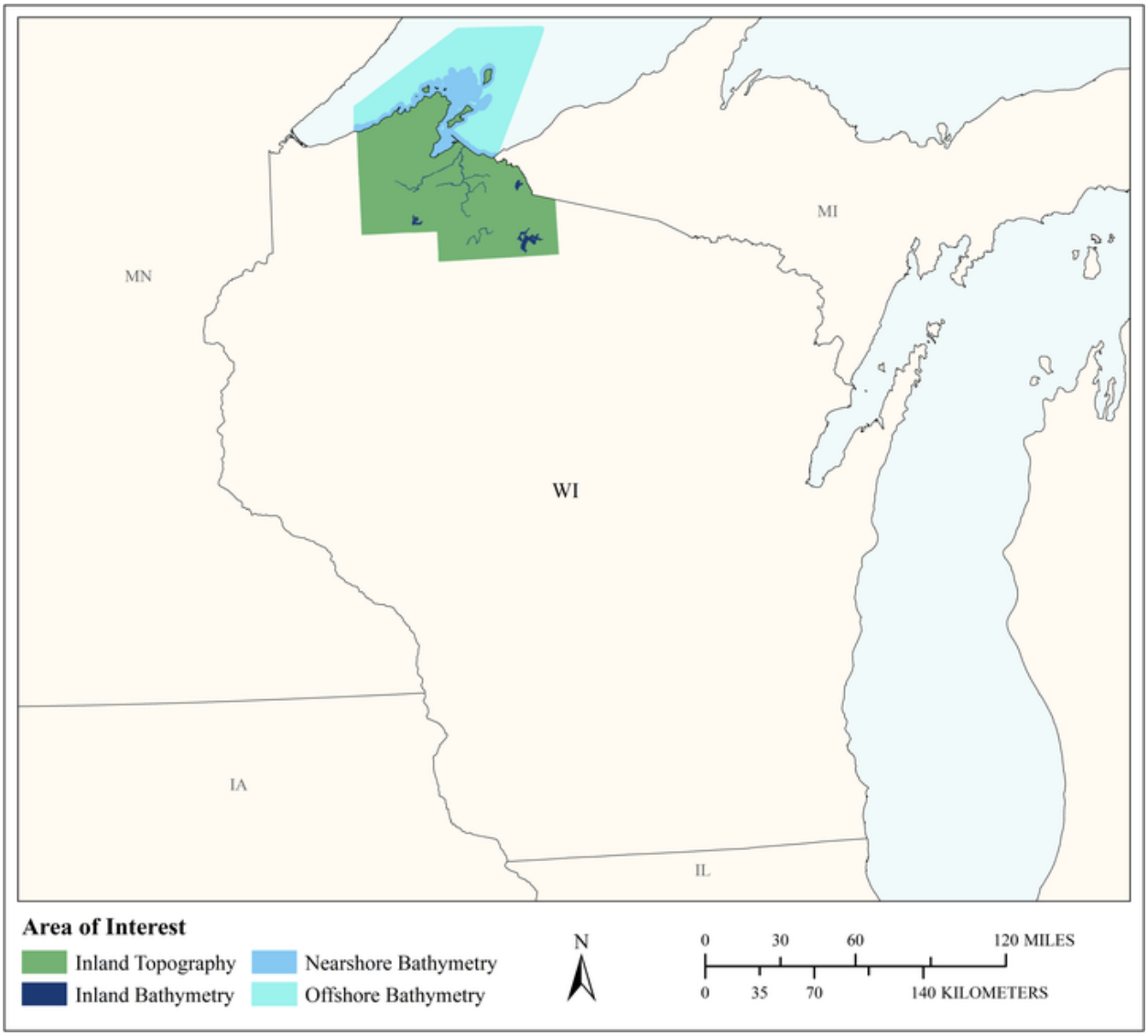
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$221,664									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$321,329									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Natural Resource Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements	Ashland, Bayfield, and Iron Counties, WI	Ashland, Bayfield, and Iron Counties, WI	Ashland, Bayfield, and Iron Counties, WI	Ashland, Bayfield, and Iron Counties, WI

MCA Description	Response
Mission Critical Activity	Natural resource management that preserves or enhances air, land and water quality and tribal economic development, in a culturally appropriate and sustainable way.
MCA Title	Natural Resource Management
MCA ID	22449
Organization Type	Tribal government
Organization Name	Bad River Band of the Lake Superior Tribe of Chippewa Indians
Sub-Agency or Division	
Organization Mission	The Bad River Tribe's mission statement is “to work toward a more progressive, financially stable government, to maintain tribal sovereignty, and enable members to progress individually towards a more fulfilling life culturally, spiritually and economically.”
Program Name	Bad River Natural Resources Department (source of staff response to this survey)
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	BU 02 - Riverine Ecosystem Management
Tertiary Business Use	BU 07 - Wildlife and Habitat Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	-historic sites/features e.g. manmade indentations or mounds on the earth (either on land or underwater) -patches of manomin (wild rice) -individual trees providing eagle, bat, or other wildlife habitat

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Highly desirable
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Not required

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	I don't know	I don't know	I don't know
Update Frequency	2-3 years	6-10 years	6-10 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI	Most interested in having current data in the tri-county area specified for the state of Wisconsin		Most interested in three counties specified for Wisconsin	Most interested in three counties listed in Wisconsin
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter	Up to 1 meter	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 1 meter	I don't know	I don't know
How far onshore needed			To Mean Higher High Water (MHHW)	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MHW	MHW
Cross sections and/or transects meet needs		Partial		
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Required	Required	Required	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Required	Required	Required	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required	Required	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Required	Required
DTM	Required	Required	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Required	Required	Required	Required
Classified point cloud	Highly desirable	Not required	Nice to have	
Edited/cube XYZ		Not required	Not required	Not required
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Required	Required	Required
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			I don't know	I don't know
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Nice to have	Highly desirable
Ground control/ground truthing	Required	Required	Required	Highly desirable
Other			Required	
Other description			Seiche predictions	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Required
Nautical and/or navigation charts			Highly desirable	Required
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Highly desirable	Highly desirable
Bottom texture			Required	Highly desirable
Bottom type			Required	Highly desirable
Submerged features			Required	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Not required	Not required
Water column properties - Physical			Highly desirable	Highly desirable
Water column properties - Chemical			Highly desirable	Highly desirable
Water column properties - Biological			Highly desirable	Highly desirable
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Highly desirable	Highly desirable
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Not required	Highly desirable
Routes			Not required	Not required
Offshore cadastral			Highly desirable	Highly desirable
Lease areas			Not required	Not required
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates	Required	Required	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Land use/land cover	Required	Nice to have	Not required	Nice to have
Wetlands	Required	Highly desirable	Highly desirable	Highly desirable
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Highly desirable	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Required	Required	Required	
Coastal and riverine structures	Highly desirable	Required	Nice to have	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			
Other				Highly desirable
Other description				Seiche

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	WROC 2015 LiDAR for Ashland (collected on 11/1/2014, 11/2/2014, and 4/17/2015 per USGS LiDAR Base Specification Version 1.0), Bayfield (collected on 10/22/2015 and 4/15/2016 per USGS LiDAR Base Specification Version 1.2) and Iron Counties, WI.	We have very little information on inland bathymetry. WIDNR has hand drawn bathymetry for several local inland lakes. There are also some side-scan sonar projects over 10 years old for portions of the Bad River-Kakagon Sloughs	NOAA Lake Superior bathymetry data of unknown origin	NOAA bathymetry data of unknown origin
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				Yes
NCEI			Yes	Yes
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				

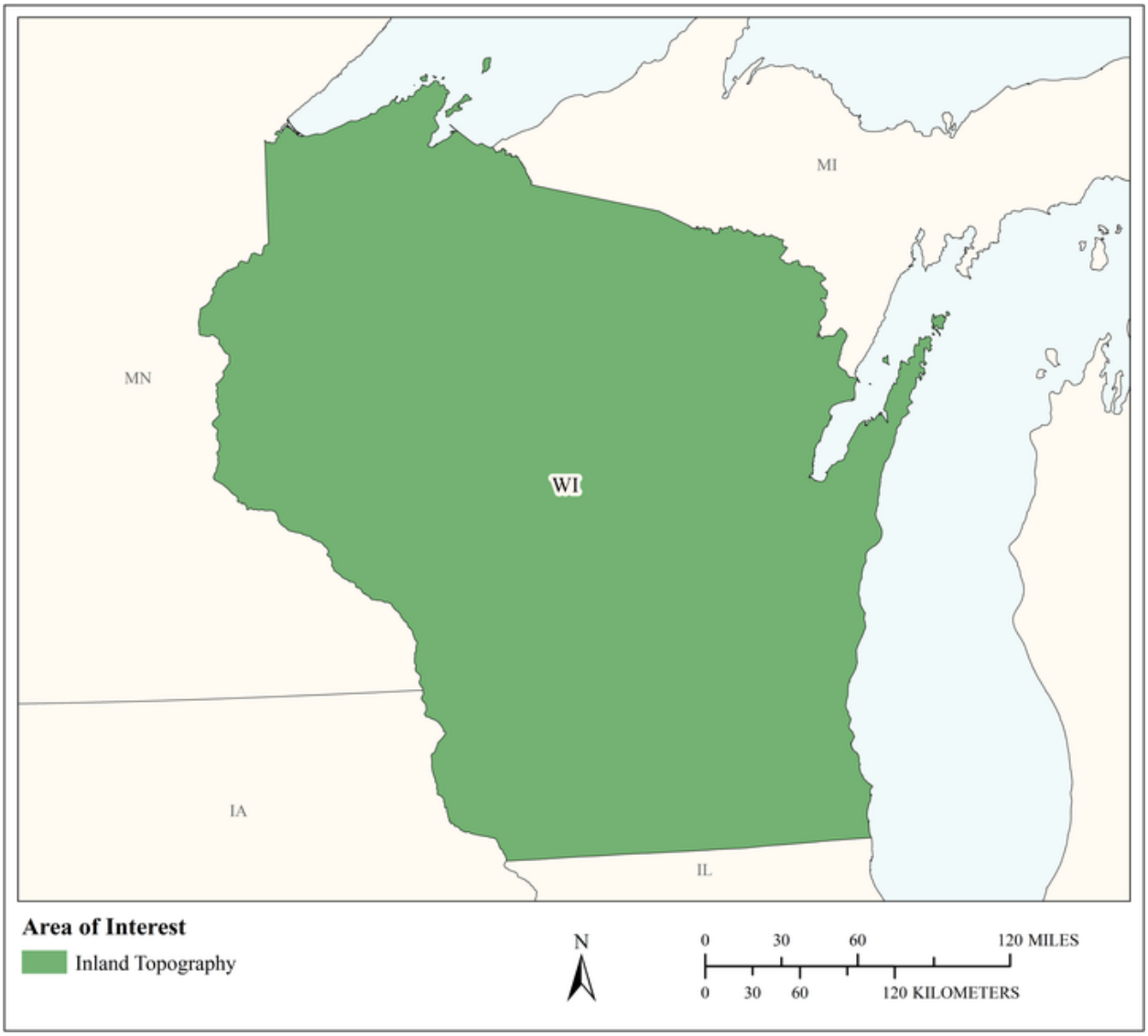
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	From contractor			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	I don't know	I don't know	Major
Cost savings/cost reduction	Major	I don't know	Major	I don't know
Cost avoidance	Major	I don't know	Major	I don't know
Increased revenues	None	I don't know	I don't know	I don't know
Mission-driven performance improvements	Moderate	I don't know	I don't know	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	Major	Major	Major
Improved response or timeliness	Major	I don't know	I don't know	Minor
Improved customer experience	Minor	Major	Major	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Major	Moderate
Environmental	Major	Moderate	Major	Moderate
Public safety, including life and property	Moderate	Moderate	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		Minor	Unable to provide	
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Moderate	Unable to provide		I don't know	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			I don't know			Major			Moderate		
Environmental	Major			Major			Major			Major		
Public safety, including life and property	Moderate			I don't know			Moderate			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Natural Resources Conservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation engineering. Soils and wetlands mapping and characterization. Modeling of biological and ecological systems. Erosion control. Rainfall penetration studies, impervious surfaces. Assessment of blue carbon stocks.
MCA Title	Natural Resources Conservation
MCA ID	60526
Organization Type	State or U.S. Territorial government
Organization Name	State of Wisconsin
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

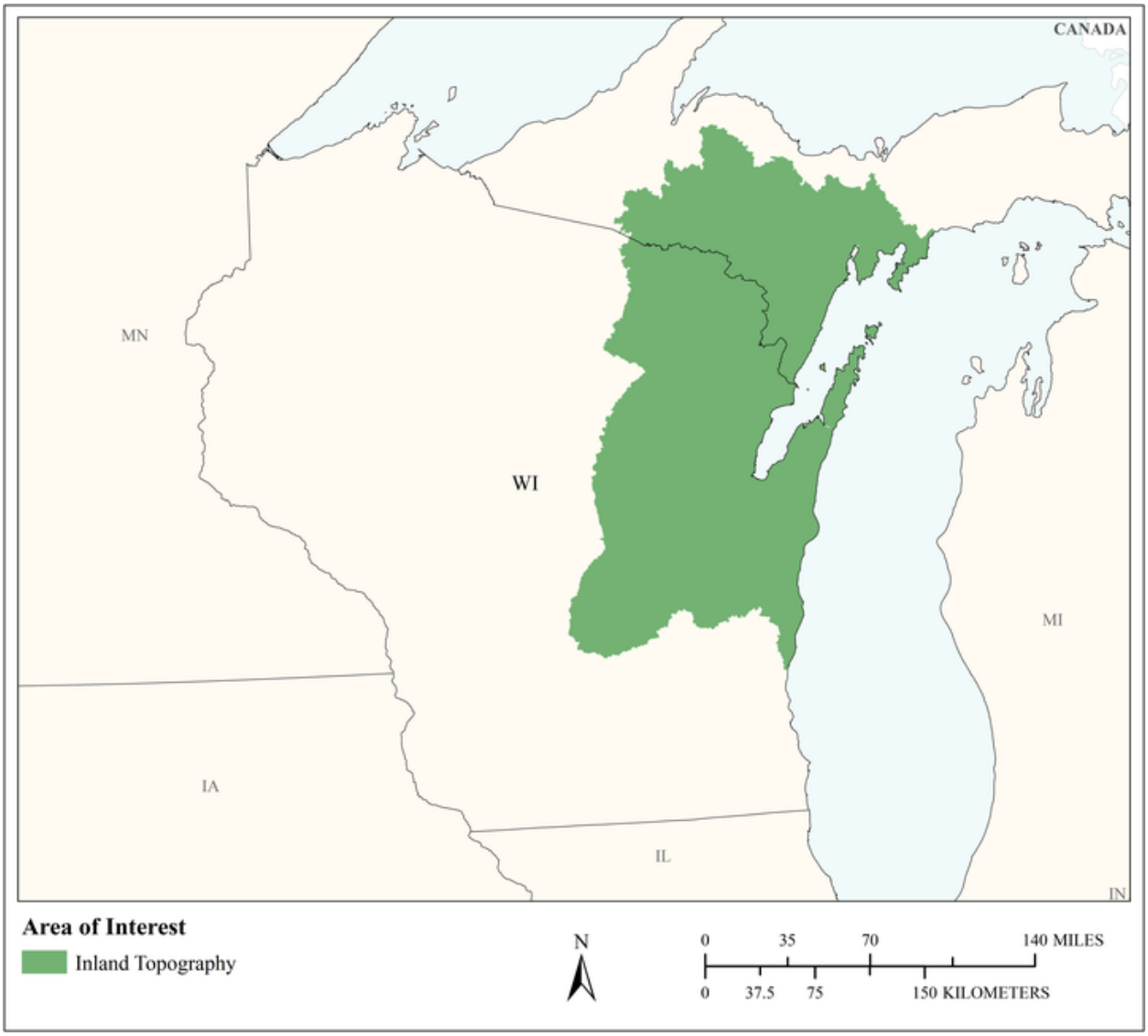
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,198,981									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$8,075,329									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Outagamie County Conservation Planning and Design



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation Best Management Practice planning and design, EPA 9-Key Element Watershed Planning, Provide and serve elevation data to our residents, Support ongoing federal agency modeling efforts within our region, flood inundation modeling, basemap representations, economic/residential development
MCA Title	Outagamie County Conservation Planning and Design
MCA ID	1445
Organization Type	Regional, County, City, or other local government
Organization Name	Outagamie County, WI
Sub-Agency or Division	
Organization Mission	The Land Conservation Department works to promote sustainable land use management for long-term conservation of land, water, and other natural resources of Outagamie County. These resources support our county's agricultural, industrial, and recreational needs. The department carries out the majority of the county's conservation programs and policies, and provides educational, technical, and conservation planning assistance to help landowners, land users, and communities.
Program Name	Land & Water Resource Management Plan (2018-2028)
Total Annual Program Budget	
Primary Business Use	BU 08 - Agriculture and Precision Farming
Secondary Business Use	BU 06 - Natural Resources Conservation
Tertiary Business Use	BU 23 - Urban and Regional Planning

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Streambank delineation, culverts, sinkholes, etc.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	2005, 20cm vertical, 2m point spacing			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	We own the data and store it locally			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			

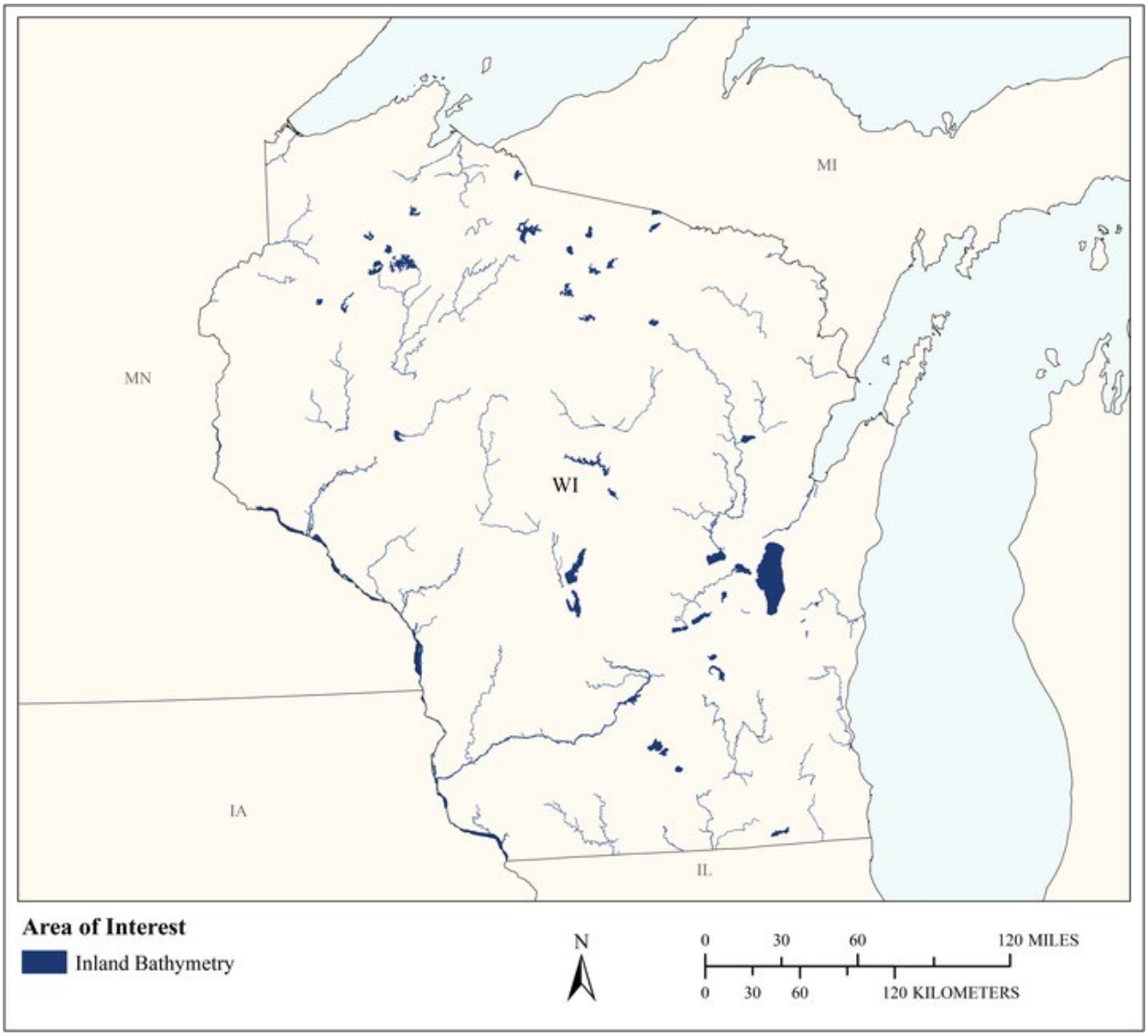
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Time savings description	3D topographic data is integral to all facets of our mission for over 10 years. The original savings were great due to year round planning and reduction in number of staff needed for survey teams.											
Cost savings/cost reduction	Major	Unable to provide										
Cost savings/cost reduction description	We do HUC-12 watershed planning and implementation that reduces agricultural runoff and erosion. Any acquisition costs saved result in more frequent high resolution county wide aerial imagery and other acquisitions in conjunction with our Land Information Plan.											
Cost avoidance	Major	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Mission-driven performance improvements description	The data is integral to developing and implementing our EPA 9-Key Element Plans which work towards TMDL compliance.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Value added to products or services description	Integral for our mission and the mission of the County as a whole.											
Improved response or timeliness	Major	Unable to provide										
Improved response or timeliness description	We have not had this use, but it would be significant if we had.											
Improved customer experience	Major	Unable to provide										
Improved customer experience description	Supports the latest erosion prediction modeling.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Education or outreach description	Integral to writing EPA 9-Key Element Planning that aids in appropriating funds for implementation											
Environmental	Major											
Environmental description	Implementation of the EPA 9-Key Element Plans increases water quality by reducing runoff											
Public safety, including life and property	Major											
Public safety, including life and property description	Zoning uses the data to keep flood mapping current.											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Fisheries Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type		Nice to have		
Geographic Area Requirements		One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Bathymetry data for fish habitat identification, management, and improvement. Interest from our staff and from customers regarding depth data/maps and using sonar for submerged vegetation. Bathymetry for fisheries would help to more effectively manage fish habitat and ecology (on specific projects such as pesticide application, tree removal, habitat rehab, etc.) as well as provide more information for anglers about our waters.
MCA Title	Fisheries Management
MCA ID	21497
Organization Type	State or U.S. Territorial government
Organization Name	Wisconsin Department of Natural Resources - Fisheries Management
Sub-Agency or Division	
Organization Mission	The DNR is dedicated to working with the citizens and businesses of Wisconsin while preserving and enhancing the natural resources of Wisconsin.
Program Name	Fisheries Management
Total Annual Program Budget	
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	BU 07 - Wildlife and Habitat Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Not required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Stream/Lake Substrate

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order		Cross sections and/or transects meet needs		
Update Frequency		>10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error		I don't know		
Acceptable Vertical Error		Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs		Yes		
Cross section/transect requirement		12" inch accuracy		

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season		Nice to have				
Entire AOI under same environmental conditions		Not required				
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless		Nice to have				
DEM for entire AOI needs to be seamless		Nice to have				
Amount of acceptable vertical manipulation to achieve spatial seamlessness		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM		Not required		
DTM		Not required		
DEM		Nice to have		
Raw point cloud data		Not required		
Classified point cloud		Not required		
Edited/cube XYZ		Not required		
Full waveform		Not required		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening		Not required		
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery		Nice to have		
Ground control/ground truthing		Not required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery		Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data		Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates		Nice to have		
Land use/land cover		Highly desirable		
Wetlands		Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features		Highly desirable		
Bridges/culverts		Nice to have		
Landmark features		Not required		
Cultural resources		Not required		
Coastal and riverine structures		Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used		The only bathymetry data we have used has been interpolated in ArcGIS from Lowrance HDS depth finders on individual water bodies. The GPS unit is said to have 12" inch accuracy.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other		Yes		
Other description		Field collected depth data		
Data that meet my needs are not available				

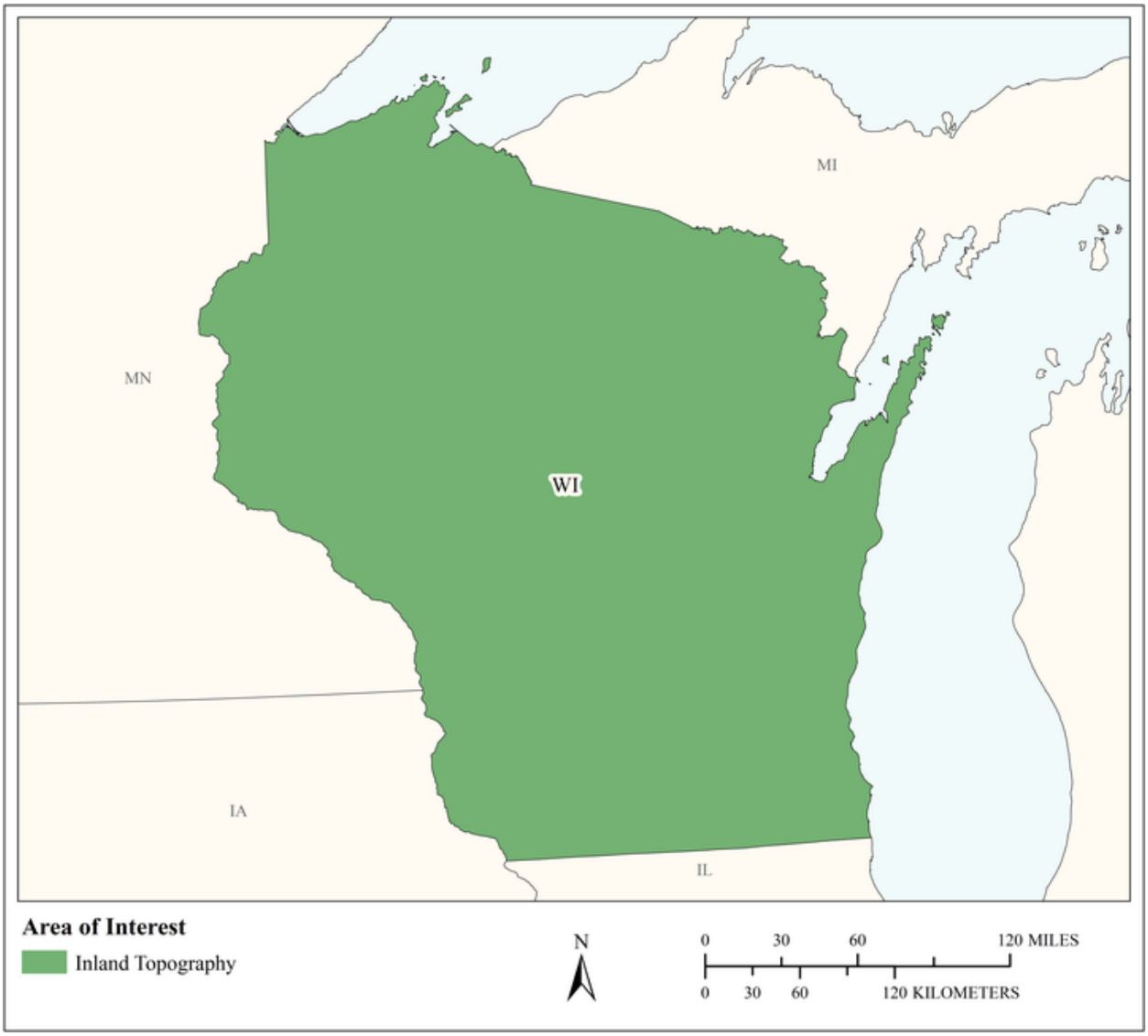
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings		Moderate		
Cost savings/cost reduction		Moderate		
Cost avoidance		Moderate		
Increased revenues		I don't know		
Mission-driven performance improvements		I don't know		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services		Major		
Improved response or timeliness		Major		
Improved customer experience		Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach		I don't know		
Environmental		Moderate		
Public safety, including life and property		I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings				Major	Unable to provide							
Time savings description				Our manual collection methods average about 28 acres of surface water per hour. This does not account for travel time to the site.								
Cost savings/cost reduction				Moderate	Unable to provide							
Cost savings/cost reduction description				We currently don't invest in bathymetry data other than what is acquired in the field for specific projects.								
Cost avoidance				Moderate	Unable to provide							
Increased revenues				Moderate	Unable to provide							
Mission-driven performance improvements				Moderate	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services				I don't know	Unable to provide							
Value added to products or services description				I would hope we could provide more depth data for anglers contacting us about bathymetry.								
Improved response or timeliness				Major	Unable to provide							
Improved response or timeliness description				Again, it is difficult to estimate costs here because we currently do not invest much in this sort of data at this point.								
Improved customer experience				Moderate	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach				Major								
Education or outreach description				We can interact with customers on a more meaningful level about our inland waters								
Environmental				Major								
Environmental description				We would be able to manage fisheries more effectively with accurate information on bathymetry and substrate on an ecological scale								
Public safety, including life and property				Minor								
Public safety, including life and property description				Identification of potential hazards to public underwater such as structure on river beds.								
Other												
Other benefits				Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Renewable Energy Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Alternate energy development – solar, tidal, wind, wave, and ocean current. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Low head power potential for hydropower.
MCA Title	Renewable Energy Resources
MCA ID	60527
Organization Type	State or U.S. Territorial government
Organization Name	State of Wisconsin
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Not required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Minor			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor			

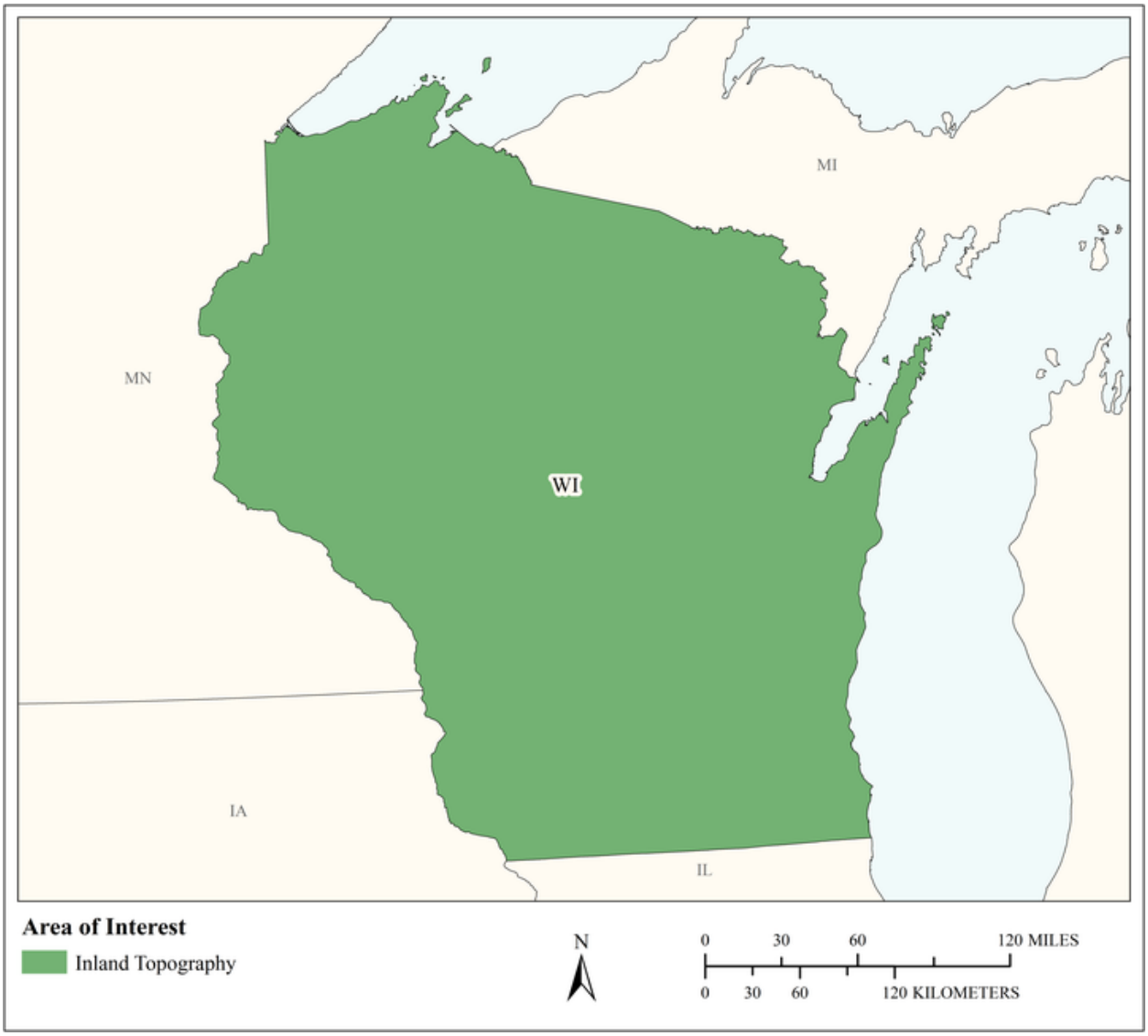
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	None											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Cultural Resources Preservation and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Discovery and analysis of underwater archaeological and historical cultural sites. Site protection and preservation planning. Discovery and analysis of Native American and other historical cultural sites and subsistence activities.
MCA Title	Cultural Resources Preservation and Management
MCA ID	60528
Organization Type	State or U.S. Territorial government
Organization Name	State of Wisconsin
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Nice to have					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have					
DEM for entire AOI needs to be seamless	Nice to have					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Moderate			
Cost avoidance	Minor			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			

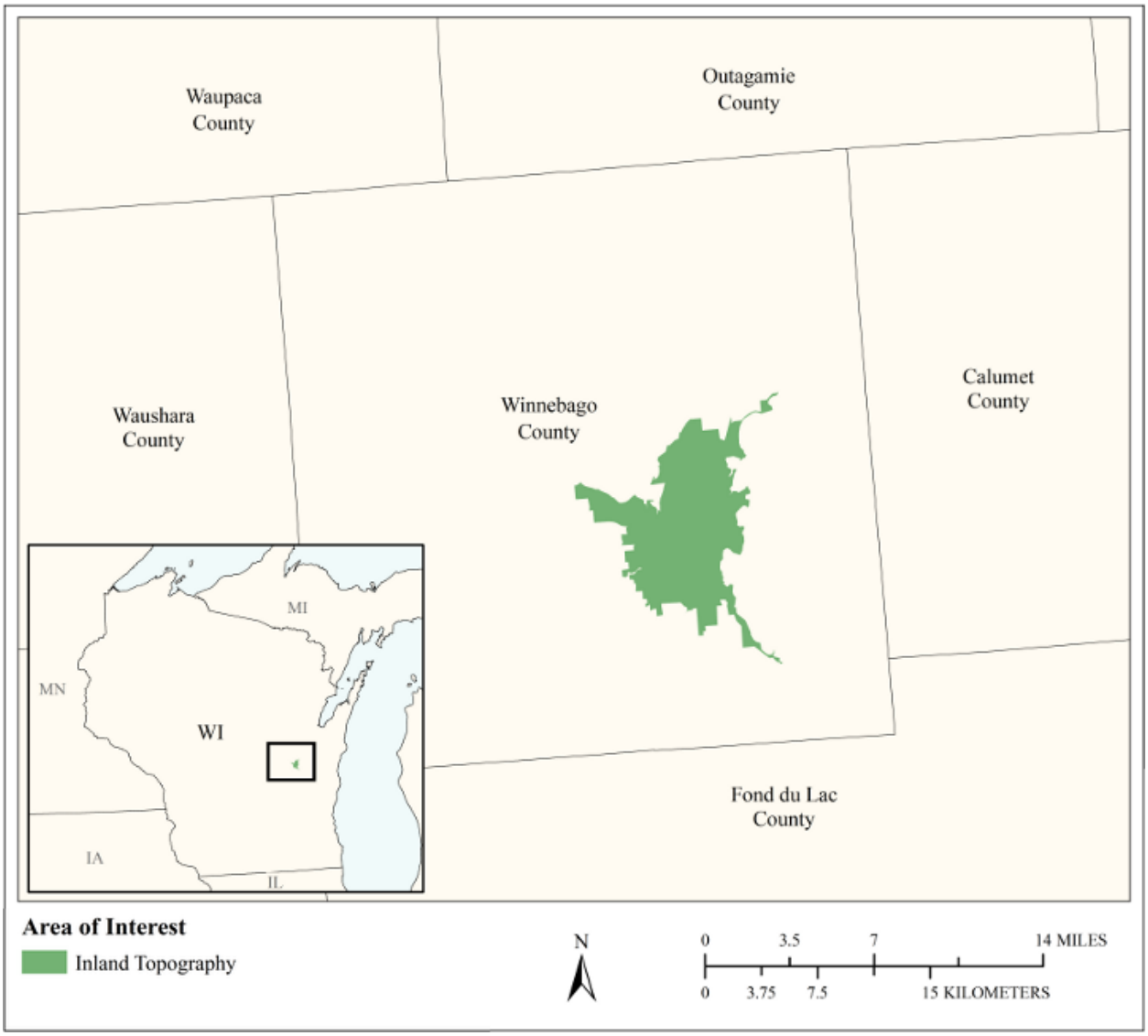
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Cost savings/cost reduction	Minor	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Moderate	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$10,276									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$8,984									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	Minor											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: City of Oshkosh Storm Water Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Respondent provided own shapefile, KML, or geodatabase			
Sub Area Requirements	City of Oshkosh, WI			

MCA Description	Response
Mission Critical Activity	Storm Water Management
MCA Title	City of Oshkosh Storm Water Management
MCA ID	1106
Organization Type	Regional, County, City, or other local government
Organization Name	City of Oshkosh, WI
Sub-Agency or Division	
Organization Mission	Municipal Government We provide the following types of services to or residents – Elections, Community Development, Assessment (Real Estate, Personal Property), Economic Development, Inspections, Planning, Parking Administration, Utilities (Storm Sewer, Sanitary Sewer, and Water), Fire, EMS, Library, Museum, Parks, Cemetery, Senior Center, Police, Public Transportation, Traffic Engineering, Public Works, Engineering, Sanitation, Street and Infrastructure Maintenance.
Program Name	Storm Water Utility
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 23 - Urban and Regional Planning
Tertiary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Any feature which can direct the primary movement of overland water flow. Things like curbs and landscaping. Our community is very flat.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	6-10 years			
Event type(s)				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI	We generally need QL2 data every 10 years for our county. However the areas in and directly adjacent to our city need a higher quality of data which is updated more frequently.			
Acceptable Horizontal Error	Less than 20 cm			
Acceptable Vertical Error	I don't know			
How far onshore needed				
How far down the beach profile needed	Below MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial			
Cross section/transect requirement	I don't know the exact vertical accuracy required for the cross sections. Currently staff use this function for engineering planning activities. When they find viable location for their construction activities they send field staff out for a topographic survey for more accurate data			

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Other	Required					
Other description	Our core AOI needs to be collected in the same season and under similar environmental conditions.					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Nice to have			
Wetlands	Nice to have			
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable			
Cultural resources	Not required			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Full City LiDAR - 2008 - Fundamental Vertical Accuracy Spec = 1.19 ft Highway Corridor LiDAR - 2014 - Fundamental Vertical Accuracy (FVA) of 15.25 cm at a 95% confidence level			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				

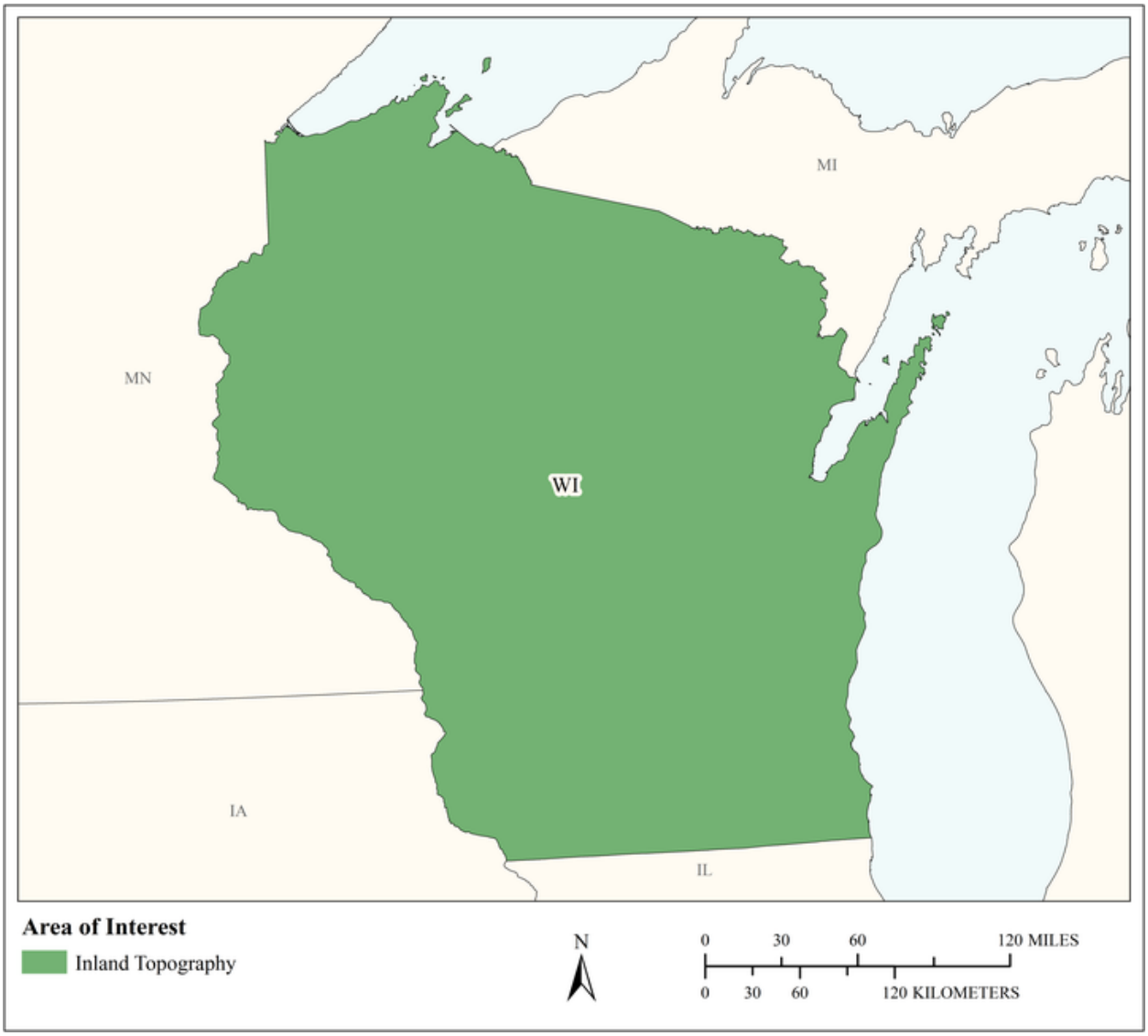
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	Data we or the county collect.			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Moderate			
Cost avoidance	Major			
Increased revenues	Moderate			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Moderate	Unable to provide										
Other operational benefits	Moderate	Unable to provide										
Other operational benefits description	Responsiveness to changing needs.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Education or outreach description	Storm Water Education											
Environmental	Moderate											
Environmental description	Applications of Storm Water Best Management Practices											
Public safety, including life and property	Moderate											
Public safety, including life and property description	More accurate floodplain zone determinations											
Other												
Other benefits	Moderate											
Other description	The program would improve our ability to accurately make decisions in a timely manner.											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Flood Risk Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Flood risk modeling and mapping of riverine and coastal areas. Dam/dike/levee safety analysis. Emergency management. Flood forecasts.
MCA Title	Flood Risk Management
MCA ID	60529
Organization Type	State or U.S. Territorial government
Organization Name	State of Wisconsin
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

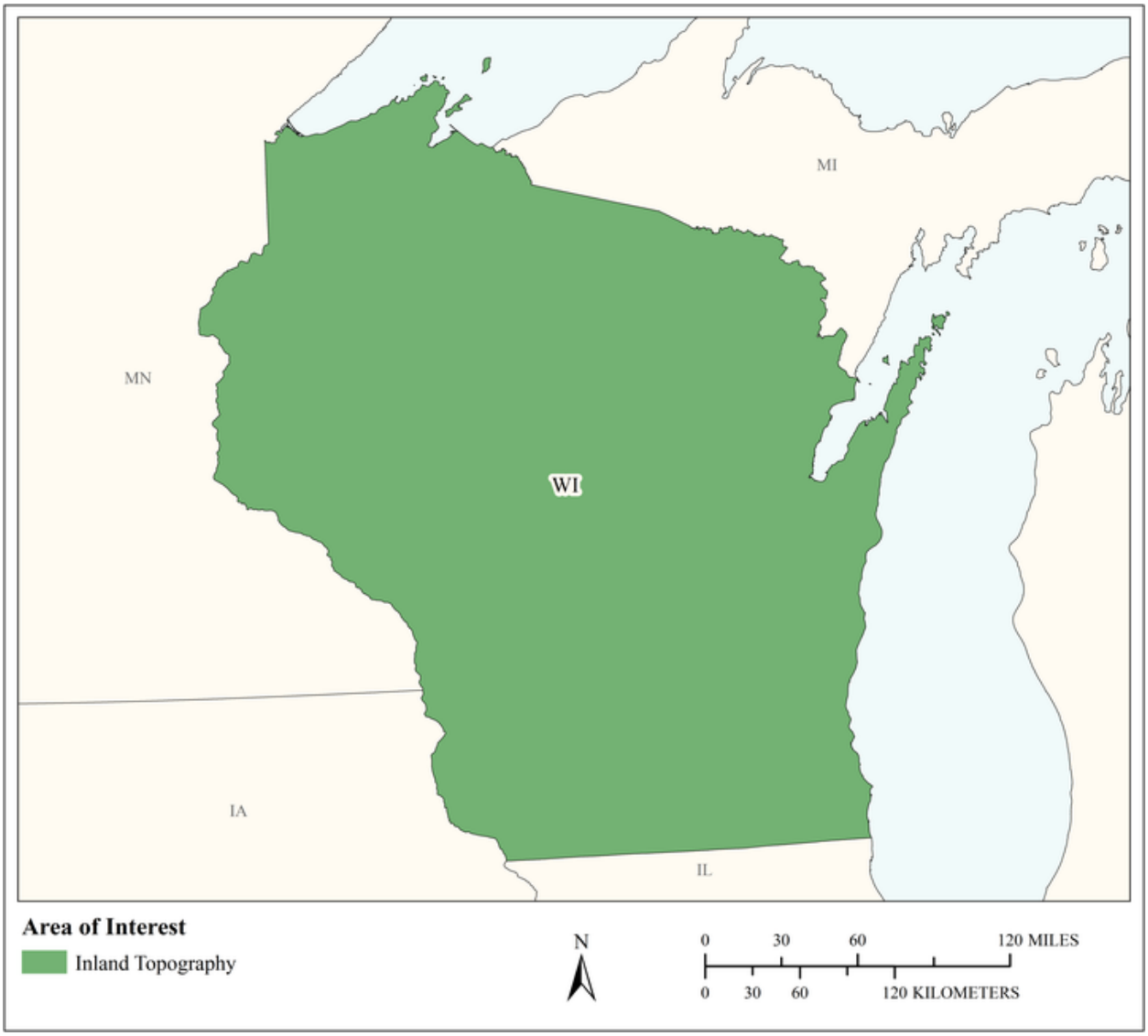
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$7,871,671									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,377,296									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Moderate											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Wildfire Management, Planning, and Response



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of forest fuel and fire susceptibility. Fire behavior modeling to support wildfire suppression activities. Wildland/urban interface building identification. Post fire analysis to determine landslide prone areas.
MCA Title	Wildfire Management, Planning, and Response
MCA ID	60530
Organization Type	State or U.S. Territorial government
Organization Name	State of Wisconsin
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 17 - Wildfire Management, Planning, and Response
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

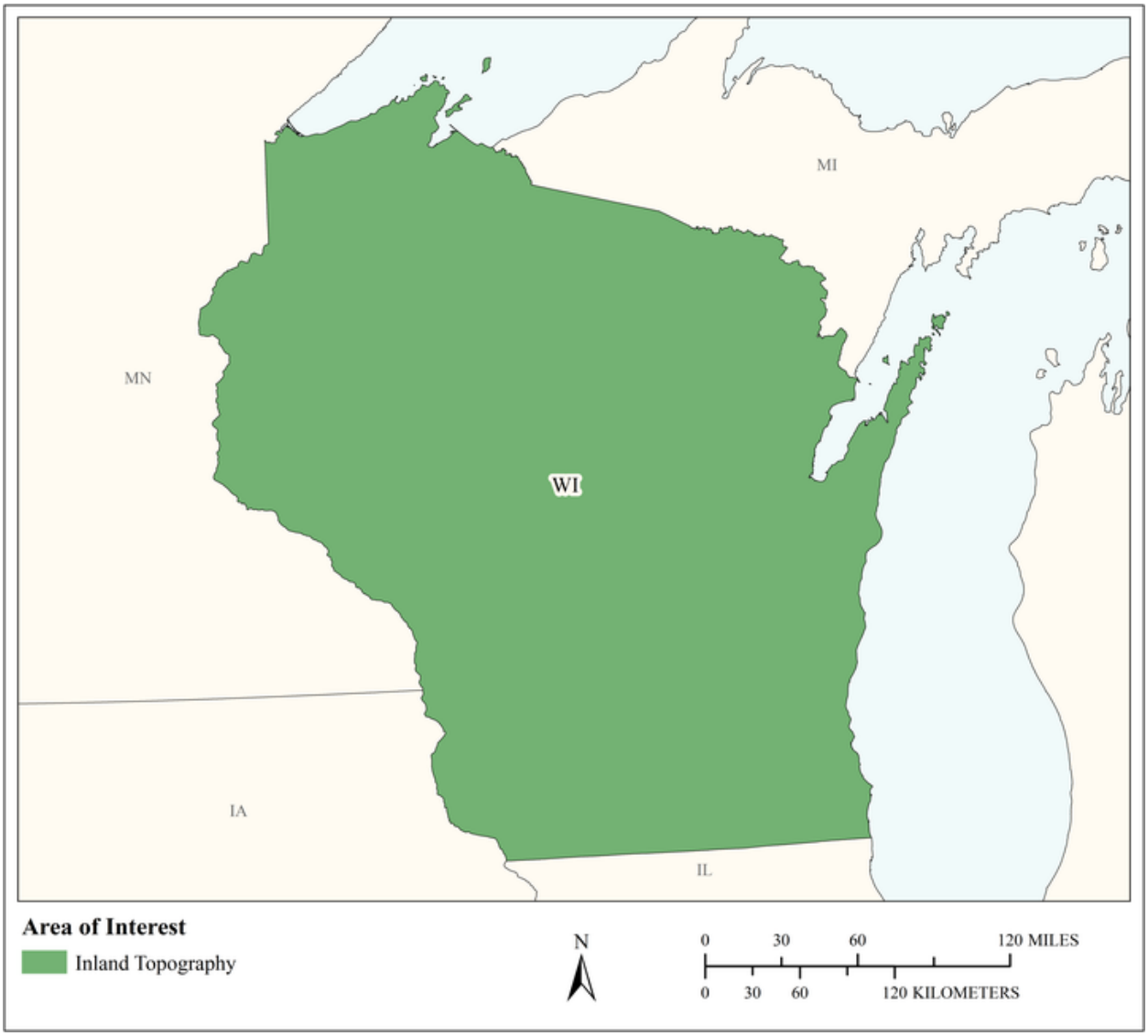
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$301,222									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Homeland Security, Law Enforcement, Disaster Response, and Emergency Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Infrastructure and border protection. Coastal search and rescue. Population dynamics. Emergency fuel supply and movement. Line of sight analysis in urban areas. Disaster response. Flood risk analysis resulting from acts of terrorism.
MCA Title	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
MCA ID	60531
Organization Type	State or U.S. Territorial government
Organization Name	State of Wisconsin
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

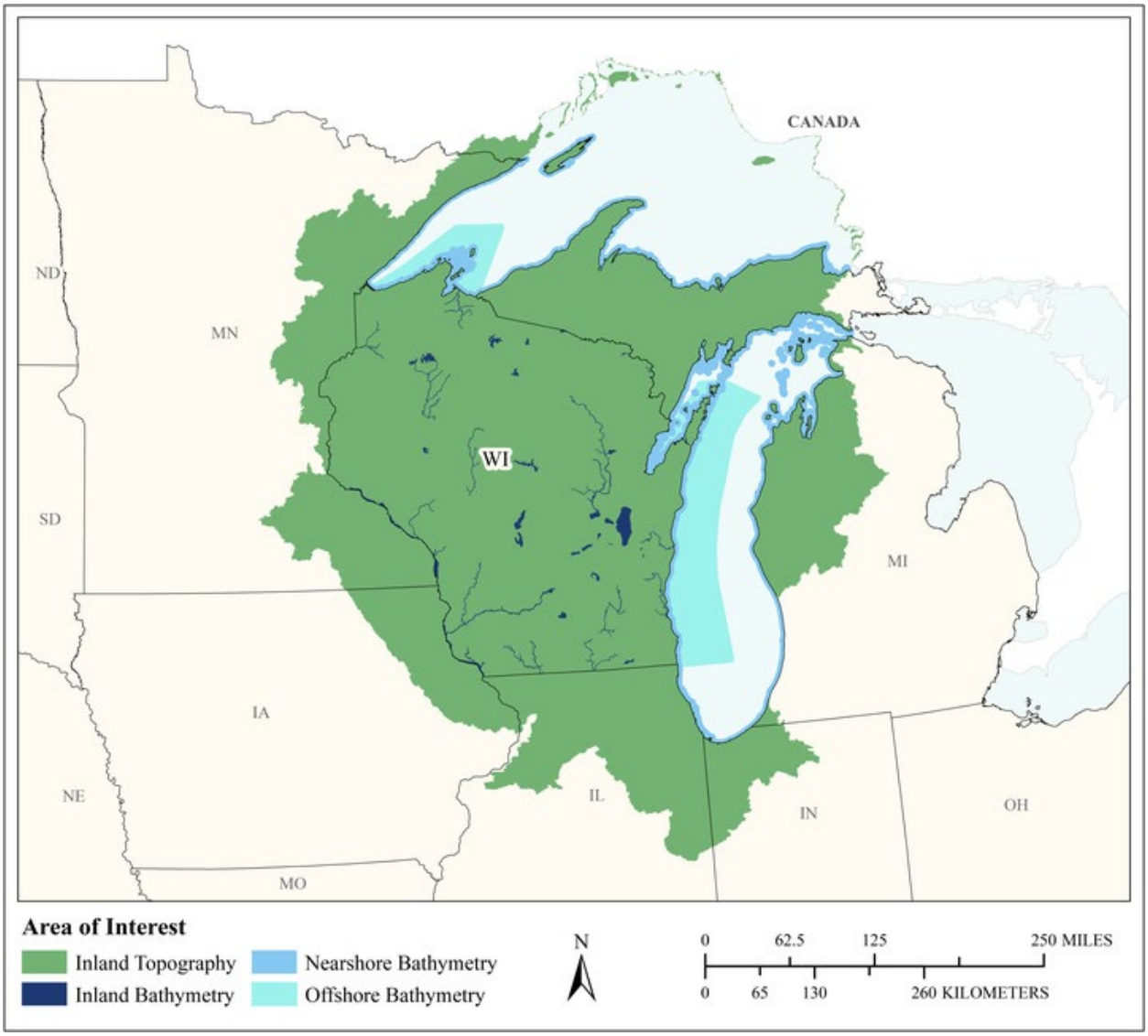
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Minor			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,653,888									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$29,231									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Moderate											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Multimodal Transportation Design



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)	One or more states, territories, or counties	Nearshore areas along the coast (including the Great Lakes) off one or more Hydrologic Units (HUC4s)	Waters offshore off one or more states (including Great Lakes states), territories, or counties
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Ground surface and benthic elevation data collection for highway and airport design. With better data we can do better analysis, save field time, and produce higher quality roadways, airports, harbors and freight systems, with fewer environmental impacts.
MCA Title	Multimodal Transportation Design
MCA ID	1214
Organization Type	State or U.S. Territorial government
Organization Name	Wisconsin Department of Transportation
Sub-Agency or Division	
Organization Mission	Mission Provide leadership in the development and operation of a safe and efficient transportation system. Values •Accountability – Being individually and collectively responsible for the impact of our actions on resources, the people we serve, and each other. •Attitude – Being positive, supportive and proactive in our words and actions. •Communication – Creating a culture in which people listen and information is shared openly, clearly, and timely — both internally and externally. •Excellence – Providing quality products and services that exceed our customers' expectations by being professional and the best in all we do. •Improvement – Finding innovative and visionary ways to provide better products and services and measure our success. •Integrity – Building trust and confidence in all our relationships through honesty, commitment and the courage to do what is right. •Respect – Creating a culture where we recognize and value the uniqueness of all our customers and each member of our diverse organization through tolerance, compassion, care and courtesy to all. •Teamwork – Creating lasting partnerships and working together to achieve mutual goals.
Program Name	Roadway design and construction, airport design and construction, stormwater modeling and stormwater management design, stream channel realignment, bridge and culvert design.
Total Annual Program Budget	
Primary Business Use	BU 19 - Land Navigation and Safety
Secondary Business Use	BU 21 - Aviation Navigation and Safety
Tertiary Business Use	BU 22 - Infrastructure and Construction Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.

General Geographic Area and Size	
Description of smallest 3D features	Curbs and gutters, culverts and inlets, roadway and advertising sign locations, mailboxes, fences (and other potential encroachments on right of way) , potholes and rocks that might indicate a 'blowout' of concrete during a high heat or freeze/thaw event. Underwater obstructions.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL1B	QL1B	
Update Frequency	Event driven only – Data need to coincide with a specific event.	Annually	Event driven only – Data need to coincide with a specific event.	Event driven only – Data need to coincide with a specific event.
Event type(s)	Event driven only		Event driven only	Event driven only
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Less than 50 cm	Less than 50 cm	Less than 50 cm
Acceptable Vertical Error	Up to 10 cm	Less than 10 cm	Less than 10 cm	Less than 10 cm
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed	As far down as required for harbor or bridge design or dredging		Below MLLW	
Tide correction requirement			I don't know	I don't know
Cross sections and/or transects meet needs	Partial			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross section/transect requirement	Survey level of accuracy <10 cm vertical and <20 cm horizontal accuracy; Cross sections are required for cut and fill estimates for design, as-built slope measurements for stormwater conveyance features, bridge start and endpoints, floodplain elevation.			

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have	Highly desirable	Highly desirable
DTM	Required	Required	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Highly desirable	Highly desirable
Full waveform	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Required	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Highly desirable	Highly desirable
Bottom texture			Required	Required
Bottom type			Required	Required
Submerged features			Required	Required
Subbottom characteristics			Required	Required
Geologic and seismic data	Required	Required	Required	Required
Water column properties - Physical			Required	Required
Water column properties - Chemical			Required	Required
Water column properties - Biological			Required	Required
Currents			Required	Required
Tide/wave heights			Required	Required
Sea ice conditions			Highly desirable	Highly desirable
Habitat distribution and classification			Required	Required
Boundaries			Required	Required
Routes			Required	Required
Offshore cadastral			Highly desirable	Highly desirable
Lease areas			Required	Required
Fixed obstructions			Required	Required
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Highly desirable	Required	Required	Required
Wetlands	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Required	Required	Highly desirable	
Cultural resources	Required	Required	Required	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We are currently using lidar-derived DTM. Information is collected by the agency at the time of project need. Some examples of other sources used include: Wisconsin NED 10m bundle from MapMart Bedrock Geologic Map of Wisconsin: Digital Information M.G. Mudrey, Jr., B.A. Brown, and J.K. Greenberg State Map 18-DI Version 1.0 2007 (no information on horizontal/vertical accuracy in metadata file) 1:24,000 landnet representation NHDPlus Version 2 Website for Great Lakes Data NHDPlus Version 2 Website for Upper Mississippi Data	Individual bathymetric studies conducted before, during and after construction activities.	DNR hydrologic data, individual bathymetric studies for projects.	DNR hydrologic data, individual bathymetric studies for projects

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI	Yes	Yes	Yes	Yes
Open Topography	Yes			
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts		Yes	Yes	Yes
USGS Inland Waters server		Yes		
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes	Yes	Yes	
State repositories used	Data from state agencies including WDNR, WGNHS	Department of natural resources Hydrologic data sets	Wisconsin Department of Natural Resources data	
Other	Yes			Yes
Other description	WisDOT collected data.			Wisconsin Department of Natural Resources data
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Minor	Minor
Cost savings/cost reduction	Major	None	Minor	Minor
Cost avoidance	Moderate	None	Minor	Minor
Increased revenues	I don't know	None	None	None
Mission-driven performance improvements	Moderate	Minor	Minor	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	None	None	None
Improved response or timeliness	Moderate	Minor	None	None
Improved customer experience	I don't know	None	None	None
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	None	None	None
Environmental	Moderate	Moderate	Moderate	Moderate
Public safety, including life and property	Moderate	Moderate	Moderate	Moderate

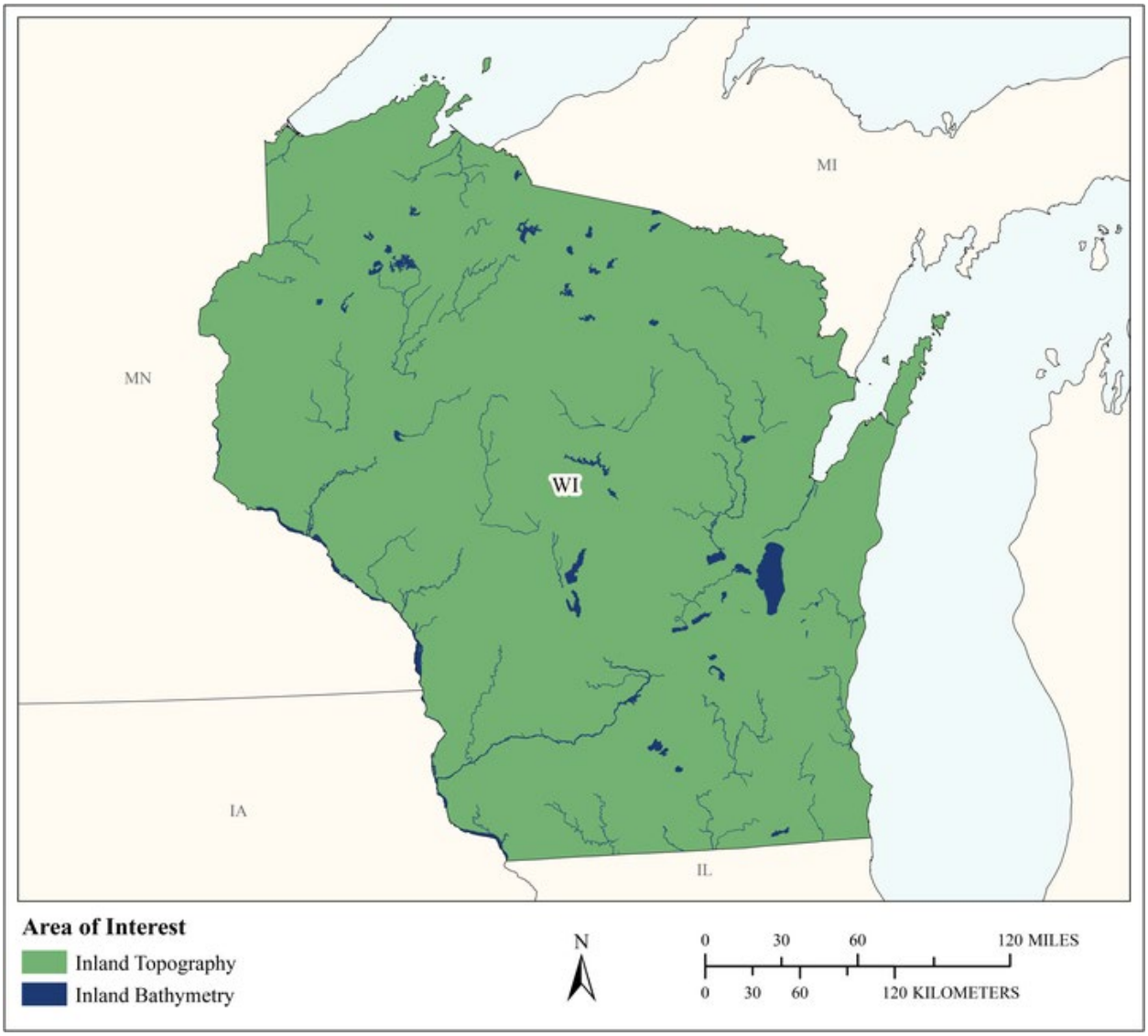
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$8,683	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Time savings description	Ground level and vegetative cover data can significantly reduce the amount of time spent in the field doing vegetative cover surveys. Will depend on whether or not the regulatory agencies will accept the data without ground truthing. Reduced field labor time for specific compliance reporting tasks, based on improved elevation and ground cover data. Slope calculations, drainage basin area calculations and stormwater flow calculations and culvert locations may all be identifiable from 3 d data. Field inspections would still be required for culvert conditions. Single source ground/hydrologic data will save significant amounts of time in building models.											
Cost savings/cost reduction	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction description	Again, this will depend on whether we maintain a maintenance focus or go back to an infrastructure development model. Program focus is changing, if we continue to focus on maintenance vs. new construction the cost savings may be significantly less. If we continue to expand existing or build new infrastructure, the savings will be significant - for survey alone.											
Cost avoidance	Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance description	Benefits would come from sizing culverts and bridges for 500 to 1000 year flood events.											
Increased revenues	None			None			None			None		
Increased revenues description	Depends on management decisions rather than accuracy or availability of data. Does not apply to agency mission.											
Mission-driven performance improvements	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Other operational benefits	Moderate	Unable to provide										
Other operational benefits description	Better ability to evaluate and design roadways and other infrastructure with more quickly accessible elevation data.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Value added to products or services description	Better shoreline/wetland delineation based on elevation data will lead to more accurate delineations and better estimates for mitigation measures. This could result in either higher or lower mitigation requirements - and related costs.											
Improved response or timeliness	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Improved response or timeliness description	Depends on whether or not new and accurate data is available immediately after the disaster. If data collection/dissemination channels are disrupted by the disaster, no net benefit would be realized. Again, this will depend on how much 'desktop' evaluation the regulatory agencies will accept. Up dated harbor, airport mapping. Potential for improved service during major incidents (active shooter, flood, etc.).											
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience description	Single location for land and water data will save time and effort for multiple areas.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			None			None			None		
Environmental	Moderate			Moderate			Moderate			Moderate		
Environmental description	Improved wetland and stormwater information, resulting in improved design and better potential for avoidance and minimization of impacts.			Better data for evaluations of impacts, mapping of critical underwater archaeological or historic resources, mapping of shielded/armored pcb deposits			Greater accuracy in shoreland wetland delineations, better definition of armored pcb sediment deposits and estimates of required areas of repair post-disturbance.					
Public safety, including life and property	Moderate			None			Moderate			Moderate		
Public safety, including life and property description	Better flood and stormwater evaluations and predictive models.						Better data for future predictive models.			Better data for future predictive models.		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes	Yes	Yes	Yes
Curvature maps	Yes	Yes	Yes	Yes
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps	Yes	Yes	Yes	Yes
Viewshed maps	Yes	Yes	Yes	Yes
Hydrologic Flow Direction Grids	Yes	Yes	Yes	Yes
Hydrologic Flow Accumulation Grids	Yes	Yes	Yes	Yes
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	Yes
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	Yes
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement	Yes		Yes	
Rugosity/Surface Roughness	Yes	Yes	Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Environmental Impact and Flood Resiliency of Road Stream Crossings



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Review of the environmental impact and flood resiliency of municipal and Department of Transportation road stream crossings.
MCA Title	Environmental Impact and Flood Resiliency of Road Stream Crossings
MCA ID	1250
Organization Type	State or U.S. Territorial government
Organization Name	Wisconsin Department of Natural Resources
Sub-Agency or Division	
Organization Mission	To protect and enhance our natural resources: our air, land and water; our wildlife, fish and forests and the ecosystems that sustain all life. To provide a healthy, sustainable environment and a full range of outdoor opportunities. To ensure the right of all people to use and enjoy these resources in their work and leisure. To work with people to understand each other's views and to carry out the public will. And in this partnership consider the future and generations to follow.
Program Name	WDNR Environmental Analysis and Sustainability Program
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 14 - Cultural Resources Preservation and Management
Tertiary Business Use	BU 15 - Flood Risk Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Need elevation data accurate enough to allow for deriving stream profile and floodplain cross sections in HecRas and HY8 (or similar) for H&H modeling to help evaluate the cost benefit and environmental impact of a range of project alternatives to drive informed decision making.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required

Inland Bathy Feature Size Requirements	Response
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need		
Acceptable Vertical Error	Up to 10 cm	Less than 10 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Nice to have		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Not required	Not required		
Classified point cloud	Not required	Not required		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Nice to have		
Ground control/ground truthing	Highly desirable	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Not required	Nice to have		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required	Not required		
Land use/land cover	Not required	Not required		
Wetlands	Not required	Nice to have		
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Not required			
Cultural resources	Required	Highly desirable		
Coastal and riverine structures	Not required	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	LiDAR of bare earth and hydro surface is available on many WI counties. However, each county has different levels of accuracy based on funds available to process and obtain data.	None available		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
State repositories used	Wisconsin Land Information Program at the Department of Administration			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor	Inland bathy data not available		
Cost savings/cost reduction	None	Inland bathy data not available		
Cost avoidance	None	Inland bathy data not available		
Increased revenues	None	Inland bathy data not available		
Mission-driven performance improvements	Minor	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None	Inland bathy data not available		
Improved response or timeliness	Minor	Inland bathy data not available		
Improved customer experience	Moderate	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Inland bathy data not available		
Environmental	Moderate	Inland bathy data not available		
Public safety, including life and property	Minor	Inland bathy data not available		

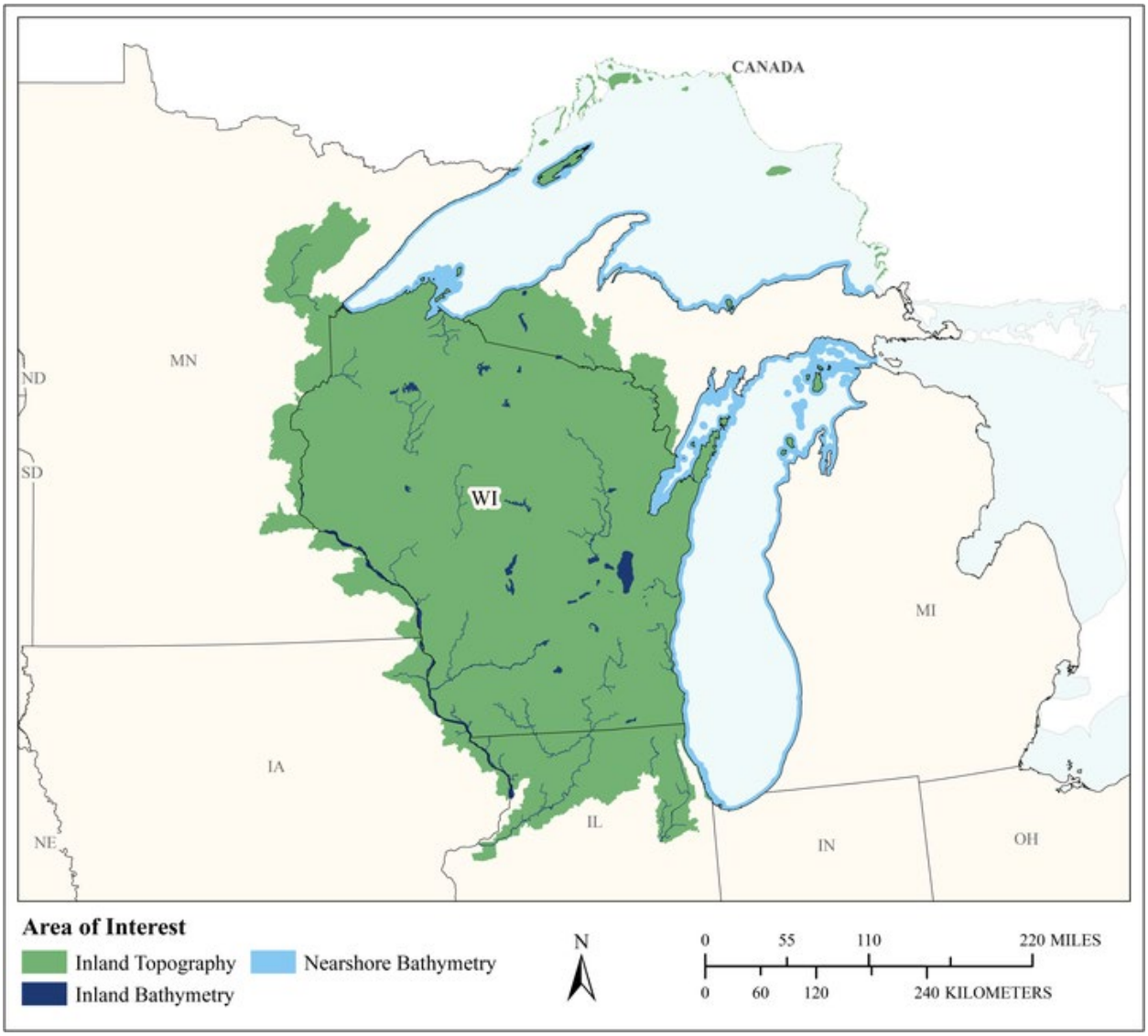
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide							
Time savings description	We still emphasize field visits as opportunities for partnerships and to help educate stakeholders on the impacts of a range of alternatives. 3D data would help staff be much better prepared for those interactions with initial data and hydro analysis in hand. Significant. Initial analysis could be performed at desktop as opposed to a field visit to get profile, road, and cross section data.											
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide							
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide							
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements description	With approximately 80,000 public road stream crossings in WI, installing road crossings that are adequately sized (based on best available modeling) is a significant water resource management issue. Increased storm intensity and frequency has resulted in significant environmental impacts, economic impacts, and loss of life. There is currently not staff availability to visit each site, survey, and model. 3D data would enable sufficient modelling for the broad range of stakeholders for budget and project development purposes. Currently, there is little to no modelling data available to evaluate road stream crossing replacements, especially in rural areas where there is no engineering assistance. That results in a "replace in kind" preferred alternative and short term vs. long term flood resiliency perspective. Modelling is an objective way to demonstrate the cost benefit of investing in larger structures to save maintenance and replacement costs over the long term. With only limited public road infrastructure funds, it is of upmost importance to look at the cost benefit of alternatives based on modelling and invest limited funds at high priority sites with significant public benefit.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide							
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate								
Environmental	Moderate			Major								

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Public safety, including life and property	Moderate	Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Dam Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more Hydrologic Units (HUC8s)	One or more Hydrologic Units (HUC8s)	Nearshore areas along the coast (including the Great Lakes) off one or more Hydrologic Units (HUC8s)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Engineering and construction of dams; determining the size of a dam (bathymetric data is needed to determine the maximum storage capacity behind a dam in order to determine whether or not the dam is "large" or "small"); dam failure analyses.
MCA Title	Dam Safety
MCA ID	1254
Organization Type	State or U.S. Territorial government
Organization Name	Wisconsin Department of Natural Resources
Sub-Agency or Division	
Organization Mission	To protect and enhance our natural resources: our air, land and water; our wildlife, fish and forests and the ecosystems that sustain all life. To provide a healthy, sustainable environment and a full range of outdoor opportunities. To ensure the right of all people to use and enjoy these resources in their work and leisure. To work with people to understand each other's views and to carry out the public will. And in this partnership consider the future and generations to follow.
Program Name	WDNR Dam Safety
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Features present on the landscape or as a result of manmade changes to the landscape (e.g., roads, buildings, earthwork, dredging, etc.).

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have

Inland Bathy Feature Size Requirements	Response
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Not required
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	I don't know	I don't know	
Update Frequency	>10 years	>10 years	6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	
Acceptable Vertical Error	Less than 5 cm	Up to 50 cm	Up to 50 cm	
How far onshore needed			To MHW	
How far down the beach profile needed	Not applicable		To MHW	
Tide correction requirement			No requirement for tide correction	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required	Not required		Not required	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Not required		Not required	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Not required	Not required		Not required	Not required
DEM for entire AOI needs to be seamless	Highly desirable	Nice to have	Highly desirable		Highly desirable	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Not required	Not required	
DTM	Not required	Not required	Not required	
DEM	Required	Required	Required	
Raw point cloud data	Not required	Not required	Not required	
Classified point cloud	Not required	Not required	Not required	
Edited/cube XYZ		Not required	Not required	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Not required	Not required	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have	Not required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Not required	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Not required	Not required	Not required	
Ground control/ground truthing	Highly desirable	Nice to have	Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Not required	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Not required	
Submerged features			Nice to have	
Subbottom characteristics			Not required	
Geologic and seismic data	Not required	Not required	Not required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Not required	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required	Nice to have	Nice to have	
Land use/land cover	Nice to have	Nice to have	Not required	
Wetlands	Required	Required	Required	
Estuaries			Not required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Highly desirable		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Not required	Nice to have	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Many counties have 2-foot contour data, however, you have to go to the individual county website to access it (if they even have it online). It would be nice if this type of data could be accessed/linked to the DNR Surface Water Data Viewer to be used in combination with other DNR layers.	Hand drawn maps by lake biologists; typically 10-foot contours; many maps developed in the 1950's (estimate)	Do not have any data.	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				

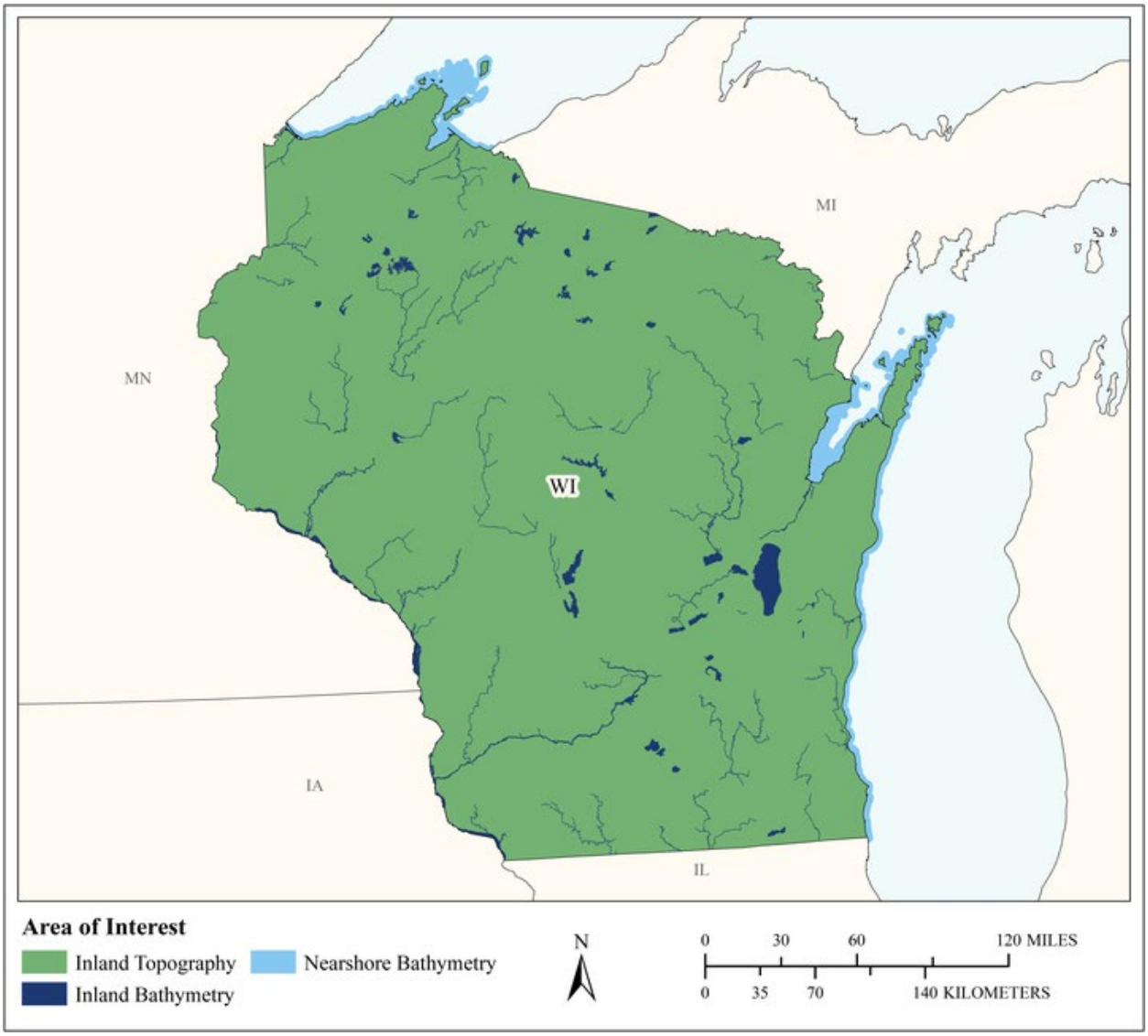
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
USGS data series				
Marine Minerals Program GIS				
State Repositories		Yes		
State repositories used		Lake database		
Other	Yes			
Other description	County			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None	Inland bathy data not available	I don't know	
Cost savings/cost reduction	None	Inland bathy data not available	I don't know	
Cost avoidance	None	Inland bathy data not available	I don't know	
Increased revenues	None	Inland bathy data not available	I don't know	
Mission-driven performance improvements	None	Inland bathy data not available	I don't know	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Inland bathy data not available	I don't know	
Improved response or timeliness	Moderate	Inland bathy data not available	I don't know	
Improved customer experience	Moderate	Inland bathy data not available	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	Inland bathy data not available	I don't know	
Environmental	Minor	Inland bathy data not available	I don't know	
Public safety, including life and property	Major	Inland bathy data not available	I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$8,683	Moderate	Annual dollars saved/realized	$241	Minor	Unable to provide				
Time savings description	Fewer field visits required. More accurate data to make decisions. More accurate representation of landscape.			Fewer field visits. Improve accuracy of modeling impoundments.								
Cost savings/cost reduction	None			None			None					
Cost avoidance	Moderate	Unable to provide		None			None					
Cost avoidance description	Assess development in floodplain or downstream of dam.											
Increased revenues	None			None			None					
Mission-driven performance improvements	Moderate	Unable to provide		Minor	Unable to provide		None					
Mission-driven performance improvements description	Having data sources in one location. Provide ability to make more consistent determinations.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		None			None					
Value added to products or services description	More accurate estimate of impacted areas due to dam break or flood.											
Improved response or timeliness	Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Improved response or timeliness description	Information all located in one spot to make comparisons easier. Ability of regulator and applicant to easily view the same information. Improved evacuation plans and assessment of impacted infrastructure.											
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			None			None					
Environmental	None			None			None					
Public safety, including life and property	Moderate			Minor			None					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Conservation Engineering



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation engineering. Soils and wetlands mapping and characterization. Modeling of biological and ecological systems. Erosion control. Engineering and construction of dams, levees, dikes, reservoirs, and coastal structures. Building site analysis. Road infrastructure. Discovery and analysis of terrestrial archaeological and historical cultural sites. Site protection and preservation planning. Discovery and analysis of Native American and other historical cultural sites and subsistence activities. Line-of-sight analysis in recreational and cultural-sensitive areas. Parks planning. Planning and development of recreational facilities such as rafting, boating, swimming, diving, and fishing areas; Trail and vista site planning, Site protection and preservation planning. Conservation planning for wildlife refuges and marine sanctuaries. Conservation of critical habitats. Water, sewer, or power line planning and vegetation analysis. Pump, drain, and well placement. Stormwater modeling. Cut and fill analysis for earth-moving.
MCA Title	Conservation Engineering
MCA ID	1421
Organization Type	State or U.S. Territorial government
Organization Name	WI DNR Bureau of Facilities and Lands
Sub-Agency or Division	
Organization Mission	To protect and enhance our natural resources: our air, land and water; our wildlife, fish and forests and the ecosystems that sustain all life. To provide a healthy, sustainable environment and a full range of outdoor opportunities. To ensure the right of all people to use and enjoy these resources in their work and leisure. To work with people to understand each other's views and to carry out the public will. And in this partnership consider the future and generations to follow.
Program Name	Wisconsin Department of Natural Resources, Bureau of Facilities and Lands
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 27 - Recreation
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)

General Geographic Area and Size	
Description of smallest 3D features	Specific location within a state property-- amphitheater, road section, water control structure/dike., Landscape architects and engineers require topo intervals for landscaping and structural site location and design. Site locations would include roads & paths, vault toilets, park entrances and visitors centers. Other structures would include water control structures, dikes & dams.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	Cross sections and/or transects meet needs	Cross sections and/or transects meet needs	
Update Frequency	2-3 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Less than 50 cm	Less than 50 cm	
Acceptable Vertical Error	Up to 20 cm	Less than 10 cm	Less than 10 cm	
How far onshore needed			To the fall line	
How far down the beach profile needed	To MHW		Below MLLW	
Tide correction requirement			No requirement for tide correction	
Cross sections and/or transects meet needs	Partial	Yes	Yes	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross section/transect requirement	Vertical and horizontal accuracy are both at less than 1cm for engineering specifications. Mapping specifications are 1 meter and less for horizontal and no vertical accuracy specifications.	Less than 1 cm for vertical and horizontal accuracy (engineering)	Less than 1 cm for horizontal and vertical (engineering standards)	

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Nice to have	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Not required	Nice to have	
DTM	Nice to have	Nice to have	Nice to have	
DEM	Highly desirable	Highly desirable	Highly desirable	
Raw point cloud data	Not required	Not required	Not required	
Classified point cloud	Nice to have	Nice to have	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Not required	Not required	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Nice to have	
Ground control/ground truthing	Highly desirable	Highly desirable	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Not required	Not required	Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Highly desirable	
Habitat distribution and classification			Not required	
Boundaries			Highly desirable	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Not required	
Floating observation/navigation systems			Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have	Nice to have	Highly desirable	
Land use/land cover	Required	Nice to have	Highly desirable	
Wetlands	Required	Highly desirable	Highly desirable	
Estuaries			Highly desirable	
Inland surface water features	Required	Highly desirable	Nice to have	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Nice to have	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Highly desirable	Highly desirable	Nice to have	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	NCED, project-derived LiDAR contours, county-based contours	At this time no consistent bathymetric is available for the engineers, although the availability would provide great assistance. Site visits are required to survey locations for boat launches and ramps, docks and piers.	None currently available--site surveys required for development of water access structures	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes	Yes	

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State repositories used	WI DNR in-house repository (submitted on a project basis to state from counties and special projects,	Currently DNR warehouses bathymetry collected for individual projects which are available to internal projects	If available, near-shore data warehoused by DNR from individual project collection	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Inland bathy data not available	None	
Cost savings/cost reduction	Moderate	Inland bathy data not available	None	
Cost avoidance	Major	Inland bathy data not available	None	
Increased revenues	None	Inland bathy data not available	None	
Mission-driven performance improvements	Minor	Inland bathy data not available	None	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Inland bathy data not available	None	
Improved response or timeliness	Minor	Inland bathy data not available	None	
Improved customer experience	Moderate	Inland bathy data not available	None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	Inland bathy data not available	None	
Environmental	Minor	Inland bathy data not available	None	
Public safety, including life and property	Minor	Inland bathy data not available	None	

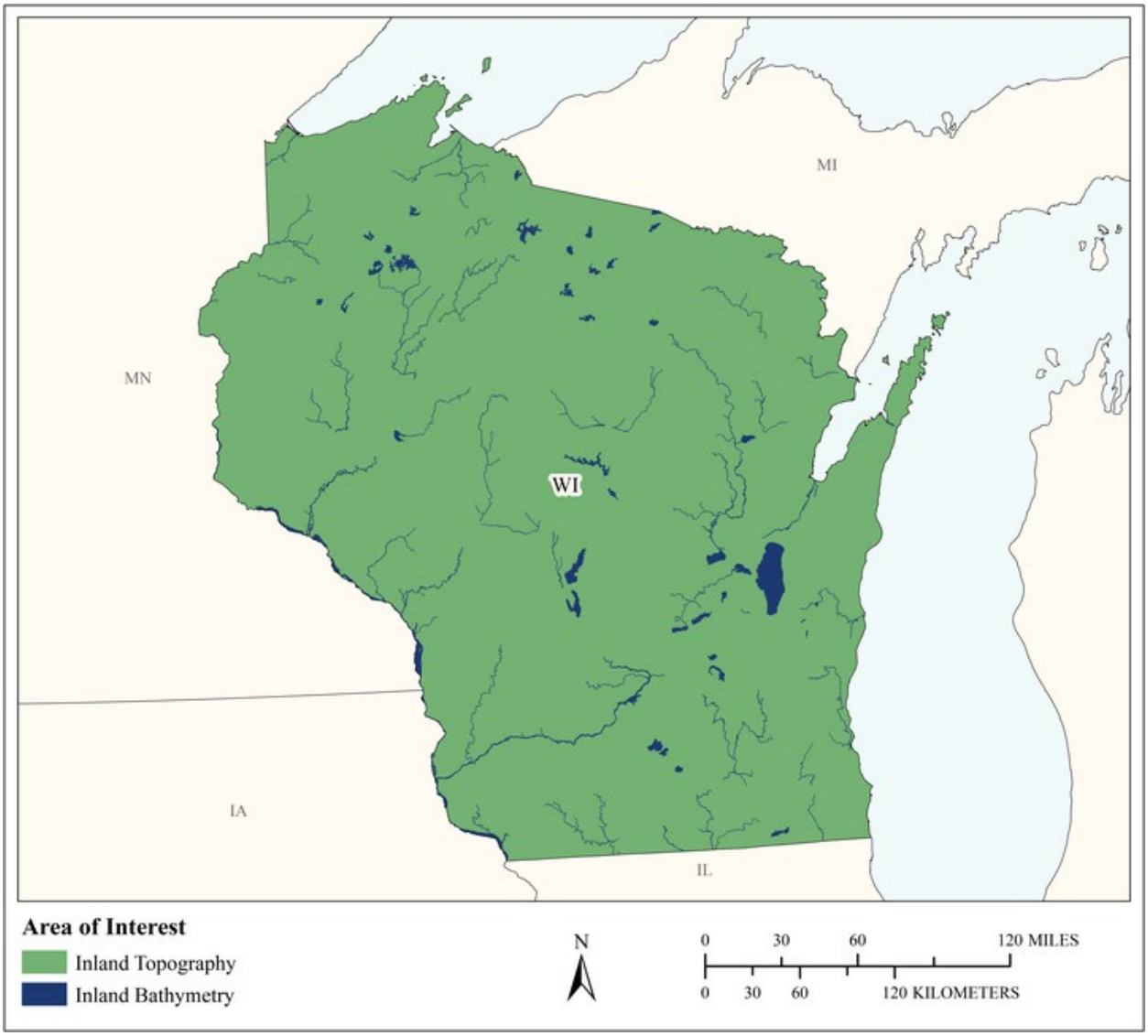
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$1,809	Moderate	Annual dollars saved/realized	$1,206	Moderate	Annual dollars saved/realized	$1,206			
Time savings description	Field visits would still be necessary for engineering surveys, site evaluation. More accurate elevation data for sight-line modeling, pre-mapping for survey events. Able to pre-plan on-site survey events, reduce time taken in the field. No need to reproject/convert existing data (GIS to CAD). Not applicable.			Field surveying still required, pre-planning map assist in survey set-up. Not Applicable. Reduce GIS staff data conversion.			Not Applicable. Reduce GIS staff data conversion. Field surveying still required, pre-planning map assist in survey set-up.					
Cost savings/cost reduction	None			Moderate	Annual dollars saved/realized	$5,000	Major	Annual dollars saved/realized	$5,000			
Cost savings/cost reduction description	Not applicable. Existing data is public-- no costs involved.			More precise survey would reduce construction materials cost. Not Applicable.			More precise survey would reduce construction materials cost. Not Applicable.					
Cost avoidance	Moderate	Annual dollars saved/realized	$1,000	Moderate	Annual dollars saved/realized	$11,000	Moderate	Annual dollars saved/realized	$11,000			
Cost avoidance description	Not applicable. Processing by Bureau GIS staff.			More precise location of water access facilities. More precise location of water access facilities/navigation maps. Assume more standardized data would reduce data errors. Reduce GIS staff data conversion.			More precise location of water access facilities. More precise location of water access facilities/navigation maps. Assume more standardized data would reduce data errors. Reduce GIS staff data conversion.					
Increased revenues	None			Moderate	Unable to provide		Moderate	Unable to provide				
Increased revenues description	Not applicable.			Enhanced navigational aids/water trail and property maps.			Enhanced navigational aids/water trail and property maps.					
Mission-driven performance improvements	Moderate	Annual percent improvement	5%	Moderate	Annual percent improvement	10%	Moderate	Annual percent improvement	10%			
Mission-driven performance improvements description	Enhance ability for property planning. Allow planners to better visualize properties. 3D data would enhance engineer plans, add new dimension to property planning.			Verification of field survey products, visualization of development plans. Verification of field survey products.			Verification of field survey products, visualization of development plans. Verification of field survey products.					
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Annual dollars saved/realized	$3,015	Moderate	Annual dollars saved/realized	$2,412	Moderate	Annual dollars saved/realized	$2,412			
Value added to products or services description	Not applicable. Trail planning, facilities site location pre-planning.			Navigational aids, water hazards. Enhancement of water trails/property mapping.			Navigational mapping, on-shore campsite location. Enhancement of water trails/property mapping.					
Improved response or timeliness	Moderate	Annual dollars saved/realized	$2,412	Moderate	Annual dollars saved/realized	$9,950	Moderate	Unable to provide				
Improved response or timeliness description	Not applicable. Improved display for cultural reviews. Improved display of state property for recreation, cultural review.			Bathymetric display on water trails/property mapping--replace manual digitization. Emergency response mapping.			Shoreline display on water trails/property mapping--replace manual digitization. Not Applicable. Emergency response mapping.					
Improved customer experience	Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved customer experience description	Not applicable. Potential self-service GIS analysis--aspect, line of site, 3D visualization.			No third-party data dissemination provided to public. Enhancement of state-owned web mapping. NOAA produced data would provide confidence.			No third-party data dissemination provided to public. Enhancement of state-owned web mapping. NOAA produced data would provide confidence.					
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			I don't know			I don't know					
Education or outreach description	Not applicable			Not applicable			Not applicable					
Environmental	Minor			Moderate			Moderate					

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Environmental description	Improve location of recreational opportunities	Allow program to place water access facilities in appropriate areas	Allow program to place water access facilities in appropriate areas	
Public safety, including life and property	Minor	Moderate	Moderate	
Public safety, including life and property description	Improved ability to survey water control structures and internal park roads.	Allow program to place water access facilities in appropriate areas	Allow program to place water access facilities in appropriate areas	

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps				
Viewshed maps	Yes	Yes		
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: County Planning and Development Activities



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Land development and zoning. Municipal mapping of building footprints and elevations. Port resilience planning. Parks and transportation planning. Virtual city creation. Urban ecology planning. Public Land Survey System (PLSS) corner monument re-establishment and protection. Reviews of subdivision plats and Certified Survey Maps. Land surveying work for other government agencies and answer surveying and land ownership questions. BU 30, Maritime and Land Boundary Management is an additional Business Use.
MCA Title	County Planning and Development Activities
MCA ID	1083
Organization Type	Regional, County, City, or other local government
Organization Name	County Governments
Sub-Agency or Division	
Organization Mission	To provide the public with high quality, easy to use geographic information and county services to taxpayers.
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 27 - Recreation
Tertiary Business Use	BU 15 - Flood Risk Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Road lines, curbs, signs, and ditches. Locate manholes, water valves, trees, edge of pavement, edge of concrete, etc. As a land surveyor, require accuracies to about the size of a thumb nail. We need to be highly accurate!

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required

Inland Bathy Feature Size Requirements	Response
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL3B		
Update Frequency	4-5 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Up to 2 meters		
Acceptable Vertical Error	Less than 5 cm	Up to 40 cm		
How far onshore needed				
How far down the beach profile needed	To MHW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Highly desirable

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Nice to have	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level			Up to double the required TVU at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Required	Not required		
Classified point cloud	Required	Nice to have		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Required	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Nice to have		
Ground control/ground truthing	Required	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Highly desirable		
Land use/land cover	Required	Nice to have		
Wetlands	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Highly desirable		
Bridges/culverts	Required	Nice to have		
Landmark features	Required	Nice to have		
Cultural resources	Highly desirable	Nice to have		
Coastal and riverine structures	Required	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Our current topo data is bare earth contour lines and ranges from 2009 to 2011 and is 2 meter intervals in rural areas and 1 meter intervals in urban areas. All of our topographic data is Lidar based on 2007 and 2017 Lidar flights. From that Lidar acquired data, we now have and use 1, 2 and 10 foot contour intervals, DEMs, DSMs, slope rasters, hillshade and aspect. The 2017 Lidar flight data meets USGS Quality Level 2 specifications.	We currently have 24k flowlines from the Wisconsin DNR that are about 10 years old along with breaklines and single and double line surface hydrography purchased from Ayres in our last LiDAR collect from them.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	Data supplied by the Wisconsin DNR.	Wisconsin DNR 24k flowlines		
Other	Yes			
Other description	County sources. 3d Point Cloud Purchased from Ayres.			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	Major	Minor		
Increased revenues	Minor	Minor		
Mission-driven performance improvements	Major	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		
Improved response or timeliness	Major	Minor		
Improved customer experience	Major	Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major		
Environmental	Major	Minor		
Public safety, including life and property	Major	Minor		

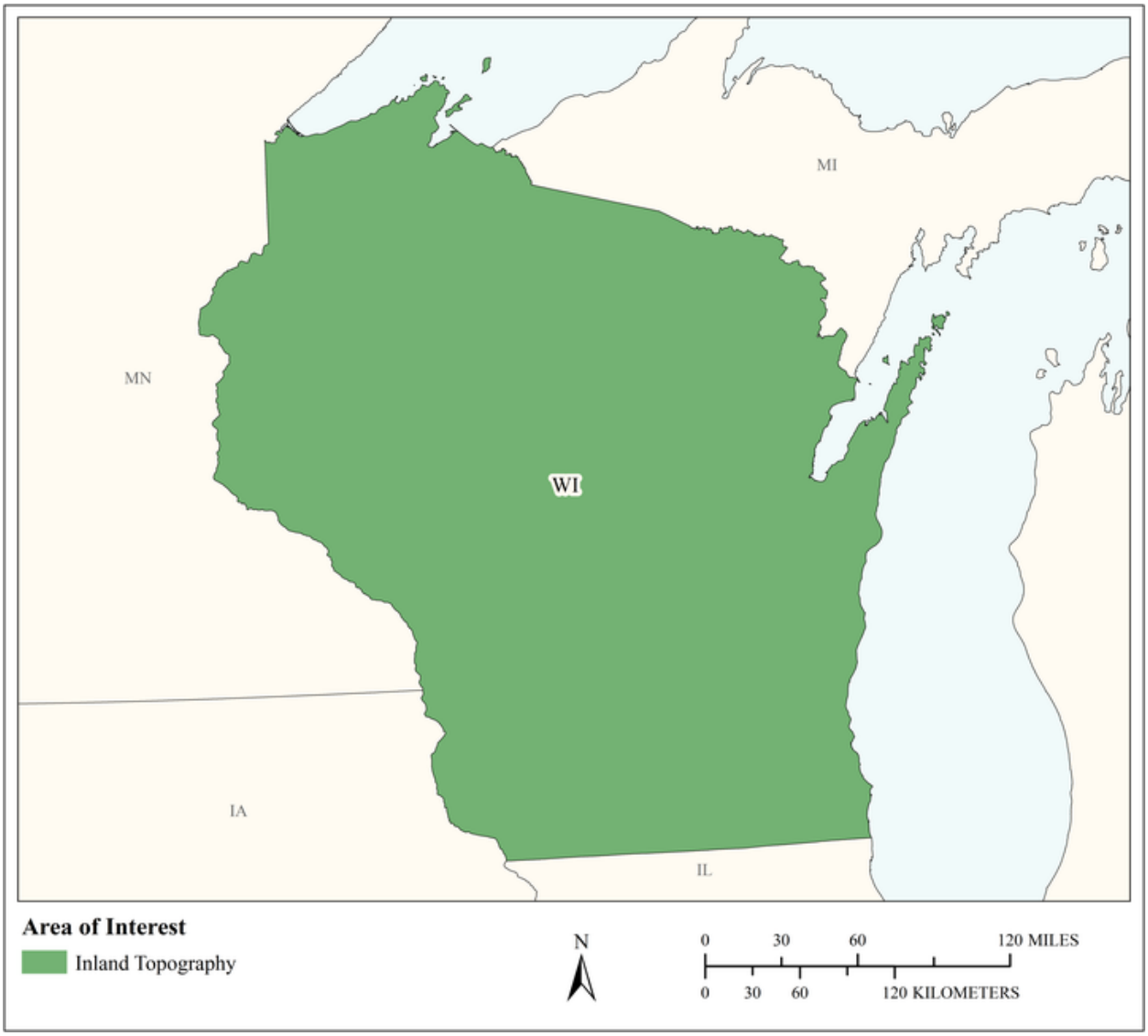
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide							
Increased revenues	Moderate	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements description	Hydro.											
Other operational benefits	Major	Annual dollars saved/realized	$15,084,557	Major	Annual dollars saved/realized	$614,367						
Other operational benefits description	Benefits added during validation phase.			Benefits added during validation phase.								
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Other customer service benefits	Major	Annual dollars saved/realized	$1,741,519	Major	Annual dollars saved/realized	$777,228						
Other customer service benefits description	Benefits added during validation phase.			Being able to create more accurate flood plain/way and wetland maps which would possibly prevent loss of life and property due to zoning restrictions. Benefits added during validation phase. Being able to create more accurate flood plain/way and wetland maps which would possibly prevent loss of life and property due to zoning restrictions.								
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Education or outreach description	Public will have access to more detailed, accurate, and up to date information about their property			More accurate, detailed, and up to date information for citizens about their property								
Environmental	Major			Minor								
Environmental description				Increased legal protection for wetlands and waterways that may have accidentally omitted from previous datasets								
Public safety, including life and property	Major			Major								
Public safety, including life and property description	More accurate shoreland zoning, floodplain, and wetland maps			Being able to create more accurate flood plain/way and wetland maps which would possibly prevent loss of life and property due to zoning restrictions								
Other				Improvements on recreation								
Other benefits				Major								

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other description		Hunters and fishers often request information on wetlands and waterways and will benefit from increased accuracy and more recent data		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Real Estate, Banking, Mortgage, and Insurance



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Assessment of risk for natural hazards (e.g., sinkholes, flooding) to inform insurance policy rates and the determination of mandatory insurance. Building permit compliance.
MCA Title	Real Estate, Banking, Mortgage, and Insurance
MCA ID	60532
Organization Type	State or U.S. Territorial government
Organization Name	State of Wisconsin
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 25 - Real Estate, Banking, Mortgage, and Insurance
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

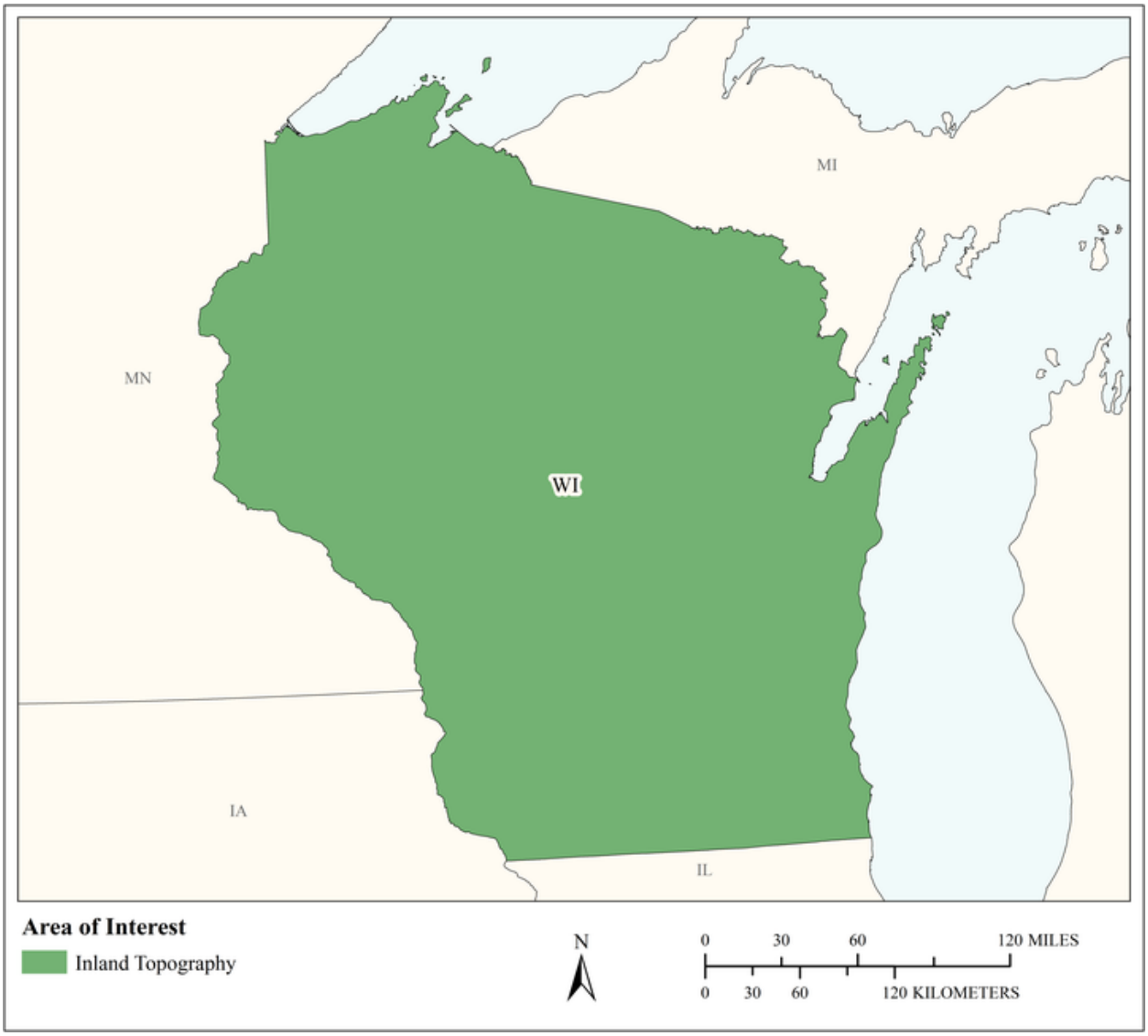
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Moderate			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,947,955									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Telecommunications



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Telecommunication tower site selection. Design of radio and radar systems. Interference analysis. Path profiles. Undersea telecommunication route selection and deployment.
MCA Title	Telecommunications
MCA ID	60533
Organization Type	State or U.S. Territorial government
Organization Name	State of Wisconsin
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 28 - Telecommunications
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Highly desirable			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Highly desirable			
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Breaklines required for standard hydro-flattening	Highly desirable			
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Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
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Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
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Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

Wyoming

Current status of elevation data for Wyoming

Wyoming is very fortunate to benefit from the attention and financial support of FEMA that has provided the resources to acquire lidar for all but two counties as of 2020. FEMA is supporting the effort for their floodplain mapping and mitigation programs, and the data are 3DEP compliant at Quality Level 2 (QL2). While the lidar data is being captured, Wyoming has yet to provide additional money to help cover derivative products or data management or delivery functions.

The state developed a draft Wyoming Lidar Plan in 2019, the focus of which needs to change to reflect the need for funding to cover the above-mentioned costs and provide usable derived datasets to prove the worth to the user community. The intent is to document use cases where QL1 data would be more beneficial in hopes of program support in the future.

Importance of elevation data to Wyoming

In the Wyoming Lidar Plan, a wide variety of applications among natural resource management agencies were identified. Below is a summary of the use cases documented in the plan.

Energy Development: Wyoming is home to an array of renewable and non-renewable energy resources. Historically, coal mining and oil and gas development have dominated the state's economy and land use. More recently, permitting for wind and solar energy development has increased. High-resolution elevation data are extremely beneficial to any of these energy-producing industries. Lidar augments site selection and engineering plans for these developments. It would also help regulatory agencies such as the BLM and Department of Environmental Quality (DEQ) to locate orphan wells, manage reclamation efforts, and assess environmental impacts from the development activities.

Natural Resource Management: Wyoming is also home to rich and diverse natural resources. Management of these resources by state, federal, and local governments would be greatly enhanced by having lidar data and its derivatives.

Invasive species, such as cheatgrass, are an increasing risk in native habitats across Wyoming. Having an accurate snapshot to provide a baseline measurement of the extent of their coverage is a critical planning tool. Recent methodologies tested by Woolpert indicate that lidar can be used effectively to map cheatgrass infestation with a 90% confidence level. Applying the technology this way is new, so improvements to the methodology are likely as more experience will inform the algorithms.

Bathymetric data would augment fishery habitat management. A large part of the cost for river restoration projects arises from sorting out existing bathymetry, calculating various metrics about stream dimensions, and then formulating the appropriate dimensions based on the river size and its geographic setting. Improved bathymetry data would reduce these planning costs. Certain species thrive at different water depths, so identifying the extent of habitat adequate for species' needs improves population estimates and distributions, considerations for habitat improvements, and the ability to identify potential invasive species given mapped depths. High resolution inland bathymetry would also improve instream flow calculations, which helps guarantee water flow to protect fish species.

The benefits of including lidar data in wildfire planning and management are substantial, which translates to improved response before, during, and after fire events. Lidar data can be used to prioritize areas in the state where tactical analysis, community interaction and education, or mitigation treatments might be necessary to reduce risk from wildfires and post-fire debris flows. Lidar is important for informing multiple Forest Service resource areas and applications related to vegetation management, wildfire

planning and response, soils and ecological unit inventory, geologic hazard mitigation, wildlife habitat management, stream corridor and wetlands mapping, watershed assessment, flood risk management, and engineering activities such as site design and transportation planning. Forest inventory information derived from lidar includes forest structure attributes critical for forest management, such as canopy cover, tree height, understory cover, basal area, tree volume, biomass, and others. The use of high-quality lidar data also provides for improved fire behavior modeling, forest fuel loads assessment, wildfire response planning, and post-fire remediation prescriptions, including post-fire assessment for slope instability, leading to improved public safety. Lidar captures fine scale, spatially complete topographic and vegetation structural patterns across the landscape with increased accuracy of the distribution, character, and condition of forest stands, geomorphology, wildlife habitat, hydrologic features, forest fire risk, roads, and infrastructure.

Floodplain mapping: One of the most notable uses of lidar is with the FEMA Risk Mapping, Assessment, and Planning (MAP) program. Through collaboration with state, local, and tribal entities, the Risk MAP program aims to deliver quality data that increases public awareness and leads to mitigation actions that reduce risk to life and property. Lidar provides the ability to run two-dimensional base level engineering analysis to identity a community's flood risk (frequently resulting in the production of a Flood Insurance Rate Maps, or FIRMs), as well as levee and dam safety inundation mapping. Elevation data are also useful for other applications within FEMA, like evacuation planning and estimating flood damages for flood insurance and disaster assistance. Lidar data aid in the identification of vulnerable properties within a floodplain, facilitating better floodplain-management decisions and education of the public on true flood risks.

Water use mapping and conservation: A "first return" digital elevation model (DEM) without hydro-flattening is useful to the Wyoming Water Development Office. Knowing the locations of bridges, culverts, and buildings is important in construction planning, and high-resolution elevation data are extremely beneficial around reservoirs, agricultural areas, and river corridors. Higher resolution data depicting the vegetation coverage along riparian corridors would help in watershed studies.

Geologic Hazards: Lidar is an excellent resource for geologic hazard mapping because of its detail and ability to penetrate vegetation. The data can be used to map active faults more accurately and distinguish previously unrecognized faults in quaternary-age deposits. Detailed imagery also enables greatly improved mapping of other geologic hazards including landslides, debris flows, karst terrane(s) (sinkholes), and active sand dunes. Local emergency management and planning officials are greatly benefitted by high-quality mapping of geologic hazards. The enhancement in detail provided by lidar also benefits traditional bedrock mapping, which allows for a better understanding of geologic formations, structures, and outcrop locations. High-resolution lidar better constrains geophysical models leading to a more precise understanding of critical mineral occurrences, oil and gas resources, and other economic mineral resources.

Infrastructure: Statewide lidar would allow public and private organizations to expand their use of high-resolution elevation data for planning and site-level engineering and reduce field work for conservation projects. Water management is critical given climate change. Having bare-earth, hydro-flattened DEMs provides a highly accurate 3D model of the earth's terrain, which leads to construction of new infrastructure with less preconstruction time and costs. Lidar capture in late summer, after snowmelt and low reservoir levels, would be most beneficial for future snowpack monitoring and understanding dam safety issues.

Inland bathymetry would be extremely beneficial for a variety of infrastructure projects. Wyoming has a number of aging dams where accurate volume calculations are critical to gauging structure adequacy. Mapping the extent of sediment deposition would also help to identify if particular areas are susceptible

due to underwater currents. Accurately measuring reservoir capacity has implications for improved water forecasts and irrigation. Finally, the planning for and installation of recreation infrastructure (like boat ramps of fishing piers) would be enhanced through inland bathymetry.

Teton County contracted Aero-Graphics, Inc. to assemble bare-earth DEMs and 2-ft. elevation contours on approximately 70,000 acres of private land in 2015. The majority of users have been architecture, engineering, and environmental consulting firms conducting work involving significant grading and geo-technical work. The application of lidar increases the efficiency and effectiveness of environmental and engineering design and analysis resulting in more accurate, comprehensive, and cost-effective management of resources and infrastructure.

Precision Agriculture: This economic driver in Wyoming is benefitted through more accurate elevation data. Water follows gravity, so the better its obstacles are mapped, the better it can be managed for the benefit of water diversion, irrigation, and recovery. Lidar produces accurate soils maps and helps calculate crop yield, identify potential production zones, and help prevent soil erosion.

High-level summary of elevation data requirements

Wyoming's geography is dynamic and diverse across the landscape. While QL2 lidar is sufficient for most of the state, mountainous areas would be better served with QL1. This is due to the complexity of the slopes and terrain, as well as the density of vegetation, which is mapped much more accurately with QL1 data and tighter flight lines. Until the data are used by more business sectors, it's hard to say where additional benefit could be seen from higher resolution data. In general respondents indicated a need for QL1 inland topography and QL1B inland bathymetry updated every 4-5 years.

High-level summary of benefits that would come from higher resolution elevation data

Higher resolution data would prove useful in fuel management projects in higher elevation forested regions. It would also be useful for orphan wells and tracking successful reclamation. QL1 data provide the ability to extract more precise scarp profiles. This means fault offsets can be mapped more accurately, leading to better magnitude approximations.

Higher resolution allows us to better identify and characterize landslides, karst features (sinkholes), active faults, active sand dunes, and other geologic hazards. In addition, higher resolution provides a more accurate surface model to locate outcrops for sample and analysis campaigns as well as better constraining geophysical models. These models are key to understanding available critical mineral resources. Higher resolution data would allow the state to improve the processes and decisions made by state, federal, local and other agencies, and NGOs.

Additional Comments

Wyoming echoes sentiments expressed by other western states related to the challenges it faces due to land ownership patterns and the dominance of federally managed lands. Coordinated partnerships should be supported to leverage funding and program opportunities for improved natural resource management.

Wyoming also echoes sentiments expressed by others about the need for federal funding to support data acquisition, access, and maintenance programs within states. A successful national elevation program requires national funding to keep it viable at the state level.

The State of Wyoming has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

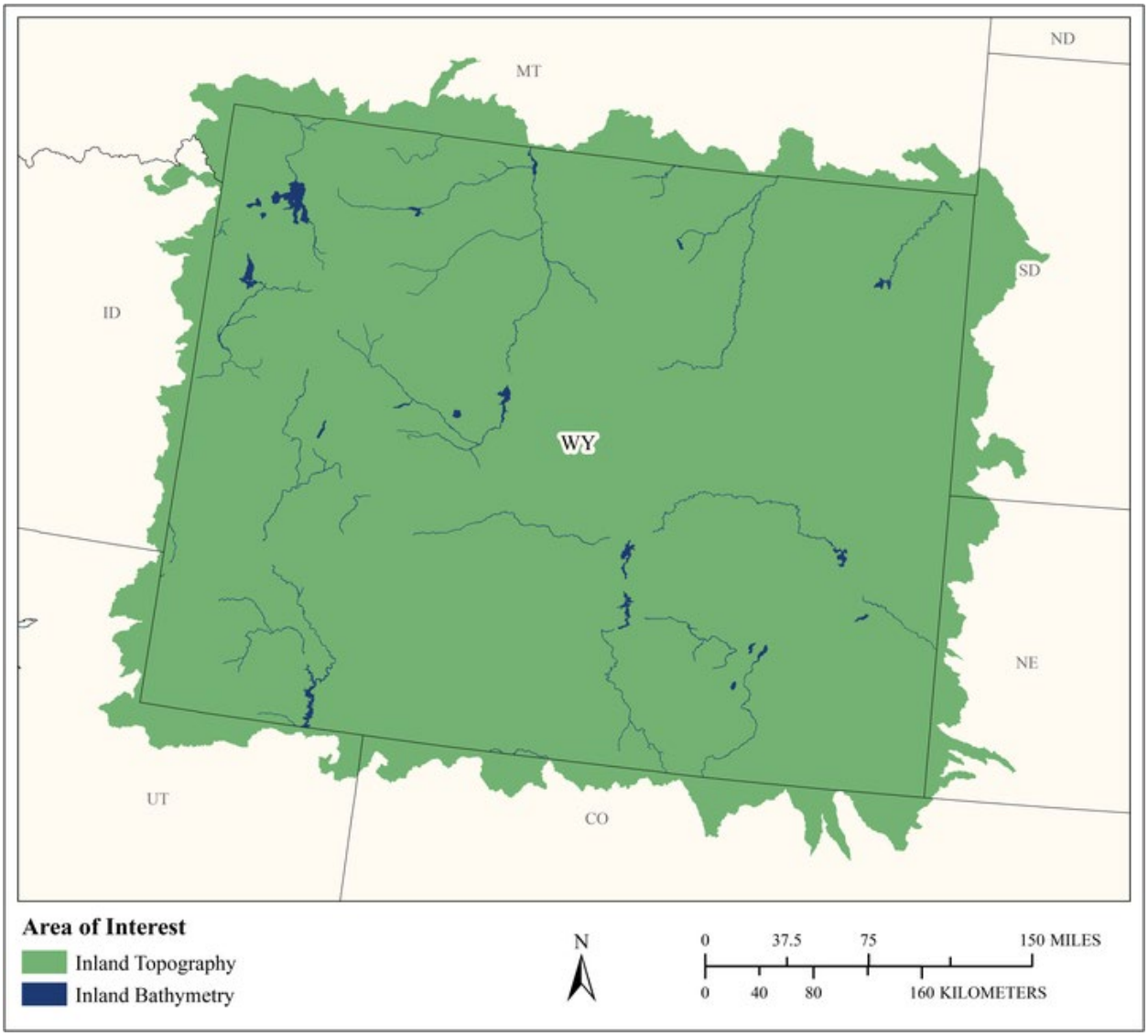
Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	Wyoming Water Development Office	1422	Water Infrastructure Planning and Development	Inland Topo	QL1	>10 years	$679,897	$160,000	I don't know	Major	None
				Inland Bathy	Cross sections and/or transects meet needs	>10 years	$272,612	Unable to quantify	None	Minor	None
BU 01 – Water Supply and Quality	Wyoming Department of Environmental Quality	21500	Environmental Permitting and Enforcement	Inland Topo	Cross sections and/or transects meet needs	>10 years	$500,000	Unable to quantify	I don't know	Major	Moderate
				Inland Bathy	Cross sections and/or transects meet needs	>10 years	Unable to quantify	Unable to quantify	Moderate	Major	I don't know
BU 02 – Riverine Ecosystem Management	State of Wyoming	60534	Riverine Ecosystem Management	Inland Topo	QL1 HD	6-10 years	$149,714	$14,954	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$79,698	$5,619	Major	Major	Major
BU 04 – Forest Resource Management	State of Wyoming	60535	Forest Resources Management	Inland Topo	QL1	2-3 years	$386,731	$560,613	Major	Major	Major
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 05 – Rangeland Management	Wyoming Department of Agriculture	1114	Rangeland Health Assessments	Inland Topo	QL2	Annually	Unable to quantify	Unable to quantify	Minor	Major	I don't know
BU 06 – Natural Resource Management	State of Wyoming	60536	Natural Resources Conservation	Inland Topo	QL1 HD	4-5 years	$3,836,493	$14,088,774	Major	Major	Major
				Inland Bathy	QL0B	6-10 years	$519,993	$23,408	Major	Major	Major
BU 07 – Wildlife and Habitat Management	WY Game and Fish Department	1275	Wildlife and Habitat Management	Inland Topo	QL1	4-5 years	$23,299	$67,295	Major	Major	Moderate
				Inland Bathy	QL3B	4-5 years	$186,726	$112,865	Minor	Moderate	Moderate
BU 08 – Agriculture	Wyoming State Engineer's Office	22091	Stream Analysis	Inland Topo	QL2	4-5 years	$113,246	$89,777	None	Moderate	Moderate
BU 10 – Geologic Assessment	Wyoming State Geological Survey	1238	Geologic Hazard and Resource Mapping	Inland Topo	Cross sections and/or transects meet needs	4-5 years	$22,099	Unable to quantify	Major	Moderate	Major
				Inland Bathy	Cross sections and/or transects meet needs	>10 years	Unable to quantify	Unable to quantify	None	None	None

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 11 – Geologic Resource Extraction	State of Wyoming	60537	Geologic Resource Mining and Extraction	Inland Topo	QL1 HD	2-3 years	$23,892	$15,849	Minor	Major	Major
				Inland Bathy	QL0B	4-5 years	Unable to quantify	$1,634	None	Minor	Minor
BU 12 – Renewable Energy Resources	State of Wyoming	60538	Renewable Energy Resources	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	None
				Inland Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 13 – Oil and Gas Resources	State of Wyoming	60539	Oil and Gas Resources	Inland Topo	QL1	Annually	$42,931	Unable to quantify	Minor	Major	Major
				Inland Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 14 – Cultural Resource Management	State of Wyoming	60540	Cultural Resources Preservation and Management	Inland Topo	QL1	4-5 years	$17,928	$15,675	Minor	Minor	Minor
				Inland Bathy	QL0B	6-10 years	$42,992	Unable to quantify	Moderate	Minor	Minor
BU 15 – Flood Risk Management	State of Wyoming	60541	Flood Risk Management	Inland Topo	QL2	4-5 years	$13,733,459	$2,402,925	Major	Moderate	Major
				Inland Bathy	QL1B	4-5 years	$954,021	$1,071,121	Moderate	Moderate	Major
BU 17 – Wildfire Management	State of Wyoming	60542	Wildfire Management, Planning, and Response	Inland Topo	QL1	4-5 years	$525,532	Unable to quantify	Major	Major	Major
BU 18 – Homeland Security	State of Wyoming	60543	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management	Inland Topo	QL2	4-5 years	$2,885,487	$50,999	Major	Moderate	Major
				Inland Bathy	QL0B	4-5 years	$812,626	$51,846	Major	Moderate	Major
BU 19 – Land Navigation	State of Wyoming	60544	Land Navigation and Safety	Inland Topo	QL0	2-3 years	$1,267,101	$102,324	Minor	Major	Major
				Inland Bathy	QL0B	2-3 years	$54,047	$559	Minor	Moderate	Moderate
BU 21 – Aviation Navigation	State of Wyoming	60545	Aviation Navigation and Safety	Inland Topo	QL1 HD	Annually	$330,660	$411,825	Minor	Moderate	Moderate
				Inland Bathy	QL0B	Annually	$65,844	Unable to quantify	Moderate	Major	Major
BU 22 – Infrastructure Management	State of Wyoming	60546	Infrastructure and Construction Management	Inland Topo	QL0 HD	4-5 years	$4,395,671	$12,935,575	Minor	Moderate	Major
				Inland Bathy	QL0B	4-5 years	$1,480,972	$153,781	Minor	Moderate	Moderate
BU 23 – Urban and Regional Planning	State of Wyoming	60547	Urban and Regional Planning	Inland Topo	QL1	4-5 years	$26,317,556	$3,038,373	Moderate	Major	Major
				Inland Bathy	QL1B	6-10 years	$1,071,868	$1,356,005	Moderate	Moderate	Major

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 24 – Health and Human Services	State of Wyoming	60548	Health and Human Services	Inland Topo	QL1	6-10 years	$34,900	$4	Moderate	Moderate	Major
				Inland Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 25 – Real Estate, Banking, and Insurance	State of Wyoming	60549	Real Estate, Banking, Mortgage, and Insurance	Inland Topo	QL1 HD	4-5 years	$3,398,537	Unable to quantify	Minor	Minor	Major
				Inland Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 26 – Education and Basic Research	University of Wyoming	22082	Academic and Applied Research Programs and Support	Inland Topo	QL1 HD	Annually	$514,016	$1,228,649	Moderate	Major	Major
				Inland Bathy	QL3B	>10 years	$134,421	Unable to quantify	Major	Major	Major
BU 27 – Recreation	State of Wyoming	60550	Recreation	Inland Topo	QL1	4-5 years	$22,444	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	4-5 years	$13,516	Unable to quantify	Major	Major	Moderate
BU 28 – Telecom-munications	State of Wyoming	60551	Telecommunications	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Inland Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	Major
BU 30 – Maritime and Land Boundary Management	State of Wyoming	60552	Maritime and Land Boundary Management	Inland Topo	QL1	6-10 years	$110,065	$421,995	Moderate	Minor	None
				Inland Bathy	QL2B	6-10 years	$82,600	Unable to quantify	Major	Major	Moderate

MCA Title: Water Infrastructure Planning and Development



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Custom description	One or more states, territories, or counties		
Sub Area Requirements	HUC10s that cover Wyoming			

MCA Description	Response
Mission Critical Activity	Water supply development and rehabilitation. Hydrologic modeling. Reservoir planning, construction, and operation. Water infrastructure mapping and assessment, rangeland, stream, and riparian assessments, development of aquifers. Inland bathy for sediment loading in reservoirs, storage capacity, dam integrity, elevations surrounding reservoirs. Elevation data are used for H&H modeling, to ensure water runs downhill, and for construction planning for water storage tanks, reservoirs, diversion structures (dams) in reservoirs, pipelines, and ditches. Planning is done at the basin-wide level as well as for individual structures.
MCA Title	Water Infrastructure Planning and Development
MCA ID	1422
Organization Type	State or U.S. Territorial government
Organization Name	Wyoming Water Development Office
Sub-Agency or Division	
Organization Mission	Wyoming Water Development Program helps ensure the delivery of water to Wyoming citizens in an economical and environmentally responsible manner. Sound water planning and use will preserve Wyoming's water entitlements and will promote the effective and efficient use of the state's water resources.
Program Name	Construction, Dams & Reservoirs, River Basin Planning
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 22 - Infrastructure and Construction Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Ditches, trees, stream channels, large pipelines

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	Cross sections and/or transects meet needs		
Update Frequency	>10 years	>10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Up to 2 meters		
Acceptable Vertical Error	Up to 10 cm	Up to 20 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs		Yes		
Cross section/transect requirement		20 cm vertical accuracy, 100 meter spacing		

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Required			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Nice to have			Highly desirable	
DEM for entire AOI needs to be seamless	Nice to have	Nice to have			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Not required		
DTM	Required	Not required		
DEM	Required	Required		
Raw point cloud data	Not required	Not required		
Classified point cloud	Nice to have	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Not required		
Ground control/ground truthing	Not required	Not required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Nice to have	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Highly desirable		
Land use/land cover	Highly desirable	Not required		
Wetlands	Highly desirable	Not required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Highly desirable		
Bridges/culverts	Nice to have	Not required		
Landmark features	Nice to have	Not required		
Cultural resources	Nice to have	Not required		
Coastal and riverine structures	Nice to have	Not required		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	10 Meter DEM to 1 Meter DEM for planning, survey grade transects for construction.	Site by site reservoir surveys (by boat).		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Moderate		
Cost savings/cost reduction	Moderate	Moderate		
Cost avoidance	I don't know	Moderate		
Increased revenues	I don't know	None		

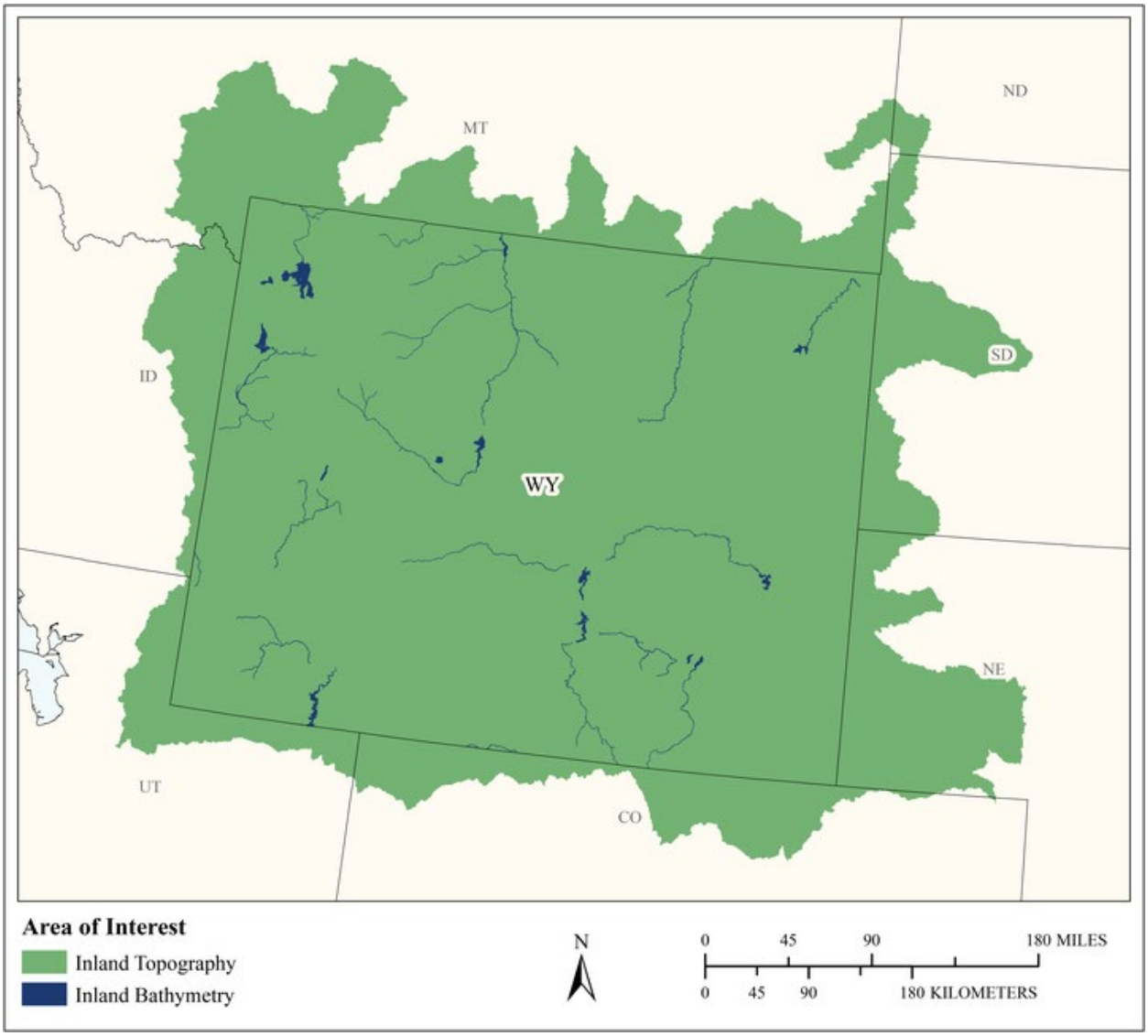
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Mission-driven performance improvements	I don't know	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor		
Improved response or timeliness	I don't know	Minor		
Improved customer experience	I don't know	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	None		
Environmental	I don't know	Moderate		
Public safety, including life and property	I don't know	None		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$79,898	Moderate	Annual dollars saved/realized	$22,612						
Time savings description	Less GPS work needed in reconnaissance level projects, master planning, watershed Studies, etc. Hours saved really depends on number of projects Range is 15-25 projects/year, two weeks of work for each. GPS data manipulation and conversion needs would be diminished. Project development planning could be done largely from the office. Easier to identify infrastructure, and stream health. Hours saved really depends on number of projects Range is 15-25 projects/year. One week of work for each.											
Cost savings/cost reduction	Major	Annual dollars saved/realized	$500,000	Minor	Annual dollars saved/realized	$250,000						
Cost savings/cost reduction description	Less GPS work needed in Master planning, & Watershed Studies.											
Cost avoidance	Moderate	Annual dollars saved/realized	$100,000	None								
Increased revenues	None			Moderate	Unable to provide							
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Annual dollars saved/realized	$160,000	Moderate	Unable to provide							
Value added to products or services description	Consultant hours * $100/hour average.											
Improved response or timeliness	Moderate	Unable to provide		Moderate	Unable to provide							
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			None								
Environmental	Major			Minor								
Environmental description	Better identification of altered landscapes and impaired waterways.											
Public safety, including life and property	None			None								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours		Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness		Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Environmental Permitting and Enforcement



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Highly desirable		
Geographic Area Requirements	One or more Hydrologic Units (HUC8s)	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Regulate and permit activity under the Clean Water Act, Clean Air Act, NEPA, SMCRA, and Abandoned Mines. Elevation data are needed for modeling of nitrate vulnerability for groundwater (pesticide models and aquifer prioritization for regulation) and for public water supplies the data are used to model wellhead protection zones above water supplies. Air quality studies use DEMs to improve models and show ozone. Elevation data are also needed for coal mine regulation, both active and abandoned. For monitoring of active mines we match recent imagery to DEMs and we also estimate cut and fill volumes for abandoned mines. Elevation data are also needed for permitting of oil and gas fields. The Abandoned Mine Lands program closes, and reclaims to native habitat, both small mine openings, and large-scale open pit features. Additionally hazardous features such as highwalls, abandoned equipment and buildings, open mine shafts, and other dangerous features are closed, reduced, covered, or otherwise rendered safe. Where appropriate and as possible, environmental degradation is reduced and remediated. Additionally underground cement grouting of mine voids is undertaken to remediate or reduce the potential of mine subsidence that can damage or destroy buildings, roads, pipelines, and other infrastructure.
MCA Title	Environmental Permitting and Enforcement
MCA ID	21500
Organization Type	State or U.S. Territorial government
Organization Name	Wyoming Department of Environmental Quality
Sub-Agency or Division	
Organization Mission	To permit and regulate activity affecting the Natural Resources of the state of Wyoming.
Program Name	Point Source and Non - Point Source pollution programs under water quality division. Groundwater Protection/Quality Coal/noncoal programs in Land Quality Storage Tank Program Hazardous Waste Solid Waste Landfills NPDES (WYPDES in Wyoming) Underground Injection Control Reservoir mapping for WYPDES program
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 11 - Geologic Resource Mining and Extraction
Tertiary Business Use	BU 13 - Oil and Gas Resources

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	200,000 sq mi - 2 million sq mi (e.g. large state, large multi-state region such as the Great Basin, standard Federal region, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Small wetlands, structure size. Sometimes individual shrubs can be useful, certainly large rocks, visible open mine shafts, roads, subsidence features, geologic anomalies, precise house corners, transmission lines including individual towers.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	Cross sections and/or transects meet needs	Cross sections and/or transects meet needs		
Update Frequency	>10 years	>10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter		
Acceptable Vertical Error	Greater than 1 meter	Greater than 1 meter		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs	Yes	Yes		
Cross section/transect requirement	Vertical accuracy 1 meter, 100m spacing	Do not Know		

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Highly desirable

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Nice to have			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have			Nice to have	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Highly desirable	Highly desirable		
DEM	Highly desirable	Highly desirable		
Raw point cloud data	Nice to have	Not required		
Classified point cloud	Highly desirable	Nice to have		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Not required		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Not required		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Highly desirable		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We are using contours to map small reservoirs for the WYPDES program, we are using currently 10m DEM to look at O2 modeling.	None to date, collect substrate samples.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	WYGISC Geohub at the University of Wyoming.			
Other	Yes	Yes		
Other description	DEQ Image Services	None		
Data that meet my needs are not available				

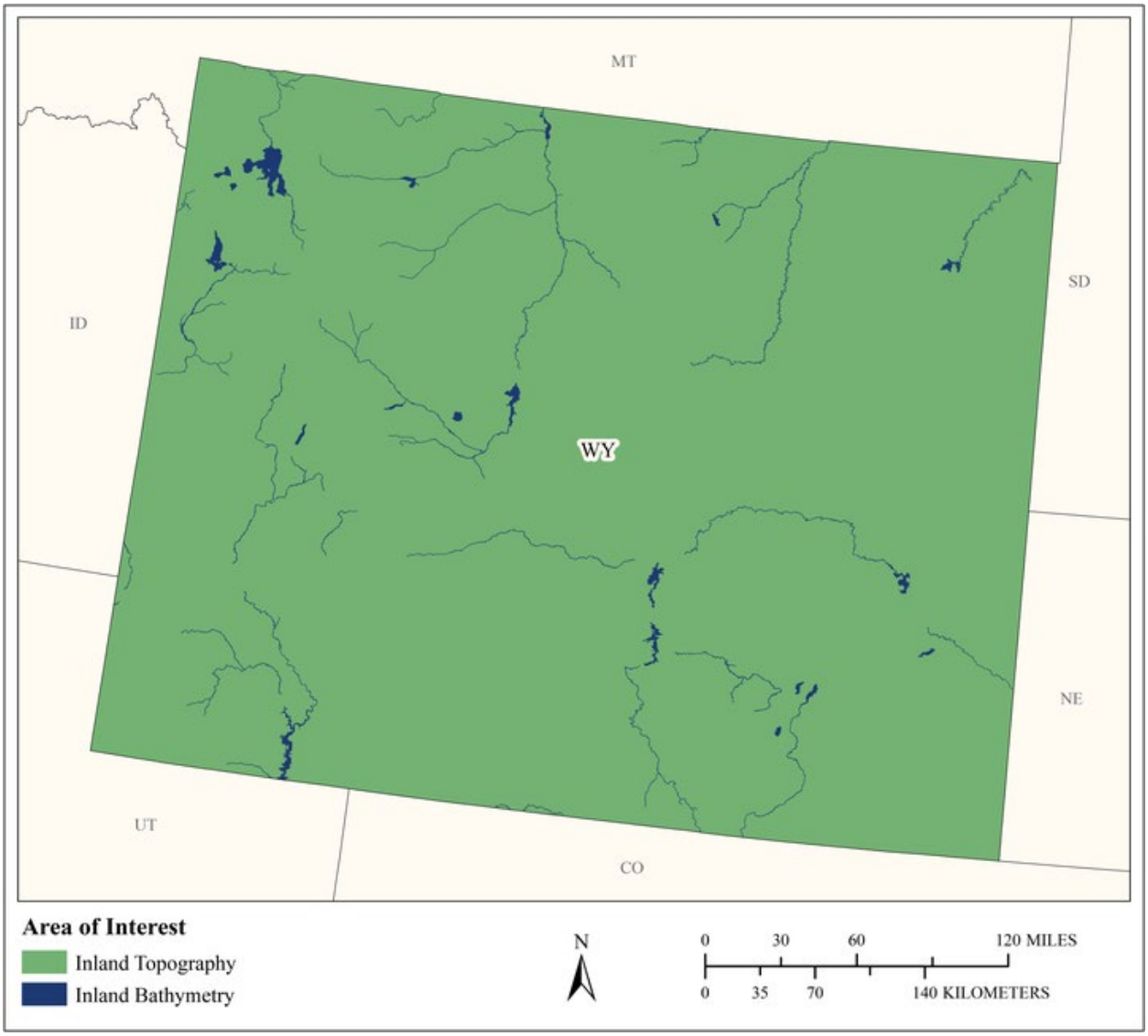
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know	Inland bathy data not available		
Cost savings/cost reduction	I don't know	Inland bathy data not available		
Cost avoidance	I don't know	Inland bathy data not available		
Increased revenues	I don't know	Inland bathy data not available		
Mission-driven performance improvements	I don't know	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know	Inland bathy data not available		
Improved response or timeliness	I don't know	Inland bathy data not available		
Improved customer experience	I don't know	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	Inland bathy data not available		
Environmental	I don't know	Inland bathy data not available		
Public safety, including life and property	I don't know	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Time savings description	Would avoid use of paper maps, avoid errors in converting to digital, permit reviews would be faster.											
Cost savings/cost reduction	Major	Annual dollars saved/realized	$500,000	Major	Unable to provide							
Cost savings/cost reduction description	Consultants do the field work. This is a guess including time for several companies.											
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Cost avoidance description	Would avoid use of paper maps, avoid errors in converting to digital, permit reviews would be faster.											
Increased revenues	Major	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		Major	Unable to provide							
Value added to products or services description	Benefits could be here as well.											
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness description	Would avoid use of paper maps, avoid errors in converting to digital, permit reviews would be faster.											
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			Moderate								
Environmental	Major			Major								
Environmental description	Better scale means size of mining permit boundary is closer to reality (small permits are faster to process than larger ones), violations to permitted size can be better identified.											
Public safety, including life and property	Moderate			I don't know								
Public safety, including life and property description	Some of these data could be expected to help the mission goal of public health and safety.											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Riverine Ecosystem Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Stream channel analysis and mapping. Stream bank erosion analysis. Aquatic and terrestrial species habitat management. Environmental management.
MCA Title	Riverine Ecosystem Management
MCA ID	60534
Organization Type	State or U.S. Territorial government
Organization Name	State of Wyoming
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B		
Update Frequency	6-10 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Required			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Required	Highly desirable		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Highly desirable	Nice to have		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Moderate	Minor		
Cost avoidance	Moderate	None		
Increased revenues	None	None		
Mission-driven performance improvements	Major	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		

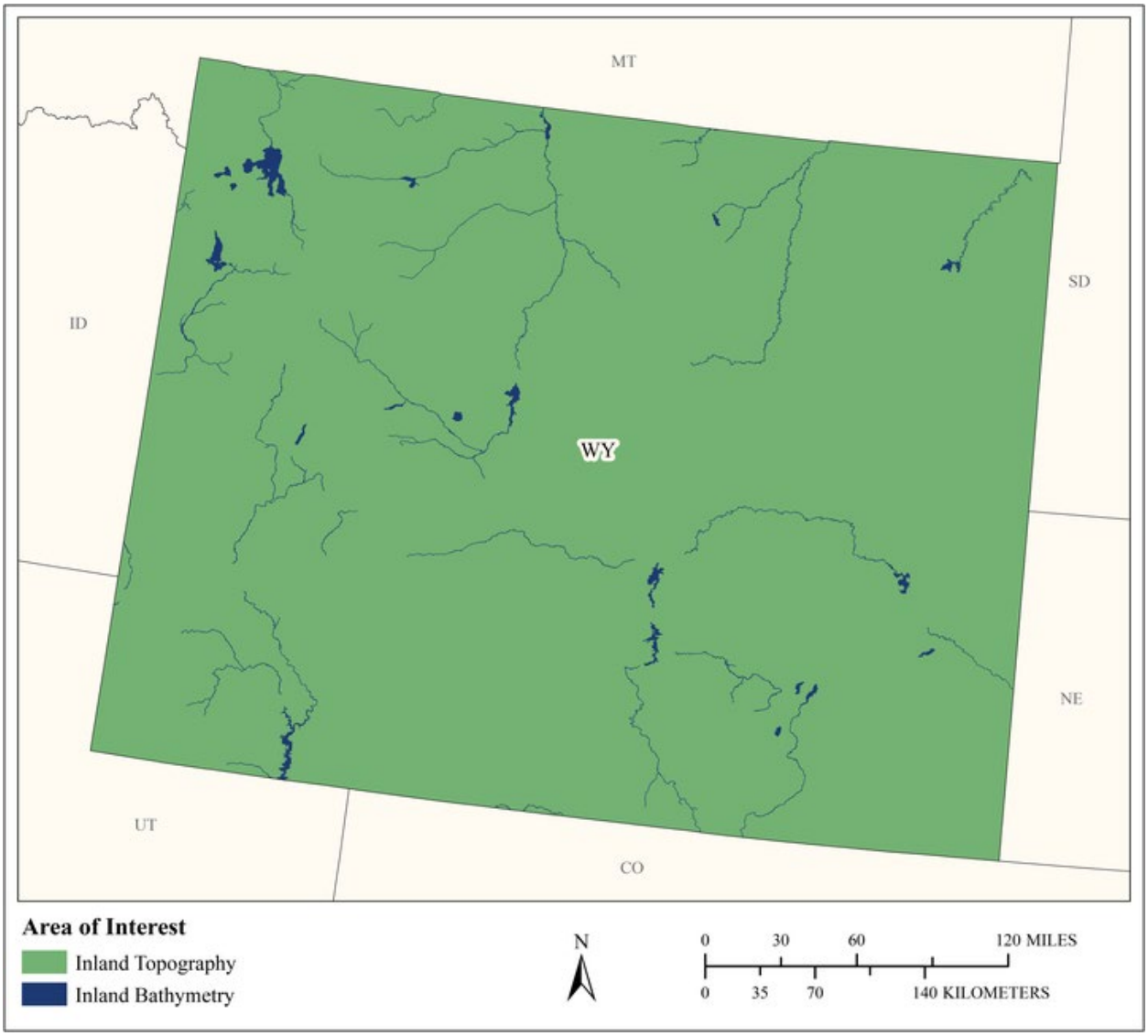
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Moderate		
Improved customer experience	Major	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate		
Environmental	Major	Major		
Public safety, including life and property	Major	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$149,714		Annual dollars saved/ realized	$79,698						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$14,954		Annual dollars saved/ realized	$5,619						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Major			Major								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Forest Resources Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Forest health assessment. Determination of standing inventory of forest resources. Prescribed burn planning. Analysis of carbon stocks for trade. Harvest systems planning.
MCA Title	Forest Resources Management
MCA ID	60535
Organization Type	State or U.S. Territorial government
Organization Name	State of Wyoming
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B		
Update Frequency	2-3 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Not required		
DTM	Required	Not required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Required	Highly desirable		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Required		
Land use/land cover	Required	Required		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Highly desirable	Required		
Landmark features	Nice to have	Nice to have		
Cultural resources	Highly desirable	Nice to have		
Coastal and riverine structures	Nice to have	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Major		
Increased revenues	Minor	Moderate		
Mission-driven performance improvements	Major	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		

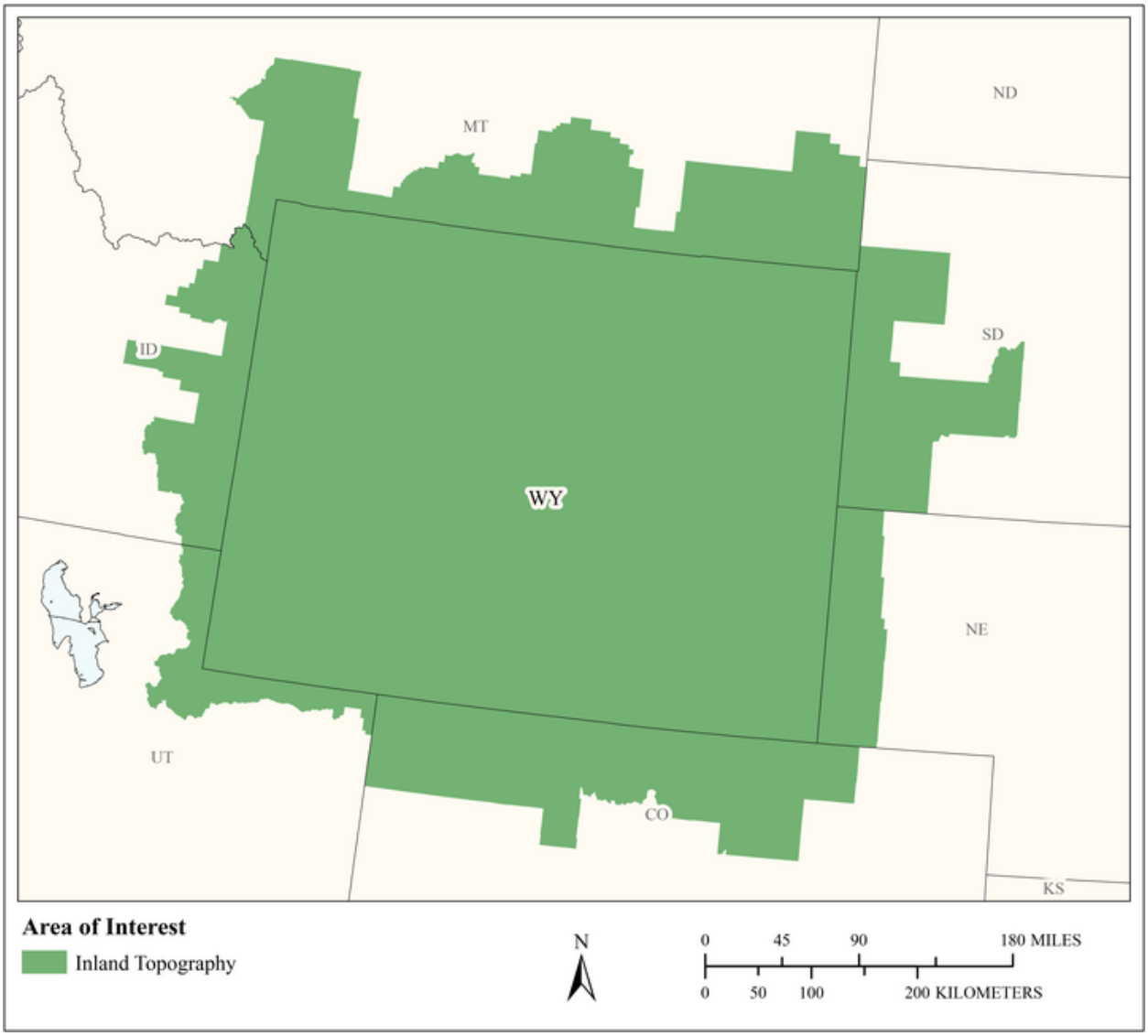
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	Major		
Improved customer experience	Moderate	Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Major		
Environmental	Major	Major		
Public safety, including life and property	Moderate	Major		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Major	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$386,731									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$560,613									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Major			Major								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes		
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Rangeland Health Assessments



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements	Wyoming and adjacent counties in neighboring states			

MCA Description	Response
Mission Critical Activity	Rangeland health assessments. 95% of rangeland is on public lands. Forest Service permits can be on public lands as well. Permittees' allotments may cross state boundary. Permittees provide data with their applications in the eastern part of state where there are little public lands. The use of elevation data for this activity is aspirational. Elevation data should be able to help identify grass types for allotment, help combat invasives, and allow the department to focus on projects with a greater chance of success. Having aspect, slope, and land cover data would result in less field work. The data could help with sage grouse plans, identification of prairie dog colonies, and sage brush. Having both bare earth and tops of vegetation should lead to fewer or faster field visits. Shrub height and shape, and grass height would be needed. Imagery is currently used and will also be needed.
MCA Title	Rangeland Health Assessments
MCA ID	1114
Organization Type	State or U.S. Territorial government
Organization Name	Wyoming Department of Agriculture
Sub-Agency or Division	
Organization Mission	The Wyoming Department of Agriculture is dedicated to the promotion and enhancement of Wyoming's agriculture, natural resources and contribution to Wyoming quality of life.
Program Name	Rangeland Health Assessment Program (RHAP), Natural Resource & Policy Division
Total Annual Program Budget	
Primary Business Use	BU 05 - Rangeland Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Not required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Individual plants

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Less than 5 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Highly desirable			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Not required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Not currently using any; data are collected via field visits or provided by permittees			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	Not currently using any			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None			
Cost savings/cost reduction	None			
Cost avoidance	None			

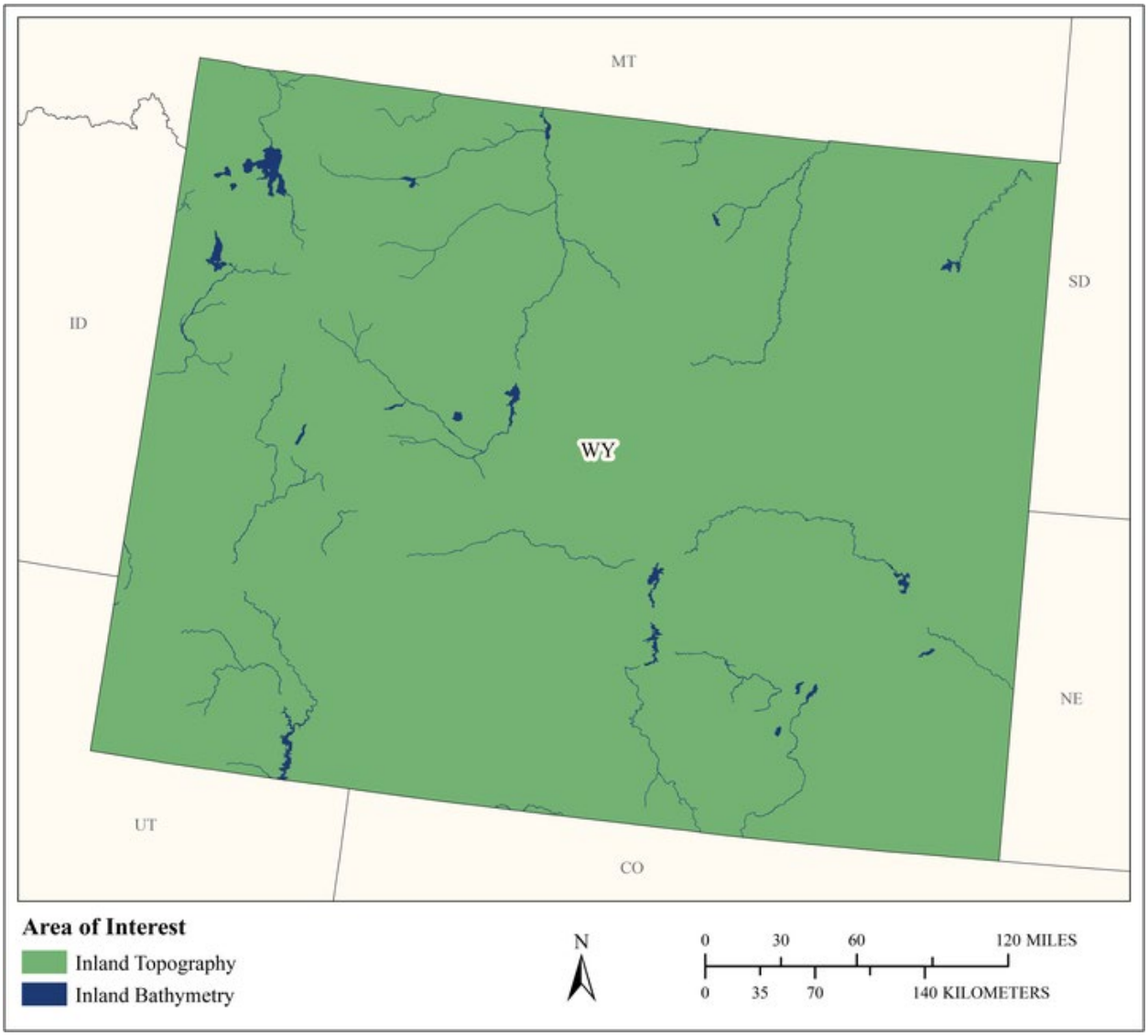
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	None			
Mission-driven performance improvements	None			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None			
Improved response or timeliness	None			
Improved customer experience	None			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	None			
Public safety, including life and property	None			
Other Current Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other	Major			
Other description	Not currently using any but benefits could be major if it can be done			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Time savings description	Significant potential savings on field visits. Could speed up NEPA. Could speed up NEPA and make more permits current.											
Cost savings/cost reduction	None											
Cost savings/cost reduction description	Would increase costs in some areas but could save in others.											
Cost avoidance	Minor	Unable to provide										
Cost avoidance description	Maybe.											
Increased revenues	Moderate	Unable to provide										
Increased revenues description	Potential to improve use of allotments. For some producers/partners.											
Mission-driven performance improvements	Major	Annual percent improvement	50%									
Mission-driven performance improvements description	More data to help inform decisions.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades				
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Natural Resources Conservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation engineering. Soils and wetlands mapping and characterization. Modeling of biological and ecological systems. Erosion control. Rainfall penetration studies, impervious surfaces. Assessment of blue carbon stocks.
MCA Title	Natural Resources Conservation
MCA ID	60536
Organization Type	State or U.S. Territorial government
Organization Name	State of Wyoming
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B		
Update Frequency	4-5 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Highly desirable			Required	
Entire AOI under same environmental conditions	Required	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Required	Required		
Classified point cloud	Required	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Required		
Land use/land cover	Required	Required		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Moderate		
Increased revenues	Minor	Minor		
Mission-driven performance improvements	Major	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		

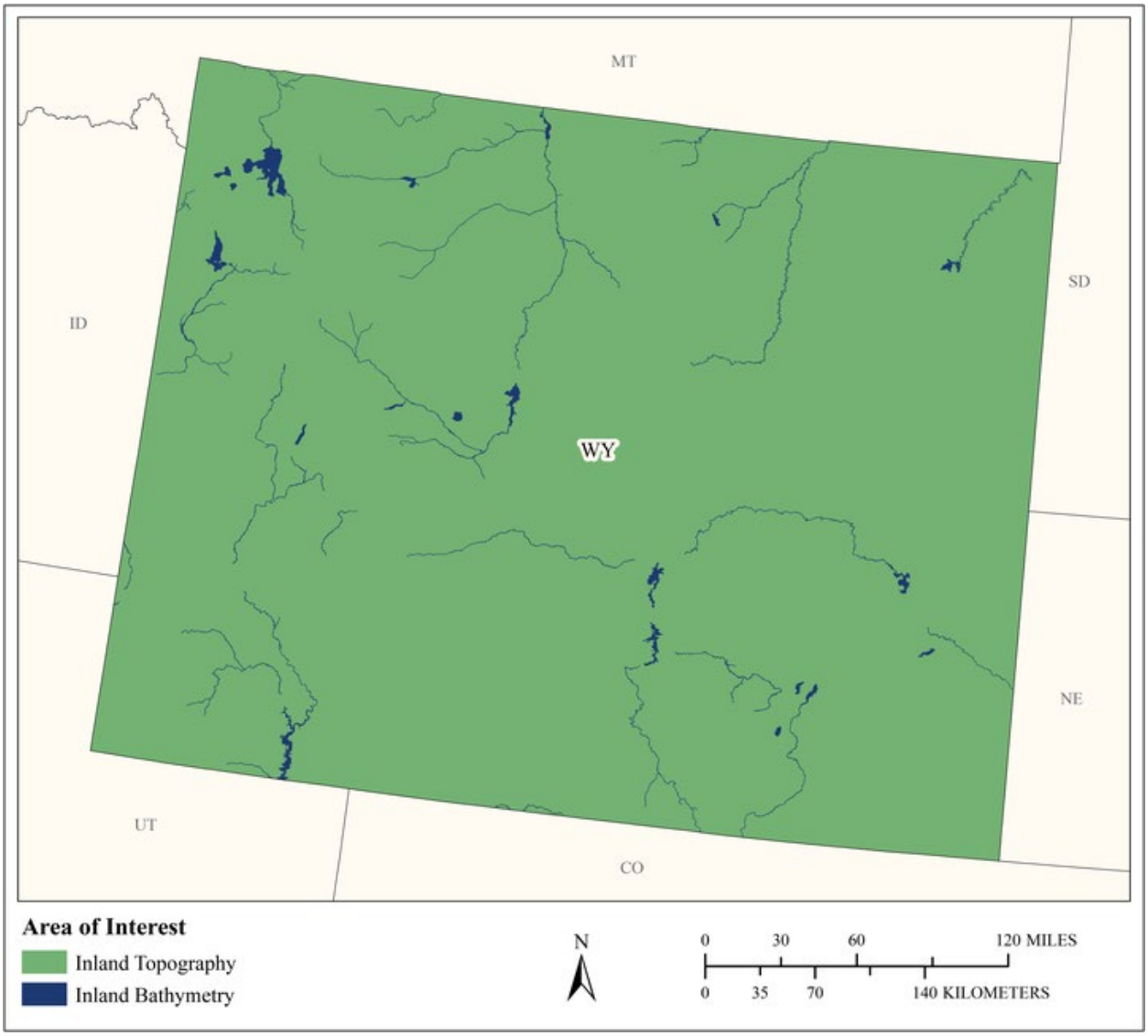
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major	Major		
Improved customer experience	Major	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate		
Environmental	Major	Major		
Public safety, including life and property	Major	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$3,836,493		Annual dollars saved/ realized	$519,993						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$14,088,774		Annual dollars saved/ realized	$23,408						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Major			Major								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Wildlife and Habitat Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Conservation planning for wildlife species and their habitats in Wyoming. Development of recreation opportunities for consumptive and nonconsumptive uses of wildlife. Monitoring for and treatment of invasive species. Engineering department uses elevation data for water rights, instream flow, irrigation projects, boat dock/ramp engineering, fish hatchery planning. Future uses would include mapping vegetation canopy and understory for sage grouse management, sage brush ecosystem management, improved ecosystem mapping.
MCA Title	Wildlife and Habitat Management
MCA ID	1275
Organization Type	State or U.S. Territorial government
Organization Name	WY Game and Fish Department
Sub-Agency or Division	
Organization Mission	The Wyoming Game and Fish Department manages the wildlife species and populations of Wyoming. Our mission is to provide hunting and fishing opportunities, as well as manage non-consumptive populations for the benefit of the public.
Program Name	The entire Wyoming Game and Fish Department.
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	BU 27 - Recreation
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	We deal a lot with vegetation composition, canopy and structure, so mapping the average shrubs would be highly valuable.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL3B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 10 cm	Up to 40 cm		
How far onshore needed				
How far down the beach profile needed	To MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable		
DTM	Nice to have	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Required	Highly desirable		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Highly desirable		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Nice to have		
Ground control/ground truthing	Highly desirable	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Required	Required		
Land use/land cover	Required	Required		
Wetlands	Required	Required		
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Required	Required		
Cultural resources	Required	Required		
Coastal and riverine structures	Required	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	All we have traditionally had in Wyoming is the basic 30 m DEM and derived 10 m DEM. With 2015 NAIP, we got the point cloud from that collection effort.	I don't know that we have any bathymetric data currently.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Wyoming's GeoHub.			

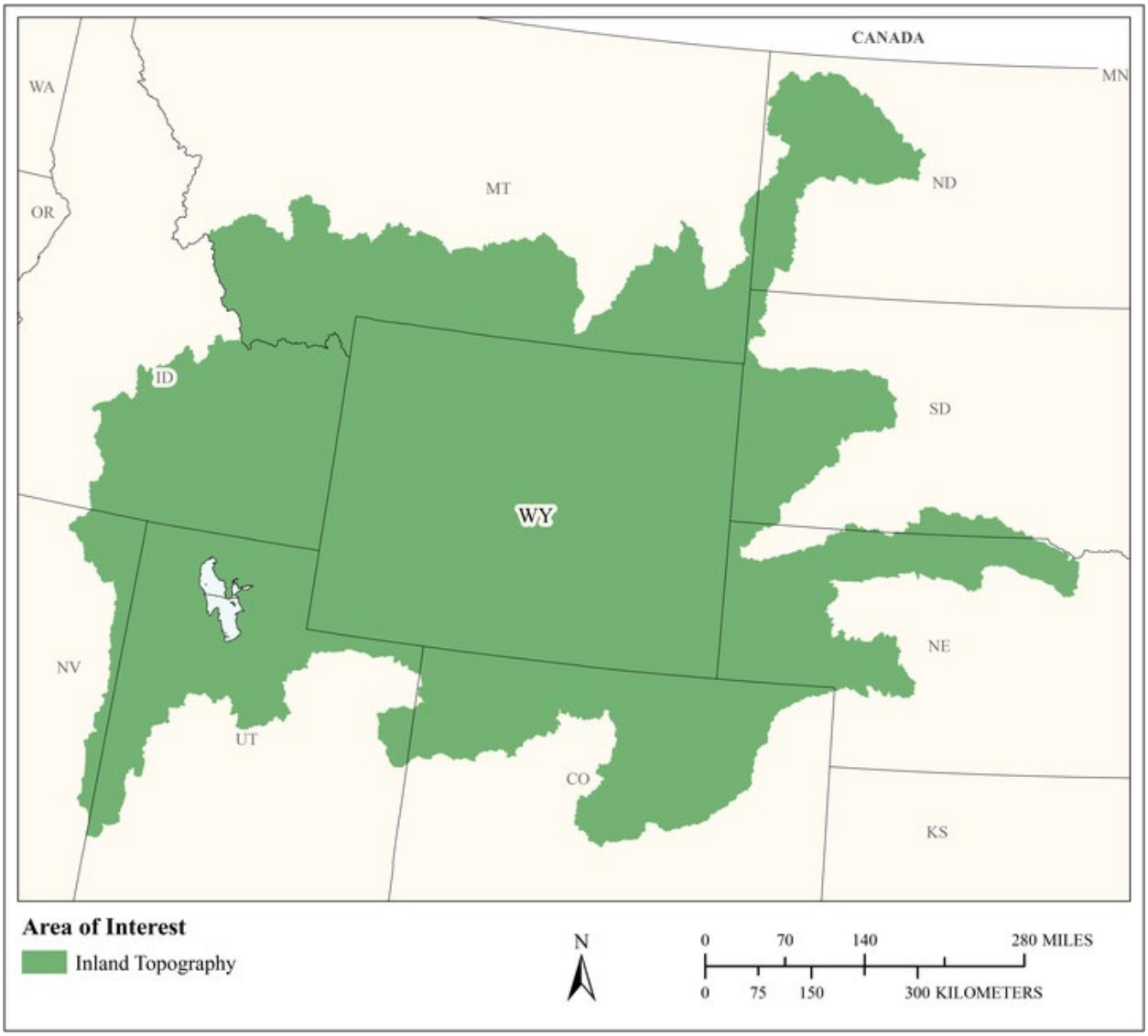
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Inland bathy data not available		
Cost savings/cost reduction	Minor	Inland bathy data not available		
Cost avoidance	Minor	Inland bathy data not available		
Increased revenues	None	Inland bathy data not available		
Mission-driven performance improvements	Minor	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	Inland bathy data not available		
Improved response or timeliness	Minor	Inland bathy data not available		
Improved customer experience	Minor	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Inland bathy data not available		
Environmental	Moderate	Inland bathy data not available		
Public safety, including life and property	Minor	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide							
Time savings description	Better scale of modeling. Less travel time for field work and less field work.											
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Moderate	Unable to provide		Minor	Unable to provide							
Increased revenues	Minor	Unable to provide		Moderate	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$23,299		Annual dollars saved/ realized	$186,726						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Minor	Unable to provide							
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$67,295		Annual dollars saved/ realized	$112,865						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Minor								
Environmental	Major			Moderate								
Public safety, including life and property	Moderate			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Stream Analysis



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more Hydrologic Units (HUC4s)			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Modeling stream flow for such cases of dam breakages, analysis of water years for irrigation and how to regulate water for users better. Elevation data are needed for H&H modeling, and to regulate and analyze stream flow and runoff for irrigation. The data are also needed for dam safety – dam breach modeling.
MCA Title	Stream Analysis
MCA ID	22091
Organization Type	State or U.S. Territorial government
Organization Name	Wyoming State Engineer's Office
Sub-Agency or Division	
Organization Mission	Mapping water rights.
Program Name	Wyoming State Engineer's Office
Total Annual Program Budget	
Primary Business Use	BU 08 - Agriculture and Precision Farming
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	200,000 sq mi - 2 million sq mi (e.g. large state, large multi-state region such as the Great Basin, standard Federal region, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Crop types, irrigation structures – dam, canal, diversion point

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Vertical Error	I don't know			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required					
Entire AOI under same environmental conditions	Nice to have					
Other	Highly desirable					
Other description	Like to see crops (leaf on) as well as leaf off					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Not required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Not required			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Best available – 30 m DEMs, 10m DEMs, aerial imagery			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	WYOMING GEOGRAPHIC INFORMATION SCIENCE CENTER (WYGISC)			

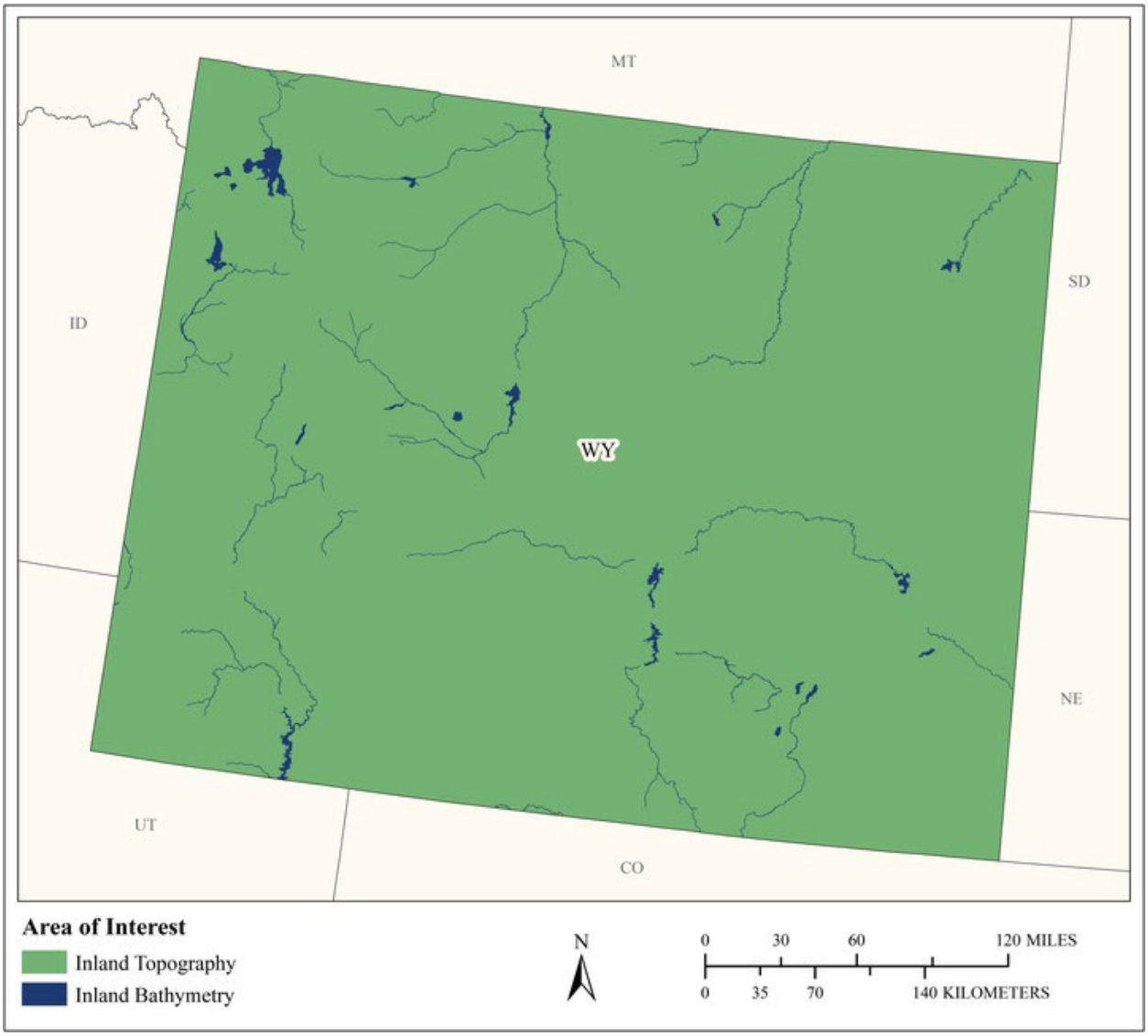
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Moderate			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Moderate	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$113,246									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$89,777									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None											
Environmental	Moderate											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Geologic Hazard and Resource Mapping



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Nice to have		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Geologic hazard mapping, modeling and interpretation including, but not limited to landslides, Quaternary-aged faulting, subsidence, active eolian (windblown – unvegetated sand dunes, etc.) features, and other geologic hazards. Enhanced ground terrain models improve ability to map geologic hazards and locate previously unrecognized events (landslides, etc.). Future ability to identify likelihood of existence of rare earth minerals based on landforms.
MCA Title	Geologic Hazard and Resource Mapping
MCA ID	1238
Organization Type	State or U.S. Territorial government
Organization Name	Wyoming State Geological Survey
Sub-Agency or Division	
Organization Mission	Promote the beneficial and environmentally sound use of Wyoming's vast geologic, mineral, and energy resources while helping protect the public from geologic hazards.
Program Name	Geologic Hazards and Resource programs
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 11 - Geologic Resource Mining and Extraction
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	We are interested in fault scarps, landslide features, and other geomorphic features in the sub 10 cm range

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Not required
51 - 100 ft	Nice to have
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Not required

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Not required
5.1 – 10 acres	Nice to have
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	Cross sections and/or transects meet needs	Cross sections and/or transects meet needs		
Update Frequency	4-5 years	>10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Up to 10 meters		
Acceptable Vertical Error	Up to 10 cm	Up to 1 meter		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs	Yes	Yes		
Cross section/transect requirement	Vertical accuracy - sub 10cm, horizontal - 1 meter or less spacing	Variable		

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Nice to have	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Nice to have			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Not required		
DTM	Required	Nice to have		
DEM	Required	Not required		
Raw point cloud data	Required	Not required		
Classified point cloud	Required	Not required		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Not required		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Not required		
Ground control/ground truthing	Highly desirable	Not required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Nice to have		
Land use/land cover	Nice to have	Not required		
Wetlands	Nice to have	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have	Nice to have		
Bridges/culverts	Not required	Nice to have		
Landmark features	Nice to have	Not required		
Cultural resources	Not required	Not required		
Coastal and riverine structures	Nice to have	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We currently use freely accessible elevation data, DEM and/or LiDAR. DEMs range from 90-10m, LiDAR is sub meter or better. Dates vary by dataset. We also use photogrammetry to create rough bare-earth datasets at the 1m level.	We are not currently using bathymetry data		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other	Yes			
Other description	Public/privately acquired LiDAR datasets that we find out about second hand.			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available		
Cost savings/cost reduction	Major	Inland bathy data not available		
Cost avoidance	Moderate	Inland bathy data not available		
Increased revenues	None	Inland bathy data not available		
Mission-driven performance improvements	Moderate	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available		
Improved response or timeliness	Moderate	Inland bathy data not available		
Improved customer experience	Moderate	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Inland bathy data not available		
Environmental	Minor	Inland bathy data not available		
Public safety, including life and property	Major	Inland bathy data not available		

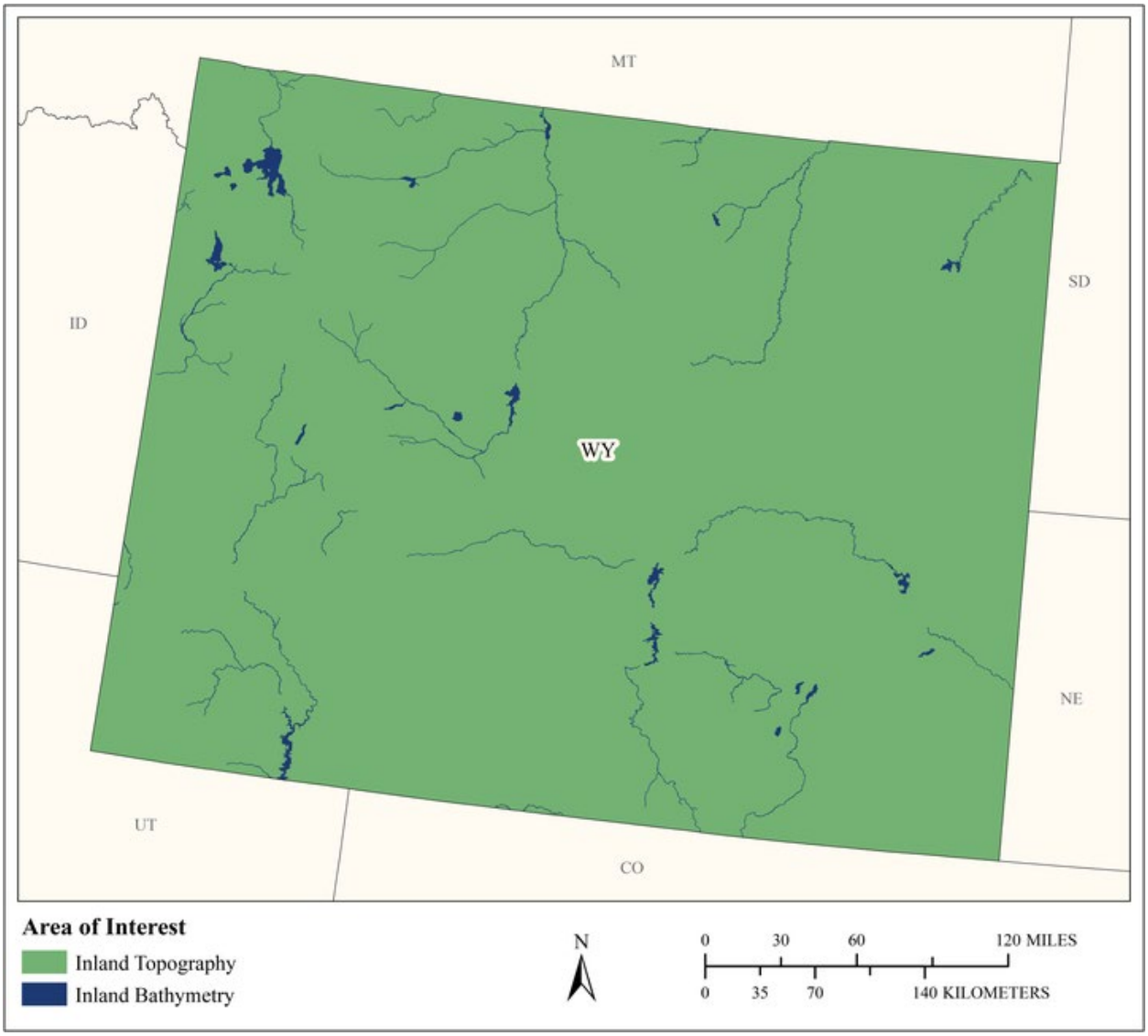
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$19,899	None								
Time savings description	We could extract cross sections/profiles from data sets instead of collecting them ourselves. Mapping techniques would be revised to save time. We would be able to drop a few steps off our QC method. Hours saved are highly dependent on location. Some field locations are 8-9 hour drives, we would see more saved hours the farther the field area. We would no longer need to build our own sub-meter terrain models. Data wouldn't change planning or monitoring much.											
Cost savings/cost reduction	Minor	Annual dollars saved/realized	$1,000	None								
Cost savings/cost reduction description	We do not have a budget to pay for acquisition, we use existing data.											
Cost avoidance	Major	Annual dollars saved/realized	$1,200	None								
Cost avoidance description	We don't pay external entities to do this for us. All we gain is staff time.											
Increased revenues	None			None								
Mission-driven performance improvements	Major	Annual percent improvement	75%	None								
Mission-driven performance improvements description	LiDAR changes the geologic mapping game. We gain accuracy and time by having the best available data. Better data in = better data out. Our ability doesn't change, our efficiency does.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		None								
Value added to products or services description	We don't pay for external data acquisition or interpretation, all benefits are scientific in nature. They are related to better data and information, not cost savings.											
Improved response or timeliness	Moderate	Unable to provide		None								
Improved response or timeliness description	We don't pay for external data acquisition or interpretation, all benefits are scientific in nature. They are related to better data and information, not cost savings.											
Improved customer experience	Major	Unable to provide		None								
Improved customer experience description	We don't pay for external data acquisition or interpretation, all benefits are scientific in nature. They are related to better data and information, not cost savings.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			None								

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Education or outreach description	By having high resolution terrain data we can revise existing geologic hazards maps, assessments, and models to better educate the public and private sectors.			
Environmental	Moderate	None		
Environmental description	Multiple date, high resolution terrain data can be used to map land form changes and relate them to oil and gas pipe lines and other infrastructure. It can also be used to create more robust EIS products.			
Public safety, including life and property	Major	None		
Public safety, including life and property description	By having high resolution terrain data we can revise existing geologic hazards maps, assessments, and models to allow the public and private sectors to mitigate geologic hazards.			

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Geologic Resource Mining and Extraction



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Onshore or offshore mineral extraction. Monitoring sand as a local resource. Seabed resources. Open mine volume computations. Stockpile analysis. Environmental impact assessment and site restoration.
MCA Title	Geologic Resource Mining and Extraction
MCA ID	60537
Organization Type	State or U.S. Territorial government
Organization Name	State of Wyoming
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 11 - Geologic Resource Mining and Extraction
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B		
Update Frequency	2-3 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Nice to have			Nice to have	
DEM for entire AOI needs to be seamless	Highly desirable	Nice to have			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Highly desirable		
Raw point cloud data	Nice to have	Highly desirable		
Classified point cloud	Highly desirable	Nice to have		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Highly desirable		
Ground control/ground truthing	Nice to have	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Highly desirable		
Land use/land cover	Nice to have	Not required		
Wetlands	Nice to have	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Nice to have		
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Nice to have	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Moderate	Moderate		
Cost avoidance	Moderate	Moderate		
Increased revenues	None	None		
Mission-driven performance improvements	Moderate	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	None		

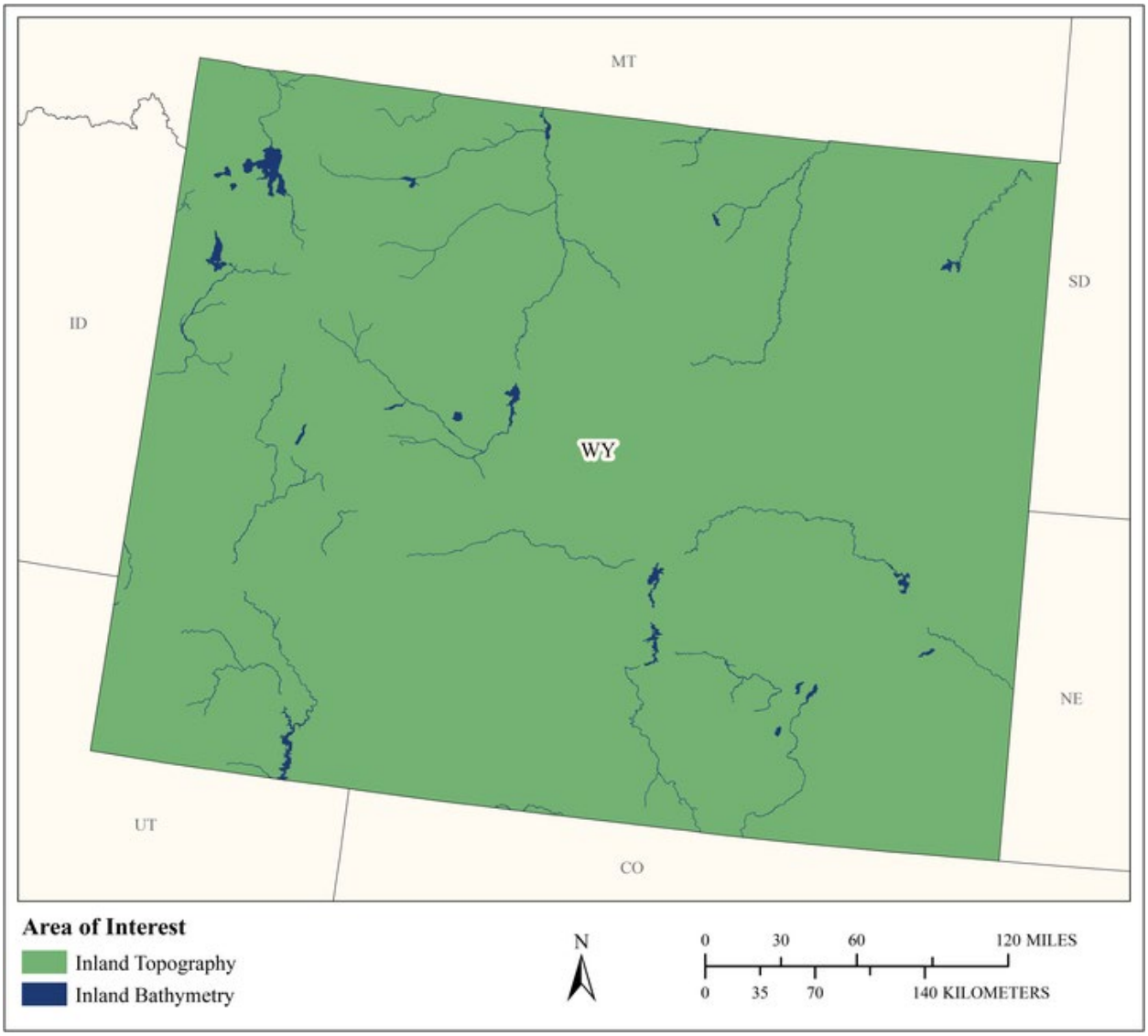
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	None		
Improved customer experience	Moderate	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	None		
Environmental	Major	Minor		
Public safety, including life and property	Moderate	None		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide							
Cost savings/cost reduction	Minor	Unable to provide		Minor	Unable to provide							
Cost avoidance	Minor	Unable to provide		Moderate	Unable to provide							
Increased revenues	None			None								
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$23,892									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide		None								
Improved response or timeliness	Major	Unable to provide		Minor	Unable to provide							
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$15,849		Annual dollars saved/ realized	$1,634						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			None								
Environmental	Major			Minor								
Public safety, including life and property	Major			Minor								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Renewable Energy Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Alternate energy development – solar, tidal, wind, wave, and ocean current. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Low head power potential for hydropower.
MCA Title	Renewable Energy Resources
MCA ID	60538
Organization Type	State or U.S. Territorial government
Organization Name	State of Wyoming
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	I don't know
Rivers and Streams	
Less than 10 ft	I don't know
10 - 50 ft	I don't know
51 - 100 ft	I don't know
101 - 500 ft	I don't know
501 - 2,500 ft	I don't know
Greater than 2,500 ft	I don't know
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	I don't know
½ - 1 acre	I don't know
1.1 – 2 acres	I don't know
2.1 – 5 acres	I don't know

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	I don't know
Greater than 10 acres	I don't know

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	I don't know		
Update Frequency	6-10 years	I don't know		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	I don't know		
Acceptable Vertical Error	Up to 20 cm	I don't know		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					I don't know	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	I don't know			I don't know	
Entire AOI under same environmental conditions	Highly desirable	I don't know			I don't know	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	I don't know			I don't know	
DEM for entire AOI needs to be seamless	Highly desirable	I don't know			I don't know	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	I don't know		
DTM	Required	I don't know		
DEM	Required	I don't know		
Raw point cloud data	Highly desirable	I don't know		
Classified point cloud	Highly desirable	I don't know		
Edited/cube XYZ		I don't know		
Full waveform	Nice to have	I don't know		
Bathymetric Attributed Grid (BAG)		I don't know		
Breaklines required for standard hydro-flattening	Nice to have	I don't know		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	I don't know		
Ground control/ground truthing	Highly desirable	I don't know		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	I don't know		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	I don't know		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	I don't know		
Land use/land cover	Highly desirable	I don't know		
Wetlands	Nice to have	I don't know		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have	I don't know		
Bridges/culverts	Nice to have	I don't know		
Landmark features	Nice to have	I don't know		
Cultural resources	Not required	I don't know		
Coastal and riverine structures	Nice to have	I don't know		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	I don't know		
Cost savings/cost reduction	Moderate	I don't know		
Cost avoidance	Moderate	I don't know		
Increased revenues	None	I don't know		
Mission-driven performance improvements	Minor	I don't know		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	I don't know		

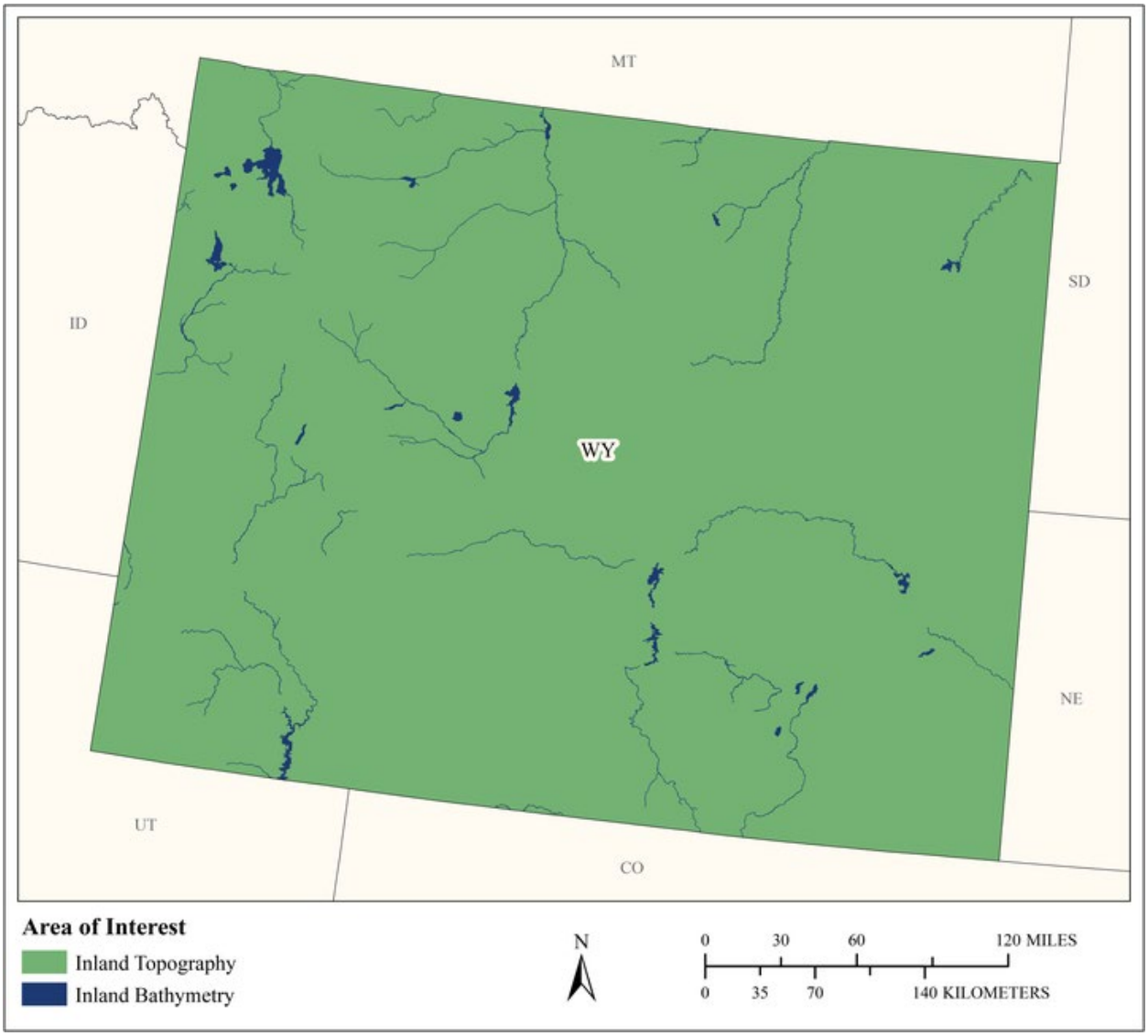
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor	I don't know		
Improved customer experience	Minor	I don't know		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	I don't know		
Environmental	Minor	I don't know		
Public safety, including life and property	Minor	I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		I don't know	Unable to provide							
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide							
Increased revenues	Moderate	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	Moderate	Unable to provide		I don't know	Unable to provide							
Improved customer experience	Minor	Unable to provide		I don't know	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			I don't know								
Environmental	Minor			I don't know								
Public safety, including life and property	None			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Oil and Gas Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Oil and gas exploration and production. Pipeline and route selection. Facility siting to mitigate geologic hazards. Construction planning. Environmental impact assessment and mitigation. Regulatory compliance.
MCA Title	Oil and Gas Resources
MCA ID	60539
Organization Type	State or U.S. Territorial government
Organization Name	State of Wyoming
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 13 - Oil and Gas Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B		
Update Frequency	Annually	2-3 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Required			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Required			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Required			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level			Up to triple the required TVU at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Highly desirable		
Raw point cloud data	Highly desirable	Nice to have		
Classified point cloud	Nice to have	Nice to have		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Not required		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Highly desirable	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Highly desirable		
Land use/land cover	Nice to have	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Highly desirable		
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Highly desirable		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Nice to have	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	I don't know		
Cost savings/cost reduction	Minor	I don't know		
Cost avoidance	Minor	I don't know		
Increased revenues	None	I don't know		
Mission-driven performance improvements	Minor	I don't know		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	I don't know		

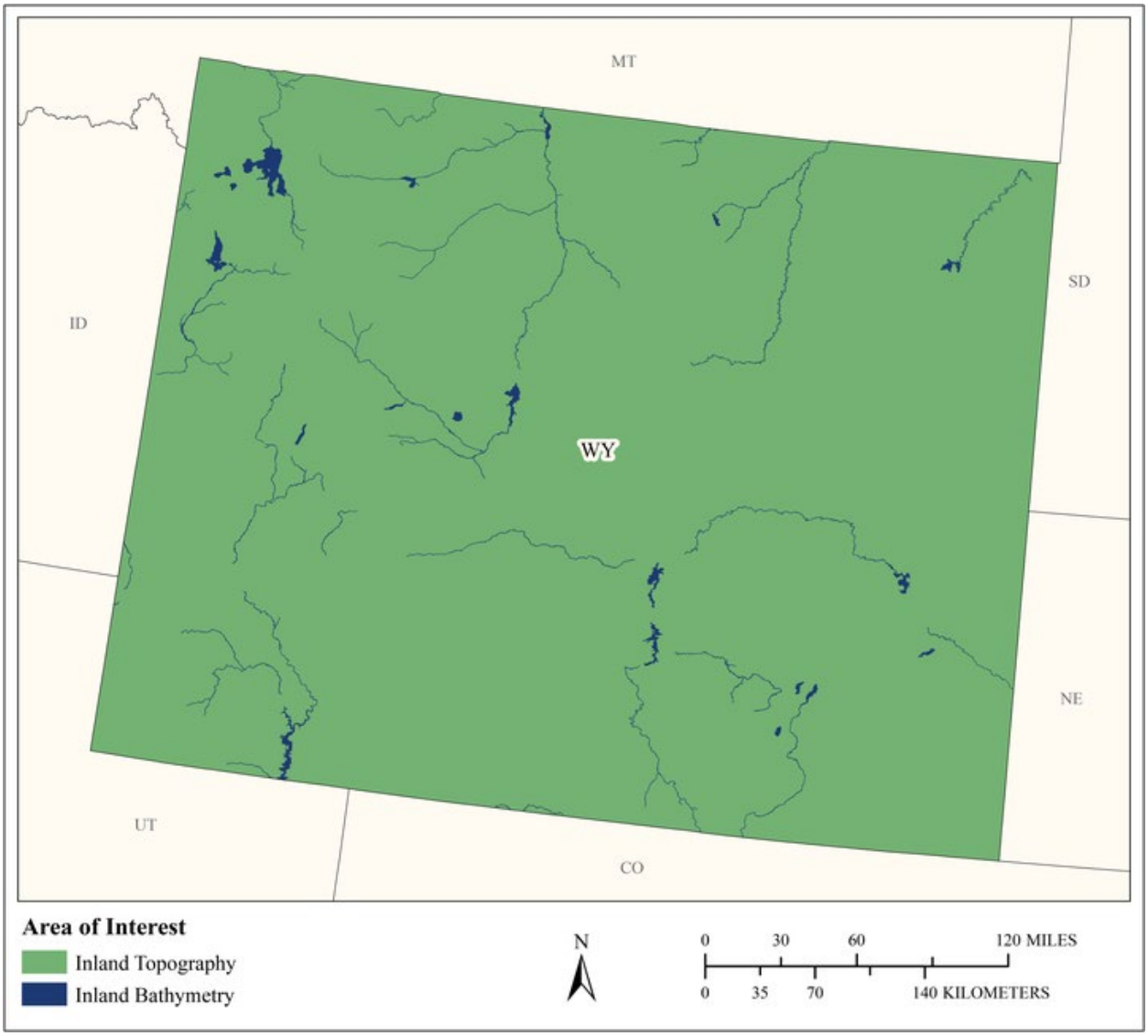
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	I don't know		
Improved customer experience	Moderate	I don't know		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	I don't know		
Environmental	Minor	I don't know		
Public safety, including life and property	Minor	I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		I don't know	Unable to provide							
Cost avoidance	Moderate	Unable to provide		I don't know	Unable to provide							
Increased revenues	None			I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$42,931									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	Major	Unable to provide		I don't know	Unable to provide							
Improved customer experience	Moderate	Unable to provide		I don't know	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			I don't know								
Environmental	Major			I don't know								
Public safety, including life and property	Major			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Cultural Resources Preservation and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Discovery and analysis of underwater archaeological and historical cultural sites. Site protection and preservation planning. Discovery and analysis of Native American and other historical cultural sites and subsistence activities.
MCA Title	Cultural Resources Preservation and Management
MCA ID	60540
Organization Type	State or U.S. Territorial government
Organization Name	State of Wyoming
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B		
Update Frequency	4-5 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Nice to have	Nice to have			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Not required			Nice to have	
DEM for entire AOI needs to be seamless	Nice to have	Nice to have			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level			Up to double the required TVU at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Not required	Not required		
Classified point cloud	Nice to have	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Nice to have	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Highly desirable		
Ground control/ground truthing	Nice to have	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Highly desirable		
Land use/land cover	Nice to have	Highly desirable		
Wetlands	Nice to have	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have	Highly desirable		
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Nice to have	Highly desirable		
Cultural resources	Required	Highly desirable		
Coastal and riverine structures	Nice to have	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Moderate	Minor		
Cost avoidance	Minor	Minor		
Increased revenues	None	Minor		
Mission-driven performance improvements	Moderate	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor		

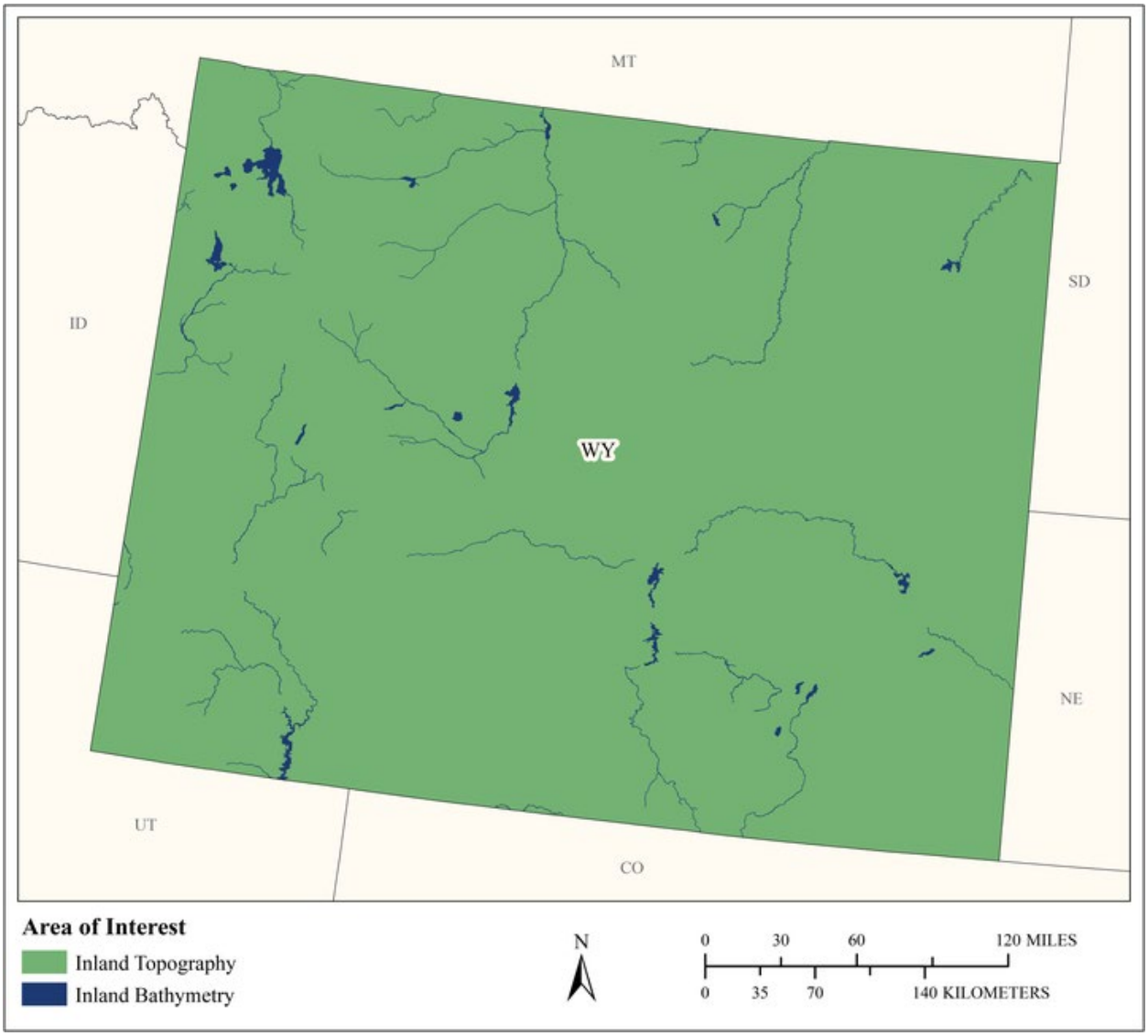
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major		
Improved customer experience	Moderate	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor		
Environmental	Minor	Moderate		
Public safety, including life and property	Minor	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Minor	Unable to provide							
Cost savings/cost reduction	Minor	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide							
Increased revenues	None			None								
Mission-driven performance improvements	Moderate	Unable to provide		Minor	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$17,928		Annual dollars saved/ realized	$42,992						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Moderate	Unable to provide		Minor	Unable to provide							
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$15,675									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Moderate								
Environmental	Minor			Minor								
Public safety, including life and property	Minor			Minor								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Flood Risk Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Flood risk modeling and mapping of riverine and coastal areas. Dam/dike/levee safety analysis. Emergency management. Flood forecasts.
MCA Title	Flood Risk Management
MCA ID	60541
Organization Type	State or U.S. Territorial government
Organization Name	State of Wyoming
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Required	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Required	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	Major	Moderate		
Increased revenues	Minor	Minor		
Mission-driven performance improvements	Major	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		

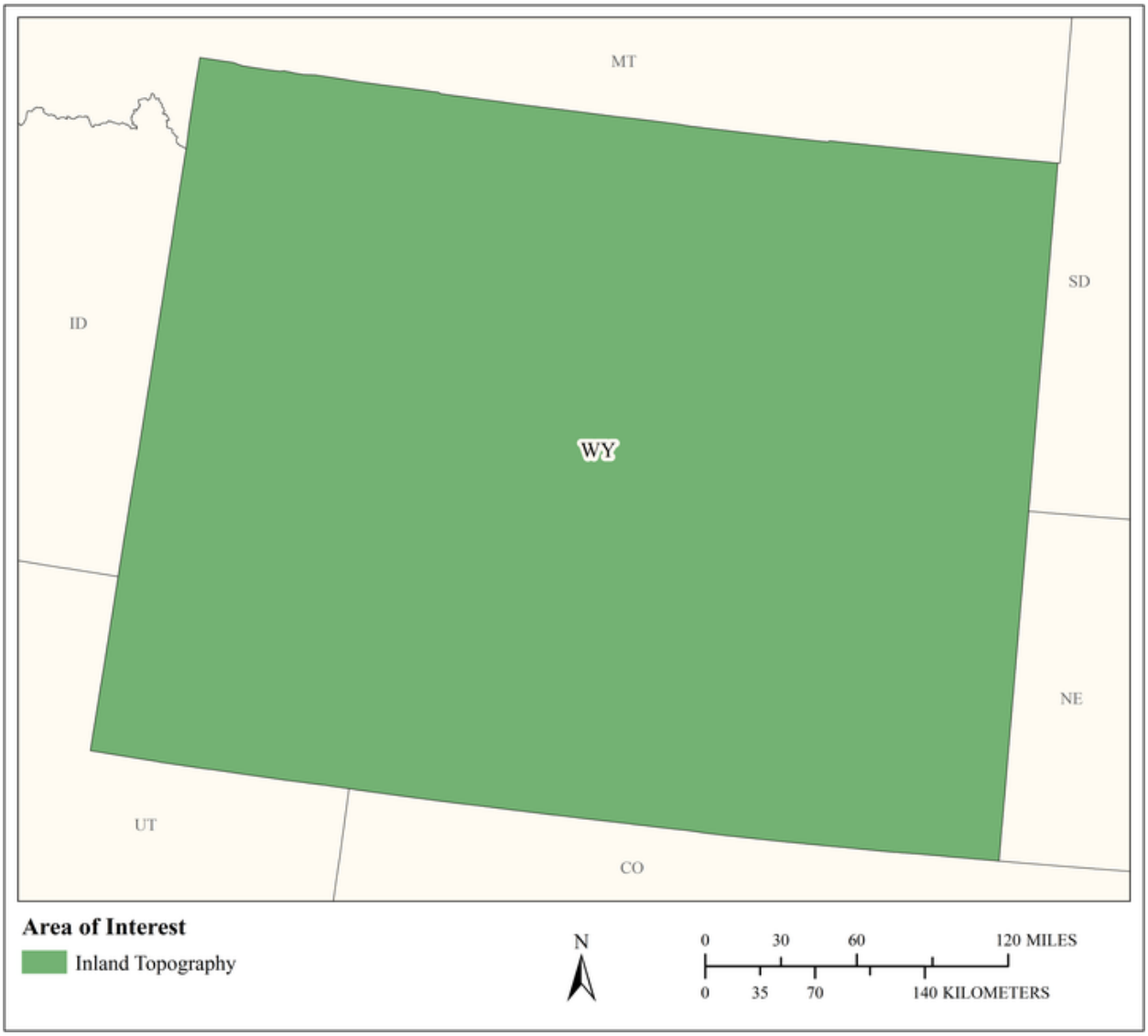
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor		
Improved customer experience	Major	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor		
Environmental	Major	Moderate		
Public safety, including life and property	Major	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		None								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$13,733,459		Annual dollars saved/ realized	$954,021						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$2,402,925		Annual dollars saved/ realized	$1,071,121						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate								
Environmental	Moderate			Moderate								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Wildfire Management, Planning, and Response



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	One or more states, territories, or counties			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of forest fuel and fire susceptibility. Fire behavior modeling to support wildfire suppression activities. Wildland/urban interface building identification. Post fire analysis to determine landslide prone areas.
MCA Title	Wildfire Management, Planning, and Response
MCA ID	60542
Organization Type	State or U.S. Territorial government
Organization Name	State of Wyoming
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 17 - Wildfire Management, Planning, and Response
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

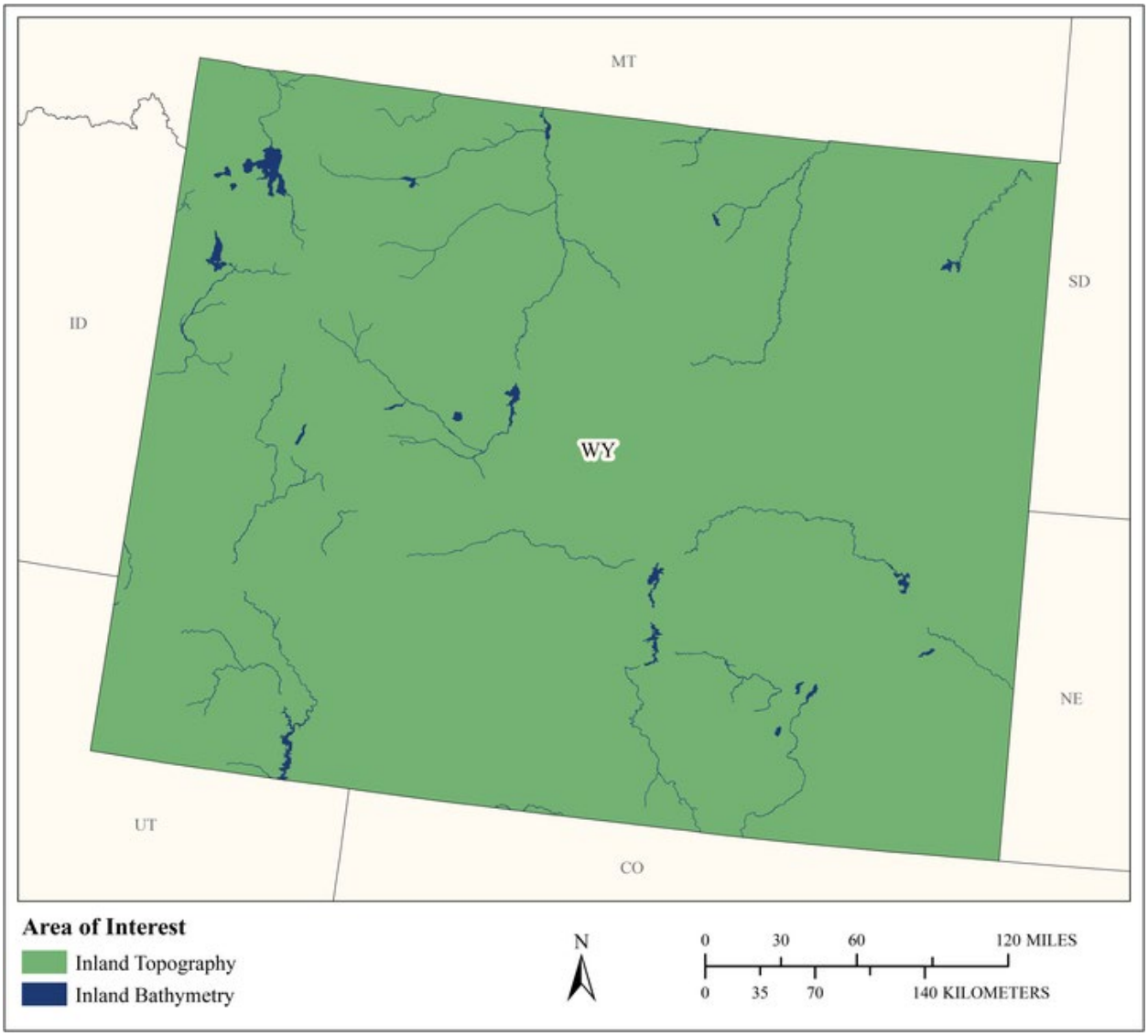
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$525,532									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Homeland Security, Law Enforcement, Disaster Response, and Emergency Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Infrastructure and border protection. Coastal search and rescue. Population dynamics. Emergency fuel supply and movement. Line of sight analysis in urban areas. Disaster response. Flood risk analysis resulting from acts of terrorism.
MCA Title	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
MCA ID	60543
Organization Type	State or U.S. Territorial government
Organization Name	State of Wyoming
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Highly desirable		
Classified point cloud	Required	Required		
Edited/cube XYZ		Highly desirable		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Required		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Moderate		
Increased revenues	None	None		
Mission-driven performance improvements	Major	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate		

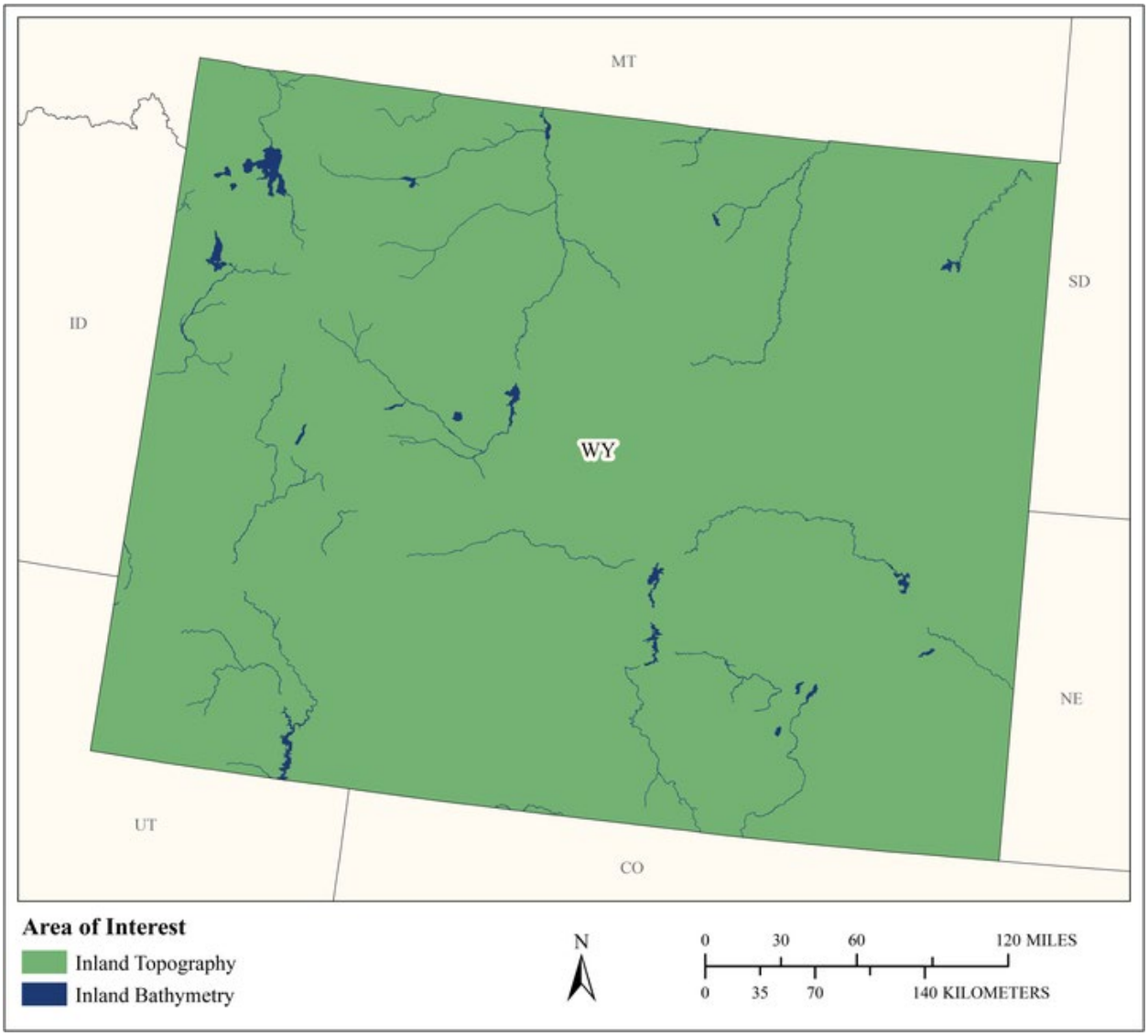
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major		
Improved customer experience	Major	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate		
Environmental	Minor	Moderate		
Public safety, including life and property	Major	Major		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$2,885,487		Annual dollars saved/ realized	$812,626						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$50,999		Annual dollars saved/ realized	$51,846						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Moderate			Moderate								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Land Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Road and railroad route selection and maintenance. Slope analysis for autonomous cars. GPS navigation visualization.
MCA Title	Land Navigation and Safety
MCA ID	60544
Organization Type	State or U.S. Territorial government
Organization Name	State of Wyoming
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 19 - Land Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL0B		
Update Frequency	2-3 years	2-3 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	Up to 2 meters		
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Highly desirable	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Required		
Land use/land cover	Highly desirable	Required		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	Moderate	Minor		
Increased revenues	None	None		
Mission-driven performance improvements	Major	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		

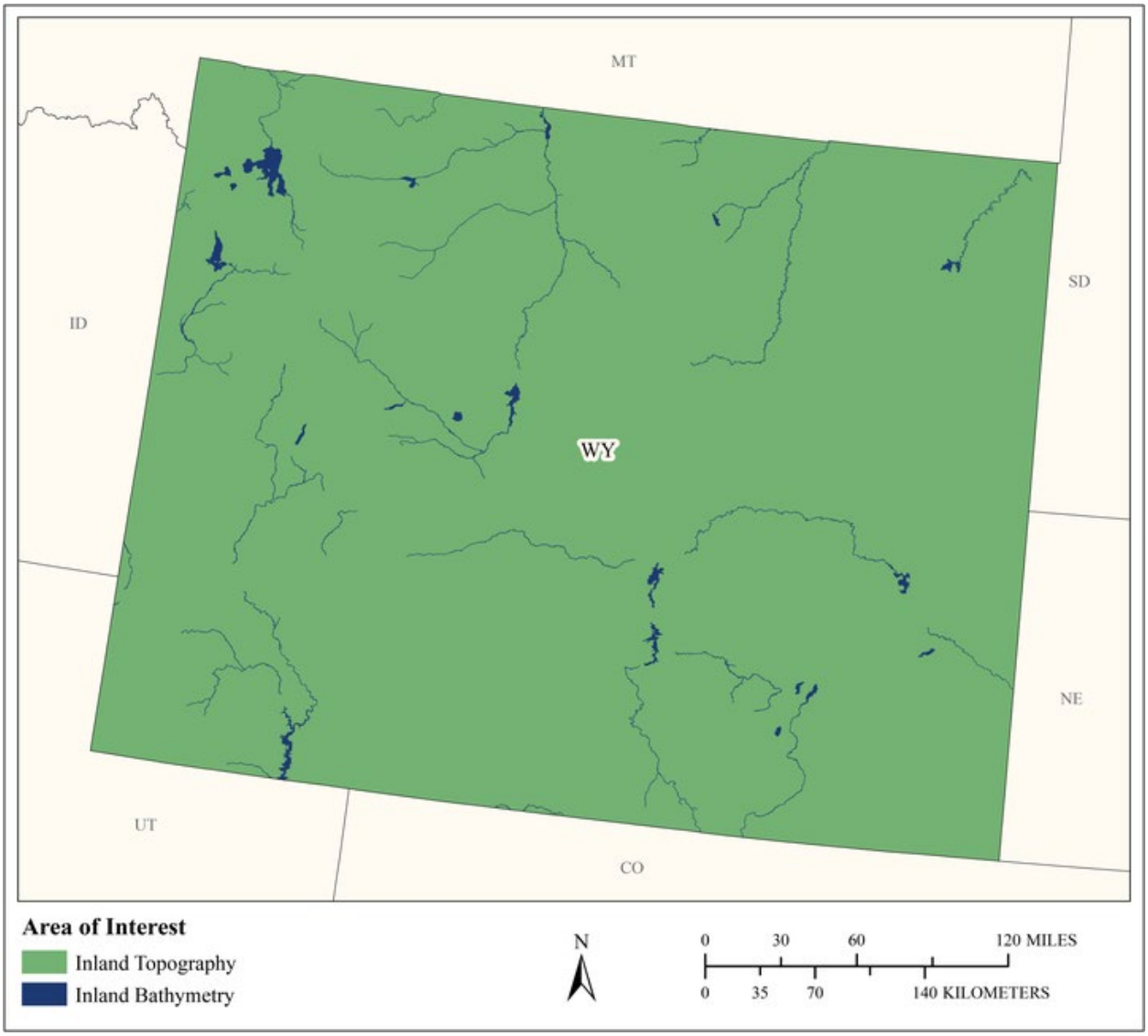
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor		
Improved customer experience	Major	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor		
Environmental	Moderate	Moderate		
Public safety, including life and property	Major	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,267,101		Annual dollars saved/ realized	$54,047						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide							
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$102,324		Annual dollars saved/ realized	$559						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor								
Environmental	Major			Moderate								
Public safety, including life and property	Major			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Aviation Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Determination of in-flight hazards and path obstructions. Aeronautical charting. Runway construction and repair.
MCA Title	Aviation Navigation and Safety
MCA ID	60545
Organization Type	State or U.S. Territorial government
Organization Name	State of Wyoming
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 21 - Aviation Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Nice to have
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B		
Update Frequency	Annually	Annually		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Highly desirable	Highly desirable		
Edited/cube XYZ		Highly desirable		
Full waveform	Highly desirable	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Required		
Land use/land cover	Required	Required		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Required	Highly desirable		
Cultural resources	Required	Highly desirable		
Coastal and riverine structures	Highly desirable	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes		
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Major		
Increased revenues	Major	None		
Mission-driven performance improvements	Major	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		

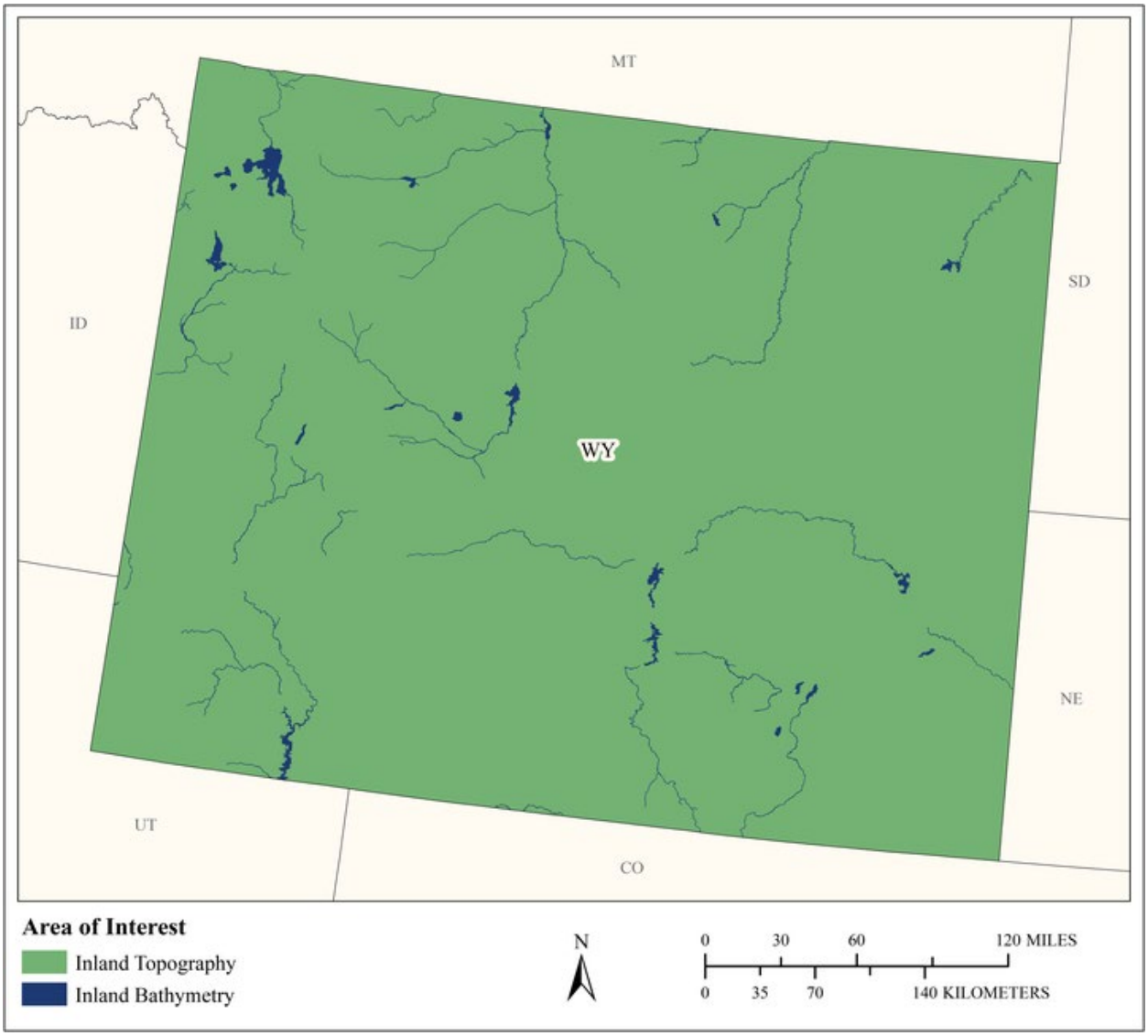
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major		
Improved customer experience	Major	Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	Minor		
Environmental	Major	Moderate		
Public safety, including life and property	Major	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Major	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$330,660		Annual dollars saved/ realized	$65,844						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$411,825									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Moderate								
Environmental	Moderate			Major								
Public safety, including life and property	Moderate			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps	Yes			
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Infrastructure and Construction Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Marine construction. Bridge design and construction. Engineering and construction of dams, levees, dikes, reservoirs, and coastal structures. Shipyard and port construction. Water, sewer, or power line planning and vegetation analysis. Pump, drain, and well placement. Stormwater modeling. Cut and fill analysis for earth-moving. Building site analysis. Road infrastructure. Infrastructure hardening or mitigation for climate change effects, e.g. sea level change.
MCA Title	Infrastructure and Construction Management
MCA ID	60546
Organization Type	State or U.S. Territorial government
Organization Name	State of Wyoming
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	Up to 2 meters		
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Nice to have		
Classified point cloud	Required	Highly desirable		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Nice to have		
Coastal and riverine structures	Highly desirable	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Moderate		
Increased revenues	Minor	None		
Mission-driven performance improvements	Moderate	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate		

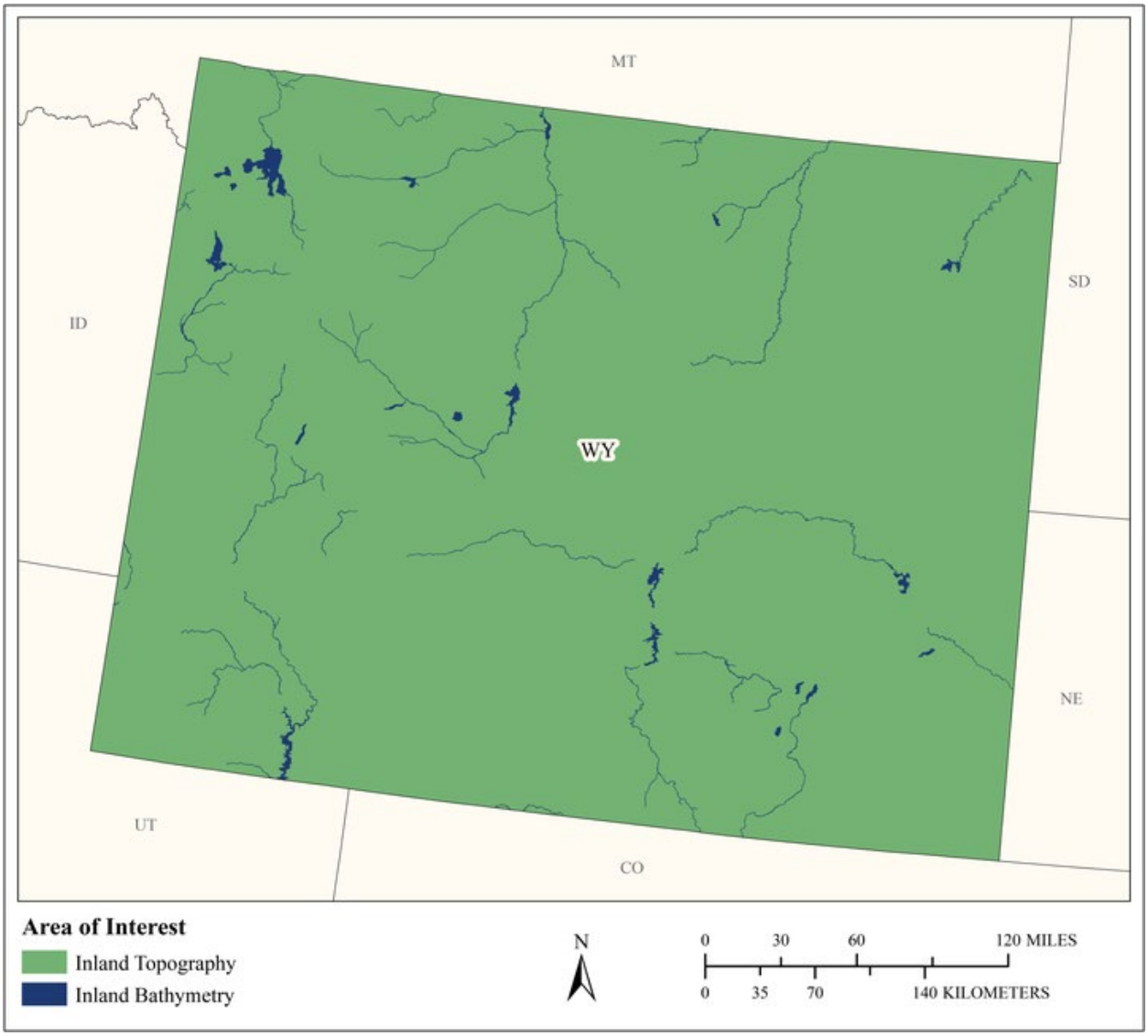
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major		
Improved customer experience	Moderate	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor		
Environmental	Moderate	Minor		
Public safety, including life and property	Moderate	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide							
Increased revenues	None			None								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$4,395,671		Annual dollars saved/ realized	$1,480,972						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Minor	Unable to provide							
Improved customer experience	Major	Unable to provide		Minor	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$12,935,575		Annual dollars saved/ realized	$153,781						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor								
Environmental	Moderate			Moderate								
Public safety, including life and property	Major			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Urban and Regional Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Land development and zoning. Municipal mapping of building footprints and elevations. Port resilience planning. Parks and transportation planning. Virtual city creation. Urban ecology planning.
MCA Title	Urban and Regional Planning
MCA ID	60547
Organization Type	State or U.S. Territorial government
Organization Name	State of Wyoming
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B		
Update Frequency	4-5 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Required	Nice to have		
Classified point cloud	Required	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Highly desirable		
Land use/land cover	Required	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Nice to have		
Coastal and riverine structures	Highly desirable	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	Major	Minor		
Increased revenues	Minor	Minor		
Mission-driven performance improvements	Major	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		

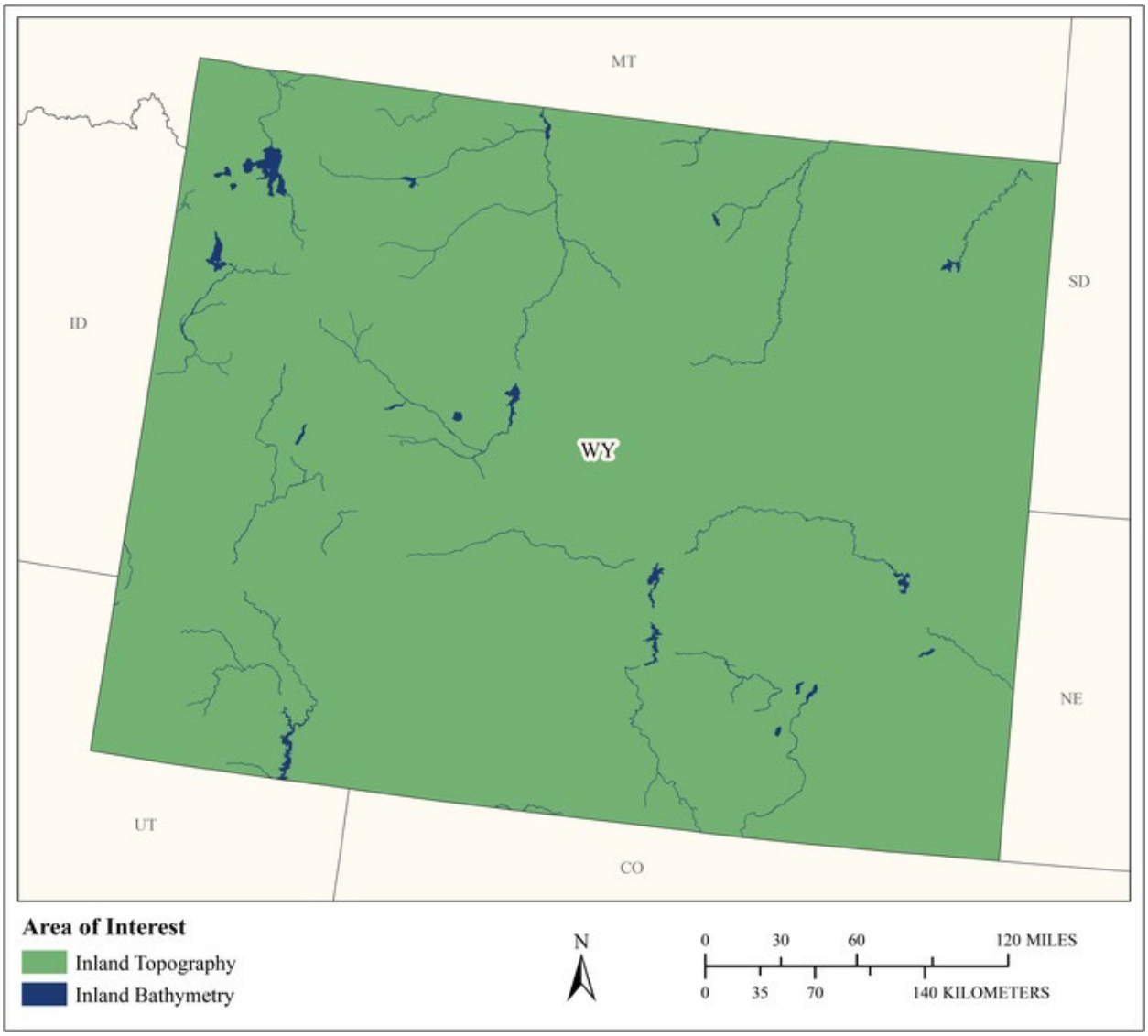
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor		
Improved customer experience	Major	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor		
Environmental	Major	Minor		
Public safety, including life and property	Major	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$26,317,556		Annual dollars saved/ realized	$1,071,868						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$3,038,373		Annual dollars saved/ realized	$1,356,005						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate								
Environmental	Major			Moderate								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Health and Human Services



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Health emergency response. Habitat modeling and disease prevention. Defining boundaries for health advisories for swimming and fishing. Marine-based bioproducts and pharmaceuticals. Public health and safety. Prevention of waterborne diseases.
MCA Title	Health and Human Services
MCA ID	60548
Organization Type	State or U.S. Territorial government
Organization Name	State of Wyoming
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 24 - Health and Human Services
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	I don't know
Rivers and Streams	
Less than 10 ft	I don't know
10 - 50 ft	I don't know
51 - 100 ft	I don't know
101 - 500 ft	I don't know
501 - 2,500 ft	I don't know
Greater than 2,500 ft	I don't know
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	I don't know
½ - 1 acre	I don't know
1.1 – 2 acres	I don't know
2.1 – 5 acres	I don't know
5.1 – 10 acres	I don't know
Greater than 10 acres	I don't know

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	I don't know		
Update Frequency	6-10 years	I don't know		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	I don't know		
Acceptable Vertical Error	Up to 20 cm	I don't know		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					I don't know	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	I don't know			I don't know	
Entire AOI under same environmental conditions	Not required	I don't know			I don't know	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	I don't know			I don't know	
DEM for entire AOI needs to be seamless	Highly desirable	I don't know			I don't know	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	I don't know		
DTM	Required	I don't know		
DEM	Highly desirable	I don't know		
Raw point cloud data	Highly desirable	I don't know		
Classified point cloud	Highly desirable	I don't know		
Edited/cube XYZ		I don't know		
Full waveform	Highly desirable	I don't know		
Bathymetric Attributed Grid (BAG)		I don't know		
Breaklines required for standard hydro-flattening	Not required	I don't know		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	I don't know		
Ground control/ground truthing	Nice to have	I don't know		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	I don't know		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	I don't know		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	I don't know		
Land use/land cover	Nice to have	I don't know		
Wetlands	Not required	I don't know		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Not required	I don't know		
Bridges/culverts	Nice to have	I don't know		
Landmark features	Nice to have	I don't know		
Cultural resources	Nice to have	I don't know		
Coastal and riverine structures	Not required	I don't know		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	I don't know		
Cost savings/cost reduction	Major	I don't know		
Cost avoidance	Major	I don't know		
Increased revenues	None	I don't know		
Mission-driven performance improvements	Major	I don't know		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	I don't know		

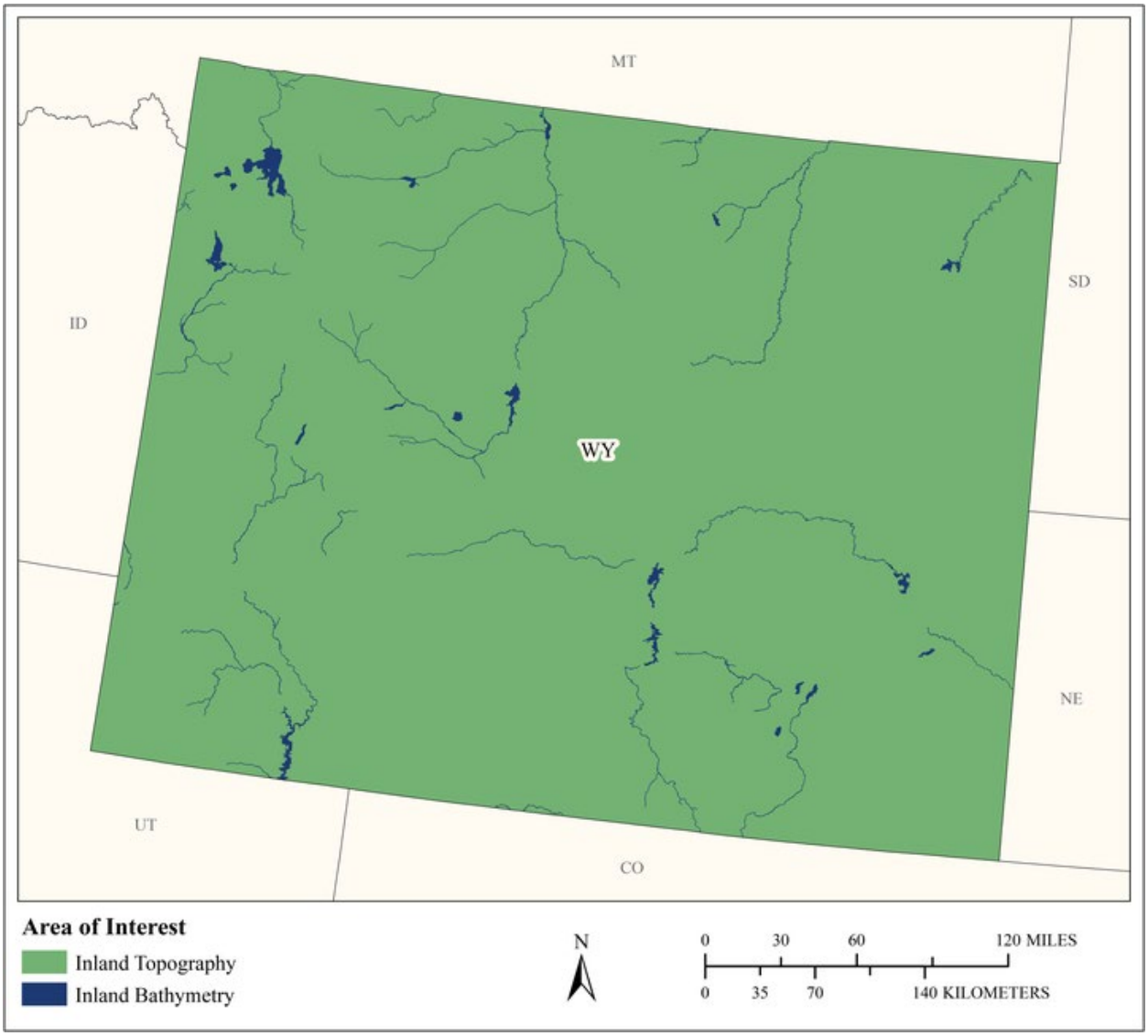
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor	I don't know		
Improved customer experience	Minor	I don't know		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	I don't know		
Environmental	Moderate	I don't know		
Public safety, including life and property	Major	I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		I don't know	Unable to provide							
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide							
Increased revenues	None			I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$34,900									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	Minor	Unable to provide		I don't know	Unable to provide							
Improved customer experience	Minor	Unable to provide		I don't know	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$4									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			I don't know								
Environmental	Moderate			I don't know								
Public safety, including life and property	Major			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Real Estate, Banking, Mortgage, and Insurance



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Assessment of risk for natural hazards (e.g., sinkholes, flooding) to inform insurance policy rates and the determination of mandatory insurance. Building permit compliance.
MCA Title	Real Estate, Banking, Mortgage, and Insurance
MCA ID	60549
Organization Type	State or U.S. Territorial government
Organization Name	State of Wyoming
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 25 - Real Estate, Banking, Mortgage, and Insurance
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	I don't know
Rivers and Streams	
Less than 10 ft	I don't know
10 - 50 ft	I don't know
51 - 100 ft	I don't know
101 - 500 ft	I don't know
501 - 2,500 ft	I don't know
Greater than 2,500 ft	I don't know
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	I don't know
½ - 1 acre	I don't know
1.1 – 2 acres	I don't know
2.1 – 5 acres	I don't know
5.1 – 10 acres	I don't know
Greater than 10 acres	I don't know

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	I don't know		
Update Frequency	4-5 years	I don't know		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	I don't know		
Acceptable Vertical Error	Up to 20 cm	I don't know		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					I don't know	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	I don't know			I don't know	
Entire AOI under same environmental conditions	Highly desirable	I don't know			I don't know	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	I don't know			I don't know	
DEM for entire AOI needs to be seamless	Highly desirable	I don't know			I don't know	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	I don't know		
DTM	Required	I don't know		
DEM	Required	I don't know		
Raw point cloud data	Nice to have	I don't know		
Classified point cloud	Required	I don't know		
Edited/cube XYZ		I don't know		
Full waveform	Nice to have	I don't know		
Bathymetric Attributed Grid (BAG)		I don't know		
Breaklines required for standard hydro-flattening	Nice to have	I don't know		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	I don't know		
Ground control/ground truthing	Required	I don't know		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	I don't know		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	I don't know		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	I don't know		
Land use/land cover	Nice to have	I don't know		
Wetlands	Nice to have	I don't know		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	I don't know		
Bridges/culverts	Nice to have	I don't know		
Landmark features	Nice to have	I don't know		
Cultural resources	Nice to have	I don't know		
Coastal and riverine structures	Nice to have	I don't know		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	I don't know		
Cost savings/cost reduction	Major	I don't know		
Cost avoidance	Major	I don't know		
Increased revenues	None	I don't know		
Mission-driven performance improvements	Moderate	I don't know		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	I don't know		

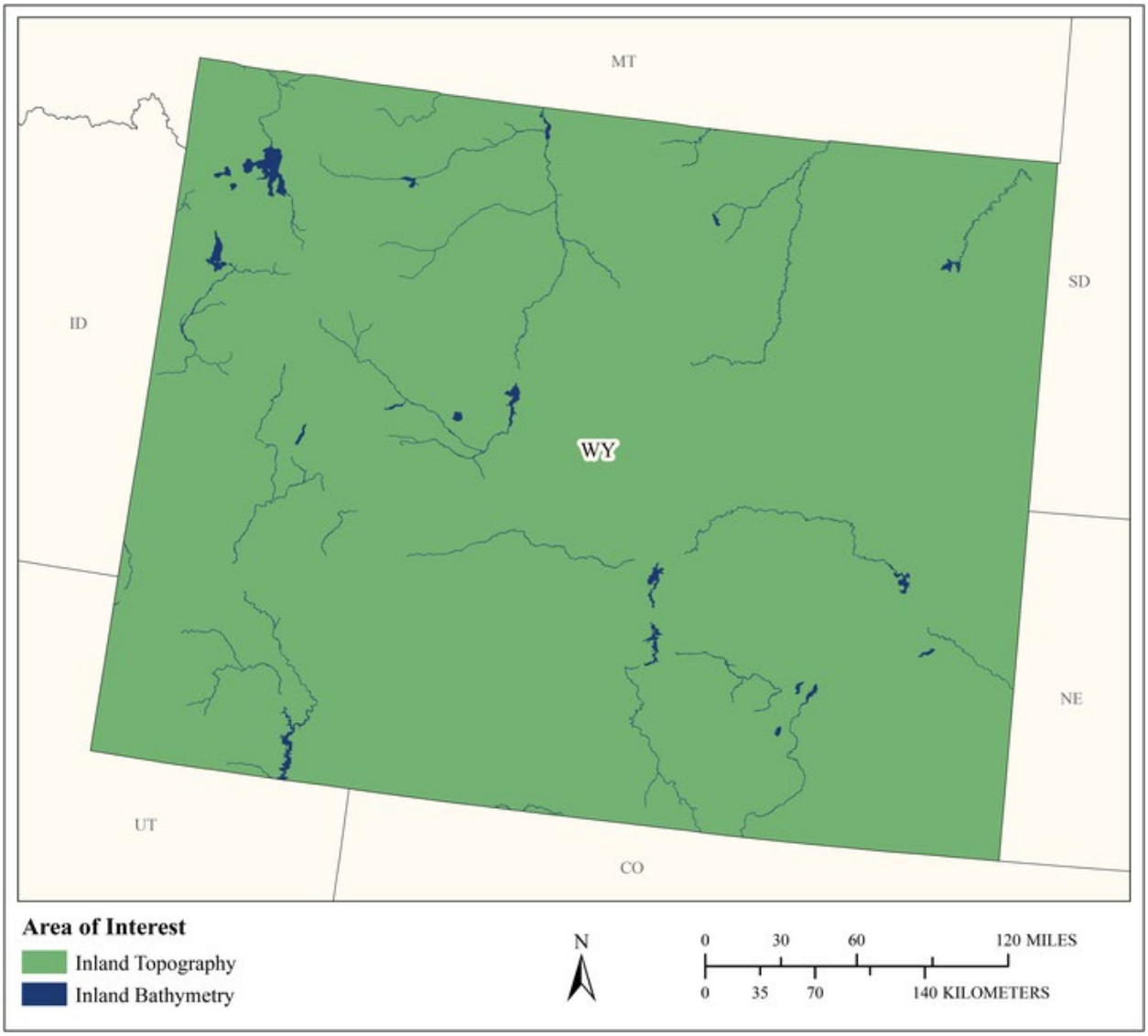
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	I don't know		
Improved customer experience	Major	I don't know		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	I don't know		
Environmental	Moderate	I don't know		
Public safety, including life and property	Moderate	I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		I don't know	Unable to provide							
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide							
Increased revenues	Minor	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$3,398,537									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	Major	Unable to provide		I don't know	Unable to provide							
Improved customer experience	Moderate	Unable to provide		I don't know	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			I don't know								
Environmental	Minor			I don't know								
Public safety, including life and property	Major			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Academic and Applied Research Programs and Support



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	WyGISC (Wyoming Geographic Information Science Center) is involved in research and service activities that involve a wide range of end products and solutions to natural resource and other problems. The main thread that ties our work is 'geospatial', which means we work directly with state and federal agencies as well as other University of Wyoming departments and NGO's to support their research or applied management needs. Due to this wide variety of support for geospatial needs, WyGISC is involved is supporting many mission critical activities for other agencies. Below is a list of topic-specific areas where we work and support: BU 01 – Water Supply and Quality BU 02 – Riverine Ecosystem Management BU 04 – Forest Resources Management BU 05 – Rangeland Management BU 06 – Natural Resources Conservation BU 07 – Wildlife and Habitat Management BU 10 – Geologic Assessment and Hazard Mitigation BU 11 – Geologic Resource Mining and Extraction BU 12 – Renewable Energy Resources BU 13 – Oil and Gas Resources BU 14 – Cultural Resources Preservation and Management BU 23 – Urban and Regional Planning BU 24 – Health and Human Services BU 26 – Education K-12 and Beyond, Basic Research BU 27 – Recreation. WYGISC houses and serves data for the state, provides application development, in addition to university programs.
MCA Title	Academic and Applied Research Programs and Support
MCA ID	22082
Organization Type	Academic or Not-for-Profit
Organization Name	University of Wyoming
Sub-Agency or Division	
Organization Mission	WyGISC's mission is to advance the knowledge and application of geographic information science and technology through research, education, and service. WyGISC aspires to become a premiere interdisciplinary academic center in geographic information science research and education, while strengthening our unique leadership role in service and outreach to the university, state and region.
Program Name	The Center's education, training and information and technology transfer activities support the adoption and use of geospatial data and information technologies among a wide range of end-users in academia, government, business, and the general public. WyGISC's research and development activities are broad, from geospatial data collection and spatial database design and development, to environmental modeling and Web-based geographic query and visualization implementations.
Total Annual Program Budget	
Primary Business Use	BU 26 - Education K12 and Beyond, Basic Research
Secondary Business Use	BU 06 - Natural Resources Conservation
Tertiary Business Use	BU 07 - Wildlife and Habitat Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required

What Needs to be Measured in 3D	Response
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	While we currently work at the small features level, having survey level features would be highly desirable for certain aspects of our work. We currently use imagery to map to features 1/2 meter in size (trees, well pads, roads, oil and gas infrastructure, etc.).

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL3B		
Update Frequency	Annually	>10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI	Areas with high frequency of change are oil and gas and other extractive industry development/disturbance areas need annual updates. Other areas would also be desirable to have annual updates.			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need		
Acceptable Vertical Error	Up to 30 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Highly desirable

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Required			Highly desirable	
Entire AOI under same environmental conditions	Required	Required			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Highly desirable		
Classified point cloud	Nice to have	Highly desirable		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Highly desirable	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Nice to have		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Nice to have		
Land use/land cover	Required	Highly desirable		
Wetlands	Required	Highly desirable		
Estuaries				
Inland surface water features	Required	Highly desirable		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Highly desirable	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We are using the resampled original USGS 30m DEM that was resampled down to 10m DEMs as the state-wide product. We also use and rely heavily on the NAIP program imagery that was/is flown every 3 years. We also have some study area-level detailed lidar data, as well as higher res imagery for some cities and properties.	Currently only use site-specific/project-specific Lidar data.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				

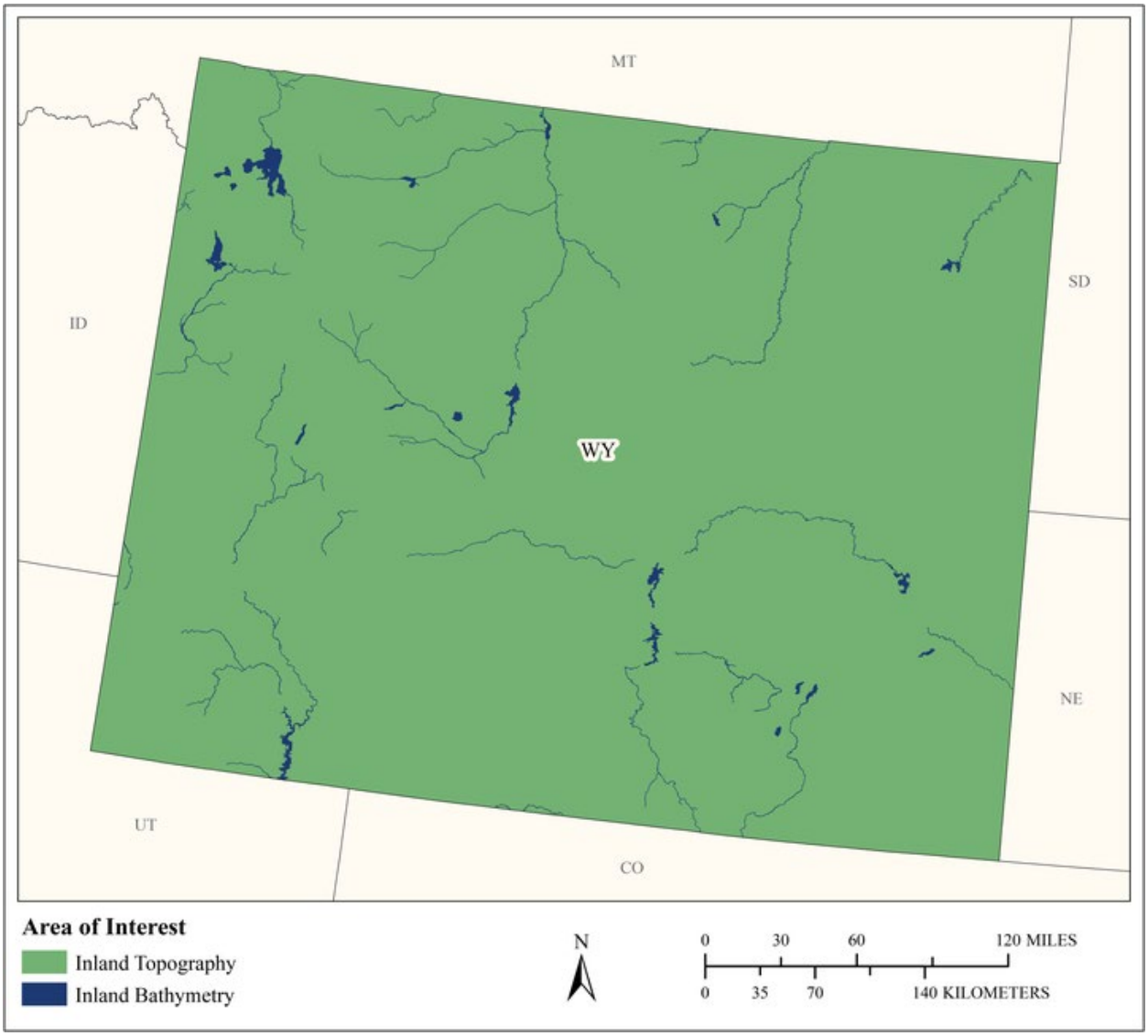
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other		Yes		
Other description		Project-specific, Non-centralized data		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Major	None		
Cost avoidance	Major	None		
Increased revenues	None	None		
Mission-driven performance improvements	Major	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		
Improved response or timeliness	Major	Minor		
Improved customer experience	Major	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor		
Environmental	Major	Major		
Public safety, including life and property	Moderate	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Cost avoidance description	Not currently working in EMS or other critical emergency areas.											
Increased revenues	Major	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$514,016		Annual dollars saved/ realized	$134,421						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,228,649									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major								
Environmental	Major			Major								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Recreation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Planning and development of recreational facilities such as rafting, boating, swimming, diving, and fishing areas; ski slopes; and golf courses. Location- based products and services such as maps and guides. Tourism. Trail and vista site planning. Orienteering.
MCA Title	Recreation
MCA ID	60550
Organization Type	State or U.S. Territorial government
Organization Name	State of Wyoming
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 27 - Recreation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required			Not required	
Entire AOI under same environmental conditions	Required	Not required			Not required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have			Nice to have	
DEM for entire AOI needs to be seamless	Required	Nice to have			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required		
DTM	Nice to have	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Highly desirable	Highly desirable		
Edited/cube XYZ		Highly desirable		
Full waveform	Not required	Nice to have		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Nice to have		
Ground control/ground truthing	Nice to have	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Highly desirable		
Land use/land cover	Nice to have	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Not required	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor		
Cost savings/cost reduction	Moderate	Minor		
Cost avoidance	Major	Minor		
Increased revenues	None	Minor		
Mission-driven performance improvements	Major	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor		

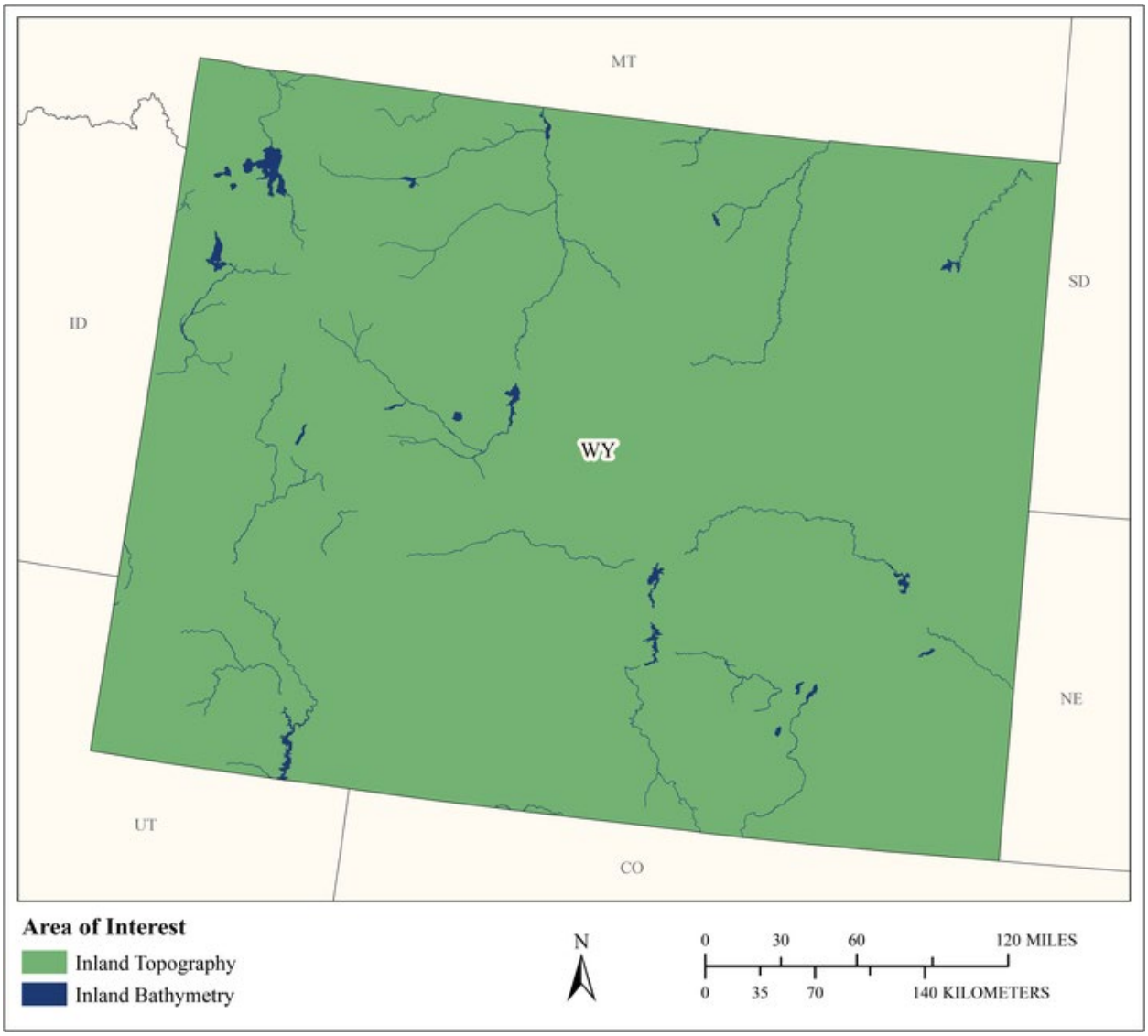
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	Minor		
Improved customer experience	Moderate	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor		
Environmental	Major	Minor		
Public safety, including life and property	Major	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	None			Moderate	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$22,444		Annual dollars saved/ realized	$13,516						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Minor	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major								
Environmental	Moderate			Major								
Public safety, including life and property	Moderate			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Telecommunications



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Telecommunication tower site selection. Design of radio and radar systems. Interference analysis. Path profiles. Undersea telecommunication route selection and deployment.
MCA Title	Telecommunications
MCA ID	60551
Organization Type	State or U.S. Territorial government
Organization Name	State of Wyoming
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 28 - Telecommunications
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Not required			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Nice to have	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have		
DTM	Highly desirable	Nice to have		
DEM	Highly desirable	Nice to have		
Raw point cloud data	Highly desirable	Nice to have		
Classified point cloud	Required	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Highly desirable	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Not required		
Ground control/ground truthing	Highly desirable	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Highly desirable		
Bridges/culverts	Required	Highly desirable		
Landmark features	Required	Highly desirable		
Cultural resources	Required	Highly desirable		
Coastal and riverine structures	Required	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI		Yes		
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Major		
Increased revenues	None	None		
Mission-driven performance improvements	Major	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		

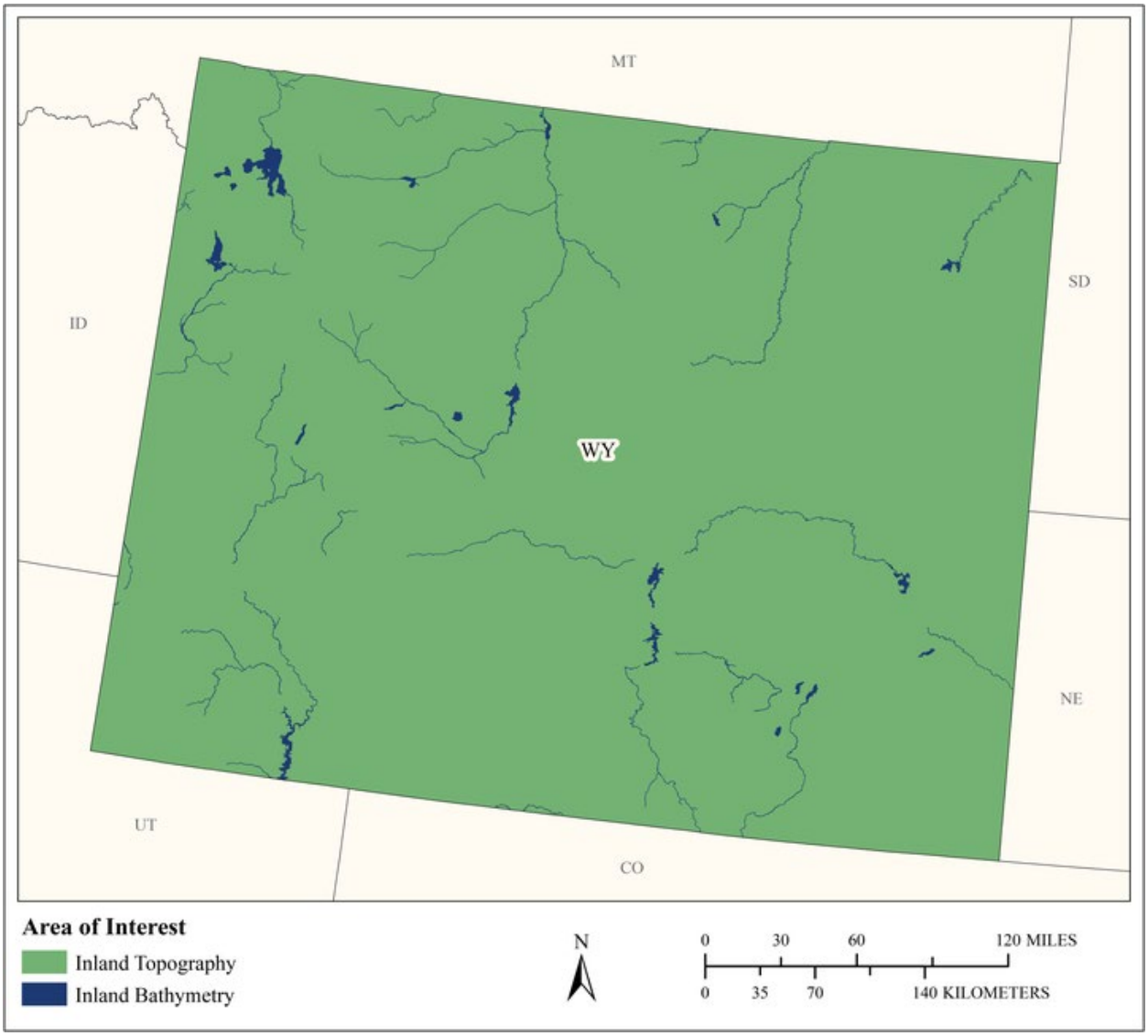
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major		
Improved customer experience	Major	Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor		
Environmental	Minor	Minor		
Public safety, including life and property	Major	Major		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know								
Environmental	I don't know			I don't know								
Public safety, including life and property	I don't know			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Maritime and Land Boundary Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Delimitation of legal and other coastal boundaries, inland boundaries, and ordinary high water lines (OHWL).
MCA Title	Maritime and Land Boundary Management
MCA ID	60552
Organization Type	State or U.S. Territorial government
Organization Name	State of Wyoming
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 30 - Maritime and Land Boundary Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B		
Update Frequency	6-10 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Required			Required	
DEM for entire AOI needs to be seamless	Highly desirable	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required		
DTM	Required	Required		
DEM	Highly desirable	Required		
Raw point cloud data	Nice to have	Highly desirable		
Classified point cloud	Highly desirable	Highly desirable		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Required		
Ground control/ground truthing	Highly desirable	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required	Required		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Highly desirable		
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Required	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Minor		
Cost savings/cost reduction	Moderate	None		
Cost avoidance	Moderate	None		
Increased revenues	Minor	None		
Mission-driven performance improvements	Major	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None		

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major	None		
Improved customer experience	Major	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor		
Environmental	Major	Minor		
Public safety, including life and property	Moderate	None		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide							
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		None								
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$110,065		Annual dollars saved/ realized	$82,600						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide							
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$421,995									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major								
Environmental	Minor			Major								
Public safety, including life and property	None			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps		Yes		
Cross sections		Yes		
Height-Above-Ground maps		Yes		
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1